# PRELIMINARY MAPS SHOWING LATE CENOZOIC DEPOSITS OF THE BRUCEVILLE, ELK GROVE, FLORIN, AND GALT 7.5-MINUTE QUADRANGLES, SACRAMENTO AND SAN JOAQUIN COUNTIES, CALIFORNIA

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## INTRODUCTION

The area described in this report is centered about 30 km south-southeast of Sacramento. It extends from the foothills of the Sierra Nevada to the Sacramento River and includes the following landforms:

1) Hills as much as 40 m above sea level, situated in the northeastern part of the area;

2) Pleistocene alluvial fans of the Mokelumne, Cosumnes, and(or) American Rivers, covering most of the central and western parts of the area;

3) Late Pleistocene and Holocene floodplains, inset into these fans and convergent with

4) Holocene floodplains of the Sacramento and Mokelumne Rivers, located at the western edge of the map area and divisible into natural levees, crevasse splays associated with these levees, alluvial flood basins historically situated both above and within reach of high tides at low river stages (mainly part of the Sacramento Basin of Bryan, 1923), and perennial lakes in small drainages impounded by Holocene alluvium.

The map is one of a series depicting Cenozoic deposits of the San Joaquin and Sacramento Valleys. Map units are differentiated on the basis of landforms, comparative soil development, superposition, and lithology, as discussed by Marchand and Allwardt (1977 and in press). Contacts generally approximate soil boundaries mapped by Cole and others (1954). Descriptions of map units give the names of soils characteristic of the units. Some subsurface data from fieldwork by the authors is shown on the Bruceville quadrangle.

## CORRELATION OF MAP UNITS

| WEST | EAST | |
|---|---|---|
| Sacramento Basin and Sacramento - San Joaquin Delta | Fans and floodplains of Mokelumne, Cosumnes, and (or) American Rivers, and adjacent foothills | |
| Qhal Qhab Qhtm---------- | Qha Qhls Qmh | ---------Holocene |
| | Qphe $Qm_2$ $Qm_2f$ | ---late Pleistocene and early Holocene |
| | $Qr_3$ $Qr_3f$ | |
| | Qr $Qr_2$ | -------Pleistocene |
| | $Qr_1$ | |
| | Qt? | |
| | Tl | ----------Pliocene |
| | Tm | ----------Miocene and Pliocene |

## DESCRIPTION OF MAP UNITS

### HOLOCENE ALLUVIUM

Qha..... Undifferentiated fine sand, silt, and clay on floodplains of the Cosumnes River and its tributaries--Commonly includes veneer (less than 1.5 m thick) of reddish, micaceous silt and sand, probably deposited since 1850 A.D. On lower part of Cosumnes River floodplain (Bruceville quadrangle), this veneer generally overlies Holocene flood-basin deposits having an A horizon 0.3-0.5 m thick. (part of Columbia-over-Sacramento soils of Cole and others,1954).

Qhab..... Flood-basin deposits--Chiefly silty clay and clayey silt, deposited under nearly lacustrine conditions from flood water, mainly of the Sacramento River, in the Sacramento Basin. Typically firm to stiff (unconfined shear strength 1-4 $kg/cm^2$); commonly contains $CaCO_3$ (nodular and/or disseminated) and black (Mn-oxide?) sand-size spherules; locally contains gastropod shells. Locally veneered with silt and sands probably of historic age. Shown where thickness generally exceeds 1.5 m, mostly below 5-foot contour in post-Riverbank gullies tributary to Sacramento Basin (western parts of Florin and Bruceville quadrangles). Additional but thinner deposits (not shown) extend farther up the gullies and mantle adjacent areas up to the 15-foot contour (Freeport soils of Cole and others, 1954; Sacramento and part of Columbia-over-Sacramento soils of Cole and others, 1954).

Qhal..... Natural-levee, crevasse-splay, and floodplain deposits--Chiefly clayey silt, silt, and fine sand. Not calcareous. (Columbia and loamy Sacramento soils of Cole and others, 1954).

Qhls..... HOLOCENE LACUSTRINE DEPOSITS--Silt and clay deposited in post-Riverbank gullies impounded by aggradation on Cosumnes River floodplain. Aggradation caused by Holocene sea-level rise and, possibly, by changes in upland vegetation and rainfall roughly contemporaneous with deposition of the upper member of the Modesto Formation ($Qm_2$) (Shlemon, 1972, p. 78). Shown only on Galt quadrangle. Additional lacustrine deposits impounded by deposits of Sacramento, Mokelumne, and Cosumnes Rivers in Florin and Bruceville quadrangles not differentiated from flood-basin alluvium (Qhab and some Qha) because of similarities in origin; the distribution of these deposits is approximated by the low-water shorelines of historic lakes, such as Beach Lake (Florin quadrangle).

Qhtm..... HOLOCENE TIDAL-WETLAND MUD (shown where generally thicker than 1.5 m)--Deposited from flood water in tidal reaches of alluvial basins. Chiefly silty clay and clayey silt. Organic content generally less than 10 percent. Typically soft (unconfined shear strength less than 1 $kg/cm^2$) and gray, owing to persistent wetting by high tides during low river stages, but stiffer and mottled in top 1 m where drained for cultivation Commonly contains roots in growth position; locally contains layers of detrital plant fragments. (Sacramento soils of Cole and others, 1954).

Qmh..... Upper Modesto and Holocene alluvium, undifferentiated

Qphe..... EOLIAN SAND (late Pleistocene and/or early Holocene). Well-sorted fine-grained sand, generally less than 1.5 m thick. Appears to contain more lithic fragments and heavy minerals than comparable sand in eastern Contra Costa County. Probably blown eastward from late Pleistocene floodplain of Sacramento River, presumably when the river was transporting glacial-outwash sand and silt. Deep oxidation profile and lack of B horizon imply contemporaneity with upper member of Modesto Formation ($Qm_2$). (Oakley soils of Cole and others, 1954).

MODESTO FORMATION

upper member includes:

$Qm_2$..... Arkosic alluvium forming a low terrace or high floodplain along the Cosumnes River; chiefly sand, moderately well sorted; probably glacial outwash from the core of the Sierra Nevada; passes westward beneath Holocene floodplain deposits formed in response to postglacial sea level rise (Hanford soils of Cole and others, 1954)

$Qm_2f$..... Local alluvial-fan deposits of mixed provenance; fine sand, silt, and clay deposited by distributaries on lower parts of fans. Like Qmz covered to the west by Holocene floodplain deposits (Honcut and Bear Creek soils of Cole and others, 1954)

RIVERBANK FORMATION

Qr..... Alluvial sand and silt near eastern edge of San Joaquin-Sacramento Delta, not differentiated as to unit but probably equivalent to the upper or middle units (Glann, Alamo, and San Joaquin, weak or normal variant [1/] soils of Cole and others, 1954)

upper unit includes:

$Qr_3f$.....Arkosic alluvium forming Mokelumne and Cosumnes alluvial fans and terraces; chiefly sand; probably glacial outwash derived from the core of the Sierra Nevada (San Joaquin, weak variant; Alamo; and Glann soils of Cole and others, 1954)

$Qr_3f$..... Local fan-derived alluvial sand and silt of mixed provenance; follows some of the larger ephemeral streams that head within the Mokelumne and Cosumnes alluvial fans (San Joaquin, weak variant, and Alamo soils of Cole and others, 1954)

middle unit includes:

$Qr_2$..... Arkosic alluvium containing some locally derived detritus; chiefly sand with some silt; probably glacial outwash derived from the core of the Sierra Nevada; forms fan surfaces and terraces of the Mokelumne, Cosumnes, and American (?) Rivers lying about 1 - 2 m above the $Qr_3$ fan and terrace surfaces (San Joaquin, normal variant; Alamo; and Glann soils of Cole and others, 1954)

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[1/] Soil variants reflect differences in profile development (weak, normal, strong) as discussed in Marchand and Allwardt, 1977 and in press).

lower unit includes:

$Qr_1$..... Arkosic alluvium containing some locally derived detritus; chiefly sand with some fine sand and silt; probably glacial outwash derived from the core of the Sierra Nevada; forms isolated remnants of old fan surfaces 2-4m above the $Qr_2$ fan and terrace surfaces along the Mokelumne and Cosumnes Rivers (San Joaquin, strong variant, and Alamo soils of Cole and others, 1954).

TURLOCK LAKE FORMATION (?)

upper unit includes:

Qt?..... Fine-grained arkosic and locally derived alluvium forming a few eroded and poorly exposed outcrops on the Elk Grove quadrangle; tentatively correlated with the Turlock Lake Formation but these outcrops could also be fine-grained facies of the Laguna Formation (Whitney soils of Cole and others, 1954). Lower unit not exposed in this area.

Tl..... LAGUNA FORMATION (Pliocene)--Cobble gravel, sand, and minor silt of mixed metamorphic, granitic, and volcanic source; moderately consolidated; forms hills and ridges rising 5-10 m above the surrounding Riverbank alluvial fans (Redding soils of Cole and others, 1954)

Tm..... MEHRTEN FORMATION (Miocene and early Pliocene)-- Mudstone, claystone, siltstone, and minor sandstone and conglomerate derived from andesitic volcanic source areas near the crest of the Sierra Nevada; forms hills and ridges east of the map area extending onto the eastern edge of the Elk Grove quadrangle (Pentz, Pentz-Redding, Peters soils of Cole and others, 1954)

SURFICIAL CONTACTS

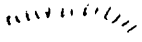


Location generally accurate within 150 m.

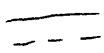


Location may err by more than 150 m.

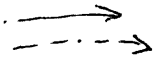
SYMBOLS FOR FORMER HYDROLOGIC FEATURES (historic or late Holocene; inferred mostly from U.S.G.S. topographic maps surveyed 1907-1908)



Landward reach of high tides at low river stages (ca. 1850 A.D.). Not shown along banks of waterways. Queried where location may err by more than 500 m.



Centerline of waterway subject to tidal flow at low river stages (late 19th century or late Holocene). Dashed where location may err by more than 500 m.



Centerline of purely fluvial waterway (late 19th century or late Holocene). Dashed where location may err by more than 500 m. Arrow gives direction of flow.

Shoreline of perennial lake at low river stage (ca. 1900 A.D.). Queried where location may err by more than 500 m.

SYMBOLS FOR SUBSURFACE DATA FROM BOREHOLES, DITCHES, AND OUTCROPS

⊙ Outcrop or hand-auger hole

S, sand; s, sandy (VF, very fine; F, fine; M, medium; C coarse: VC, very coarse)

Z, silt; z, silty

C, clay; c, clayey

p, peaty (approx. 10-50 percent organic content)

pp 0.5 Unconfined sheer strength ($kg/cm^2$) measured with pocket penetrometer

– – – – Gradational contact

——— Sharp contact

Ab ⊤⊤⊤⊤⊤⊤ Buried soil; letter denotes diagnostic horizon (following Soil Survey Staff, 1975).

## References

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