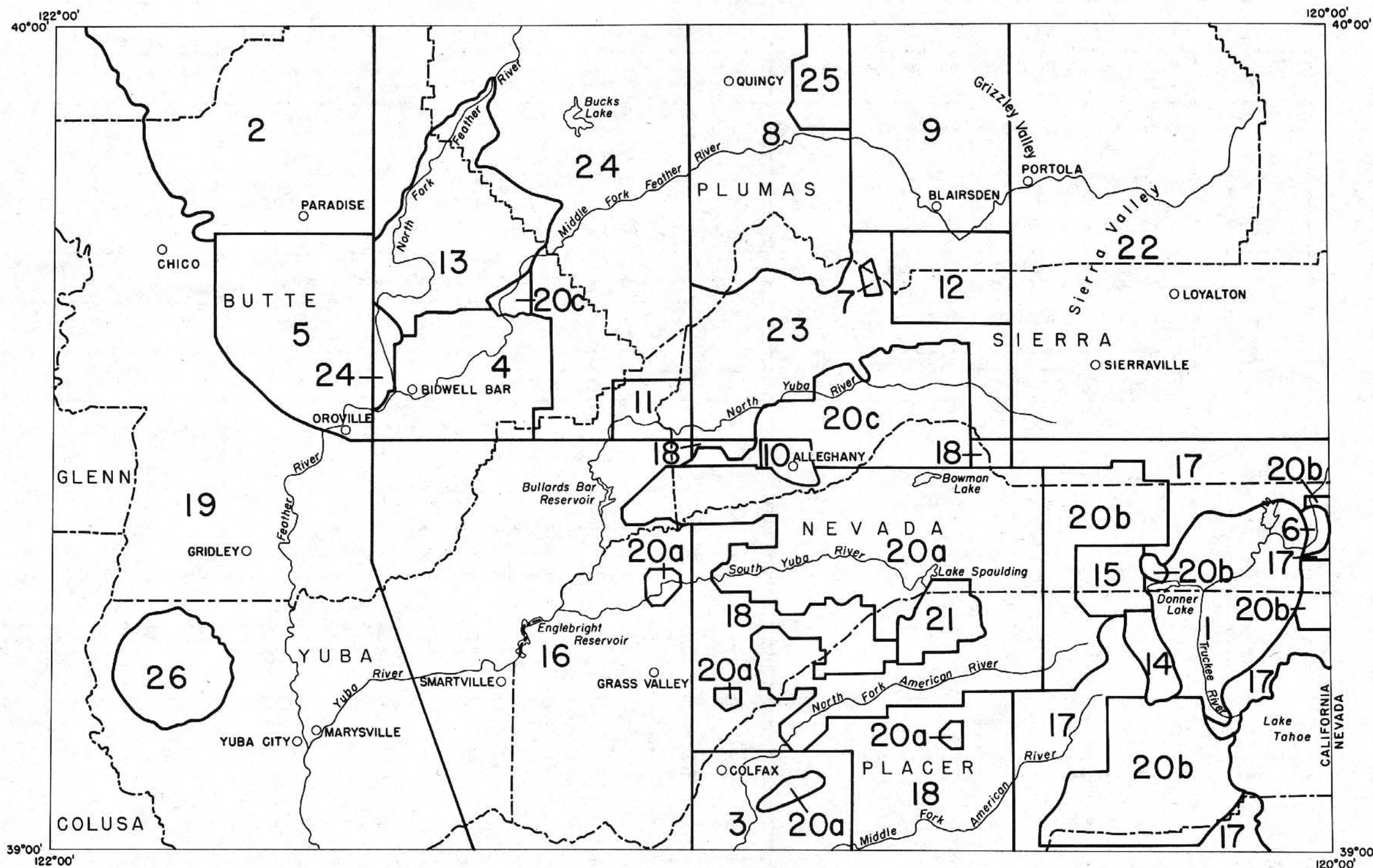


EXPLANATORY DATA  
CHICO SHEET  
GEOLOGIC MAP OF CALIFORNIA  
OLAF P. JENKINS EDITION

COMPILATION BY JOHN L. BURNETT AND CHARLES W. JENNINGS, 1962

(Third Printing, 1977)

INDEX TO GEOLOGIC MAPPING  
USED IN THE COMPILATION OF THE  
CHICO SHEET



1. Birkeland, P. W., Pleistocene history of the Truckee River Valley, north of Lake Tahoe, California, scale 1:62,500, Stanford University, unpublished Ph.D. thesis in preparation, 1961. (Pre-Pleistocene units in part after Daley and Poole, see item 6.)

2. Burnett, J. L., Reconnaissance geologic map of the Paradise and the northeastern half of the Richardson Springs quadrangles, California, scale 1:62,500, California Div. Mines and Geology reconnaissance mapping for the State Geologic Map, 1961.

Saul, L., Senonian Mollusks from Chico Creek, scale 1:15,625, University of California, Los Angeles, unpublished M.A. thesis, 1959.

Taff, J. A., Hanna, G. D., and Cross, C. M., 1940, Type locality of the Cretaceous Chico Formation: Geological Society America Bulletin, vol. 51, pp. 1311-1328, Fig. 1: Portion of Chico quadrangle, scale 1" equals about 6 miles.

Cook, R. E., The Upper Cretaceous Chico Formation at the type locality, scale 1:93,700, Stanford University, unpublished M.S. thesis, 1949.

3. Chandra, D. K., Geology of the Colfax and Foresthill quadrangles, California, scale 1:24,000, University of California, Berkeley, unpublished Ph.D. thesis, 1954. Also California Div. Mines and Geology Special Report 67 in press, 1961.

4. Compton, R. R., 1955, Trondhjemite batholith near Bidwell Bar, California: Geological Society America Bulletin, vol. 66, pp. 9-44, Pl. 1: Geologic map of the Bidwell Bar region, California, scale 1:42,240.

5. Creely, R. S., Geology of the Oroville quadrangle, California, scale 1:62,500, University of California, Berkeley, unpublished Ph.D. thesis, 1955. Also California Div. Mines and Geology report in preparation, 1961. Pliocene andesite flows added by J. L. Burnett (see item 2).

6. Daley, A. C., and Poole, D. M., A geologic section in east-central California eastward from Donner Pass, scale 1:31,680, University of California, Los Angeles, unpublished M.A. thesis, 1949.

7. Durrell, C. and Proctor, P. D., 1948, Iron-ore deposits near Lake Hawley and Spencer Lakes, Sierra County, California: California Div. Mines Bulletin 129-L, pp. 167-192, Pl. 20: Geologic map of the magnetite deposits of the Sierra iron mine area, Sierra County, California, scale 1:12,000.

8. Durrell, C., Reconnaissance geologic maps of portions of the Quincy, Spring Garden, Onion Valley, Blue Nose Mountain, La Porte, and Mt. Fillmore quadrangles, California, scale 1:24,000, unpublished, 1957.

Turner, H. W., 1897, Downieville folio, California: U. S. Geol. Survey, Geol. Atlas of the U. S., folio 37, Map: Historical geology sheet, scale 1:125,000. (Modifications of limestone and dolomite areas by Q. A. Aune, California Div. Mines and Geology, unpublished limestone investigations, 1961.)

9. Durrell, C., Geologic map of the Blairsden quadrangle, California, scale 1:48,000, in progress, 1958.

Durrell, C., 1959, Tertiary stratigraphy of the Blairsden quadrangle, Plumas County, California: California Univ. Dept. Geol. Sci. Bulletin, vol. 34, no. 3, pp. 161-192.

Durrell, C., 1959, The Lovejoy Formation of northern California: California Univ. Dept. Geol. Sci. Bulletin, vol. 34, no. 4, pp. 193-220.

10. Ferguson, H. G. and Gannett, R. W., 1932, Gold quartz veins of the Alleghany District, California: U. S. Geol. Survey Prof. Paper 172, 139 pp., Pl. 1: Geologic map of the Alleghany District, California, showing principal mining claims, scale 1:12,000.

11. Goodwin, J. G., The geology of the southern half of the Strawberry Valley quadrangle, scale 1:24,000, University of California, Berkeley, unpublished M.A. thesis, 1952.

12. Ford, R. S., Geology and geohydrology of Sierra, Mohawk, and Humboldt Valleys, Plumas and Sierra Counties, scale 1:62,500, California Dept. Water Resources unpublished office report, 1961.

13. \*Hietanen, A., 1951, Metamorphic and igneous rocks of the Merrimac area, Plumas National Forest, California: Geological Society America Bulletin, vol. 62, pp. 565-608, Pl. 1: Geologic map of the Merrimac area, Plumas National Forest, California, scale 1:50,680.

14. Hudson, F. S., 1948, Donner Pass zone of deformation, Sierra Nevada, California: Geological Society America Bulletin, vol. 59, pp. 795-800, Pl. 1: Geologic map and structure sections, Donner Pass region, scale 1:62,500.

15. Hudson, F. S., 1951, Mount Lincoln-Castle Peak area, Sierra Nevada, California: Geological Society America Bulletin, vol. 62, pp. 931-952, Pl. 1: Geologic map and structure sections of Mt. Lincoln-Castle Peak area, scale 1:62,500.

16. \*Lindgren, W. and Turner, H. W., 1895, Smartsville folio, California: U. S. Geol. Survey, Geol. Atlas of the U. S., folio 18, Map: Areal geology, scale 1:125,000. (For Eocene marine Wheatland Formation and Reeds Creek Andesite, see B. L. Clark and C. A. Anderson, 1938, Wheatland Formation and its relation to early Tertiary andesites in the Sierra Nevada: Geological Society America Bulletin, vol. 49, pp. 931-956, Fig. 2: Geologic map of the area north of Wheatland, scale 1:140,000.)

17. Lindgren, W., 1897, Truckee folio, California: U. S. Geol. Survey, Geol. Atlas of the U. S., folio 39, Map: Historical geology sheet, scale 1:125,000. (North shore of Lake Tahoe modified after G. A. Thompson and C. H. Sandburg, 1958, Structural significance of gravity surveys in the Virginia City-Mount Rose area, Nevada and California: Geological Society America Bulletin, vol. 69, pp. 1269-1282, Pl. 1: Map of Bouguer gravity anomalies and geology, Virginia City-Mount Rose area, Nevada and California, scale 1:125,000.)

18. Lindgren, W., 1900, Colfax folio, California: U. S. Geol. Survey, Geol. Atlas of the U. S., folio 66, Map: Historical geology sheet, scale 1:125,000.

19. Olmsted, F. H. and Davis, G. H., 1961, Geologic features and groundwater storage capacity of the Sacramento Valley, California: U. S. Geol. Survey Water-Supply Paper 1497, 241 pp., Pl. 2: Geologic map of the Sacramento Valley, scale 1:250,000.

20a. Southern Pacific Company, Land Dept., Regional geologic mapping program; geologic maps of portions of T14N, R9-10E; T15N, R9-12E; T16N, R10-13E; T17N, R8-13E; T18N, R8-13E; MDM, by J. W. Cooksley Jr., F. H. Bonham Jr., and M. S. Tischler, scale 1:24,000, unpublished, 1959.

20b. Southern Pacific Company, Land Dept., Regional geologic mapping program; geologic maps of portions of T14N, R13-16E; T15N, R15-16E; T16N, R14-16E; T17N, R14-18E; T18N, R14-15, 18E; T19N, R15E; MDM, by W. L. Coonrad, J. T. Collier, and R. T. Laird, scale 1:24,000, unpublished, 1959.

20c. Southern Pacific Company, Land Dept., Regional geologic mapping program; geologic maps of portions of T19N, R9-12E; T20N, R11-12E; MDM, by E. A. Danehy, H. F. Bonham Jr., J. W. Cooksley Jr., J. Gamble, M. S. Tischler, and G. W. Olcott, scale 1:24,000, unpublished, 1959.

21. Stanford Geological Survey (R. R. Compton in charge), Geologic map of the Cisco-Yuba Gap area, California, scale 1:48,000, Stanford University, unpublished, 1955.

22. Stinson, M. C., Reconnaissance geologic maps of the Chilcoot, Sierraville, Portola and Loyalton quadrangles, California, scale 1:62,500, California Div. Mines and Geology reconnaissance mapping for State Geologic Map, 1961. (Additions and modifications by R. S. Ford, see item 11; C. Durrell, reconnaissance geology of part of the Portola quadrangle; and J. A. Van Couvering, Geology of the Chilcoot quadrangle, scale 1:62,500, University of California, Los Angeles, M.A. thesis in progress, 1961.)

23. Turner, H. W., 1897, Downieville folio, California: U. S. Geol. Survey, Geol. Atlas of the U. S., folio 37, Map: Historical geology sheet, scale 1:125,000. (Modifications of limestone and dolomite areas by Q. A. Aune, California Div. Mines and Geology, unpublished limestone investigations, 1961.)

24. \*Turner, H. W., 1898, Bidwell Bar folio, California: U. S. Geol. Survey, Geol. Atlas of the U. S., folio 43, Map: Historical geology sheet, scale 1:125,000. (Modifications of limestone and dolomite areas by Q. A. Aune, California Div. Mines and Geology, unpublished limestone investigations, 1961.)

25. Wilhelms, D. E., The geology of the eastern portion of the Spring Garden quadrangle, California, scale 1:24,000, University of California, Los Angeles, unpublished M.A. thesis, 1958.

26. Williams, H., 1929, Geology of the Marysville Buttes, California: California Univ. Dept. Geol. Sci. Bulletin, vol. 18, pp. 103-220, Map: Geologic Map of the Marysville Buttes, California, scale 1:62,500.

Johnson, H. R., 1943, Marysville Buttes (Sutter Buttes) gas field: in California Div. Mines Bulletin 118, pp. 610-615, Fig. 270: Marysville (Sutter) Buttes gas field, scale 1:100,000. Also Buttes Gas and Oil Company map of Sutter Buttes, scale 1" = 400', in Geological Society of Sacramento Annual Field Trip Guidebook, East-Central Sacramento Valley, 1961.

Garrison, L. E., The Marysville Buttes, Sutter County, scale 1:62,500, in California Div. Mines and Geology Bulletin 181, in preparation 1961.

\*Fault additions and minor modifications by L. D. Clark, personal communication, September 13, 1961; and L. D. Clark, 1960, Foothills fault system, western Sierra Nevada, California: Geological Society America Bulletin, vol. 71, pp. 483-496.

For a complete list of published geologic maps of this area see Division of Mines Special Report 52.

# STRATIGRAPHIC NOMENCLATURE—CHICO SHEET

AGE	STATE MAP SYMBOL	STATE MAP UNIT	STRATIGRAPHIC UNITS AND CHARACTERISTIC LITHOLOGIES <small>(The formally named formations grouped within an individual State Map Unit, are listed in stratigraphic sequence from youngest to oldest.)</small>		
QUATERNARY	Recent	QaI	RECENT ALLUVIUM	Recent river and stream alluvium; fan deposits.	
		Qsc	RECENT RIVER AND MAJOR STREAM CHANNEL DEPOSITS IN THE GREAT VALLEY	Sediments along river channels and major streams including adjacent natural levees.	
		Qf	RECENT ALLUVIAL FAN DEPOSITS IN THE GREAT VALLEY	Sediments deposited from streams emerging from high lands surrounding the Great Valley. Includes Victor Formation— <i>lenticular silt, sand, gravel, and clay</i> (Pleistocene in part). Qf' = younger sediments comprising the Chico Fan.	
		Qb	RECENT BASIN DEPOSITS IN THE GREAT VALLEY	Sediments deposited during flood stages of major streams in the area between natural stream levees and fans.	
		Ql	QUATERNARY LAKE DEPOSITS	Younger lake beds; playa-like deposits in scattered basins of interior drainage; locally includes overlying alluvium. Mohawk Lake Beds— <i>conglomerate, sandstone, siltstone, and shale</i> (may be upper Pliocene in part).	
	Pleistocene	Qg	QUATERNARY GLACIAL DEPOSITS	Moraines, glacial drift, and fluvioglacial sand and gravel.	
		Qt	QUATERNARY NONMARINE TERRACE DEPOSITS	River, stream, and lake terrace deposits, some fanglomerate; glacial outwash terraces in the Truckee area.	
		Qc	PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS	Fanglomerate from the Cascade Range— <i>sand, gravel, and silt consisting of volcanic detritus derived from the Tuscan Formation</i> . Older fanglomerate. Fluvial deposits in the Truckee Valley area, including some lake beds.	
		Qpv <sup>b</sup>	PLEISTOCENE VOLCANIC ROCKS:		
			BASALTIC		
		Qpv <sup>P</sup>	PYROCLASTIC		Tuff associated with cinder cones in the Truckee area.
		QP	PLIOCENE-PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS		Unnamed continental deposits equivalent to the Laguna Formation and Arroyo Seco Gravel to the south— <i>silt, sand, clay, and unsorted gravel</i> .
		*	QUATERNARY AND/OR PLIOCENE CINDER CONES		Cinder cones; Sutter Buttes vent tuff.
		Pc	MIDDLE AND/OR LOWER PLIOCENE MARINE SEDIMENTARY ROCKS		Sutter Formation— <i>tuff, sandstone, conglomerate</i> (probably not of local origin; age uncertain but predates intrusion of Sutter Buttes). New Era Formation— <i>conglomerate, sandstone, and siltstone underlying the Tuscan Formation in the Oroville area</i> .
		Pliocene	PLIOCENE VOLCANIC ROCKS:		
Pv <sup>r</sup>	RHYOLITIC				
Pv <sup>a</sup>	ANDESITIC				
Pv <sup>b</sup>	BASALTIC				
Pv <sup>P</sup>	PYROCLASTIC				
Miocene	MIOCENE VOLCANIC ROCKS:				
	Mv <sup>r</sup>	RHYOLITIC			
	Mv <sup>a</sup>	ANDESITIC			
	Mv <sup>P</sup>	PYROCLASTIC			
	∅	OLIGOCENE MARINE SEDIMENTARY ROCKS			
	∅v <sup>P</sup>	OLIGOCENE VOLCANIC ROCKS:			
		PYROCLASTIC			
	Ec	EOCENE NONMARINE SEDIMENTARY ROCKS			
	E	EOCENE MARINE SEDIMENTARY ROCKS			
	Eocene	EOCENE VOLCANIC ROCKS:			
Ev <sup>b</sup>		BASALTIC			
Ev <sup>P</sup>		PYROCLASTIC			
Tc	TERTIARY NONMARINE SEDIMENTARY ROCKS				
Tl	TERTIARY LAKE DEPOSITS				
Undivided	TERTIARY INTRUSIVE (HYPABYSSAL) ROCKS:				
	Ti <sup>r</sup>	RHYOLITIC			
	Ti <sup>a</sup>	ANDESITIC			
	Ti <sup>b</sup>	BASALTIC			
	TERTIARY VOLCANIC ROCKS: UNDIFFERENTIATED				
	Tv <sup>a</sup>	ANDESITIC			
	Tv <sup>b</sup>	BASALTIC			
Tv <sup>P</sup>	PYROCLASTIC				

# STRATIGRAPHIC NOMENCLATURE—Continued

AGE	STATE MAP SYMBOL	STATE MAP UNIT	STRATIGRAPHIC UNITS AND CHARACTERISTIC LITHOLOGIES (The formally named formations grouped within an individual State Map Unit, are listed in stratigraphic sequence from youngest to oldest.)
MESOZOIC JURASSIC TRIASSIC UNDIVIDED PALEOZOIC PERMIAN MISSISSIPPIAN	Ku	<b>UPPER CRETACEOUS MARINE SEDIMENTARY ROCKS</b>	Chico Formation— <i>fossiliferous marine sandstone, shale, and conglomerate</i> . Kione Sand— <i>white quartzose sandstone</i> (Sutter Buttes area). Unnamed greenstone conglomerate and sedimentary breccia at Cherokee in the Oroville quadrangle.
	gr	<b>MESOZOIC GRANITIC ROCKS</b>	Trondhjemite, granodiorite, tonalite, granophyre, and metagranodiorite porphyry (Big Bald Rock area). Granodiorite, granite, trondhjemite, and diorite (Merrimac area). Elsewhere the granitic rocks include granodiorite, diorite, monzonite, quartz porphyry, schistose granodiorite, granulite, alaskite, and undifferentiated plutonic rocks.
	bi	<b>MESOZOIC BASIC INTRUSIVE ROCKS</b>	Metagabbro (Big Bald Rock area). Metagabbro, metadiorite, and heterogeneous gabbroic and dioritic rocks (Merrimac area). Gabbroic and dioritic rocks (Swedes Flat area). Gabbro and associated albite diorite and albite diabase (Colfax area). Includes some amphibolite which is derived, in part, from volcanic rocks.
	ub	<b>MESOZOIC ULTRABASIC INTRUSIVE ROCKS</b>	Ultrabasic intrusive rocks, largely serpentinized, including minor talc schist and soapstone.
	Ju	<b>UPPER JURASSIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS</b>	Mariposa Formation— <i>slate, shale, graywacke, mudstone, sandstone, breccia, conglomerate, and metabasalt</i> . Colfax Formation— <i>fossiliferous tuff and shale</i> . Lower member of the Trail Formation <sup>2</sup> — <i>metamorphosed conglomerate, sandstone, slaty shale, and tuff</i> . Monte de Oro Formation— <i>siltstone, sandstone, and conglomerate</i> .
	Jml	<b>MIDDLE AND/OR LOWER JURASSIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS</b>	Sailor Canyon and Milton Formations <sup>3</sup> — <i>slate, hornfels, graywacke, quartzite, chert, conglomerate, marble, and some interbedded volcanic rocks</i> .
	JRv	<b>JURASSIC AND/OR TRIASSIC METAVOLCANIC ROCKS</b>	Logtown Ridge Formation— <i>basic flows, tuff, and agglomerate, including some shale and slate</i> ; Kettle Formation <sup>2</sup> — <i>andesite and dacite breccia, tuff, conglomerate, and sills or flows</i> ; volcanic portion of the Sailor Canyon and Milton Formations— <i>metamorphosed tuff, breccia, and flows (also includes subordinate amounts of hornfels, slate, and graywacke)</i> . Oregon City Formation— <i>metavolcanic rocks containing lesser amounts of metasedimentary rocks</i> (Oroville area). Includes most of the porphyry and diabase, amphibolite, and amphibolite schist of Lindgren and Turner. Metabasalt, metarhyolite, metadacite, quartz porphyry, amphibolite, hornblende porphyry, hornblende and amphibolite schist, and agglomerate of Compton (1955) and Hietanen (1951). Much of the JRv shown in the broad belt on the western side of the map includes rocks of uncertain age; a large part of these rocks may be Paleozoic.
	R	<b>TRIASSIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS</b>	Cedar Formation— <i>limestone, sandstone, and shale</i> . Unnamed limestone and chert breccia in the Duncan Peak 7½' quadrangle.
	m	<b>PRE-CRETACEOUS METAMORPHIC ROCKS, UNDIFFERENTIATED</b>	Undifferentiated metavolcanic and metasedimentary rocks.
	mv	<b>PRE-CRETACEOUS METAVOLCANIC ROCKS</b>	Amphibolite of the Downieville Folio (in part JRv). Undifferentiated metavolcanic rocks commonly containing some metasedimentary rocks.
	gr-m	<b>PRE-CENOZOIC GRANITIC AND METAMORPHIC ROCKS</b>	Migmatized metavolcanic and metasedimentary rocks. Injection gneiss.
	P	<b>PALEOZOIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS,</b>	Calaveras Group <sup>1</sup> (Upper Paleozoic): Clipper Gap Formation— <i>clay slate, chert, and crystalline limestone</i> ; Delhi Formation— <i>siliceous argillite, slate, hornfels, and crystalline limestone</i> ; Cape Horn Slate— <i> fissile clay slate, schist, quartzite, and metavolcanic rocks</i> ; Relief Quartzite— <i>quartzite, quartzitic mica schist, chert, and slate</i> ; Kanaka Formation— <i>siliceous slate, chert, schist, metatuff, and metaconglomerate</i> ; Tightner Formation— <i>amphibolite schist, slate, hornblende-chlorite schist, and minor crystalline limestone</i> ; Blue Canyon Formation— <i>slate, phyllite, mica schist, clay slate, quartzite, and crystalline limestone</i> . Grizzly Formation <sup>2</sup> — <i>gray quartzite and slaty sandstone</i> (pre-Permian age). Also includes rocks commonly referred to the Calaveras Formation, but may include some Mesozoic rocks.
	Is	<b>LIMESTONE AND/OR DOLOMITE</b>	Crystalline limestone and dolomite lentils within the Calaveras Formation.
Pv	<b>PALEOZOIC METAVOLCANIC ROCKS</b>	Taylor Formation <sup>2</sup> — <i>augite andesite metabreccia, metatuff, keratophyre porphyry sills or flows</i> . Most of the quartz porphyry of Turner and the augite porphyry of Turner (altered augite andesite with some diabase). Some of the amphibolite of Turner. Greenstone and metavolcanic rocks within the Calaveras Formation. Undifferentiated metavolcanic rocks.	
Rv	<b>PERMIAN METAVOLCANIC ROCKS</b>	Unnamed mafic pyroclastic breccia in the northwestern part of the Blairsden quadrangle. Reeve Formation <sup>2</sup> — <i>porphyritic andesitic metabreccia, fossiliferous metatuff, and minor slaty mudstone and quartzite</i> .	
CM	<b>MISSISSIPPIAN MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS</b>	Upper member of the Peale Formation <sup>2</sup> — <i>metamorphosed chert, slate, tuffaceous metasandstone, and volcanic flows and breccia</i> (may include some Pennsylvanian rocks).	

### NOTES

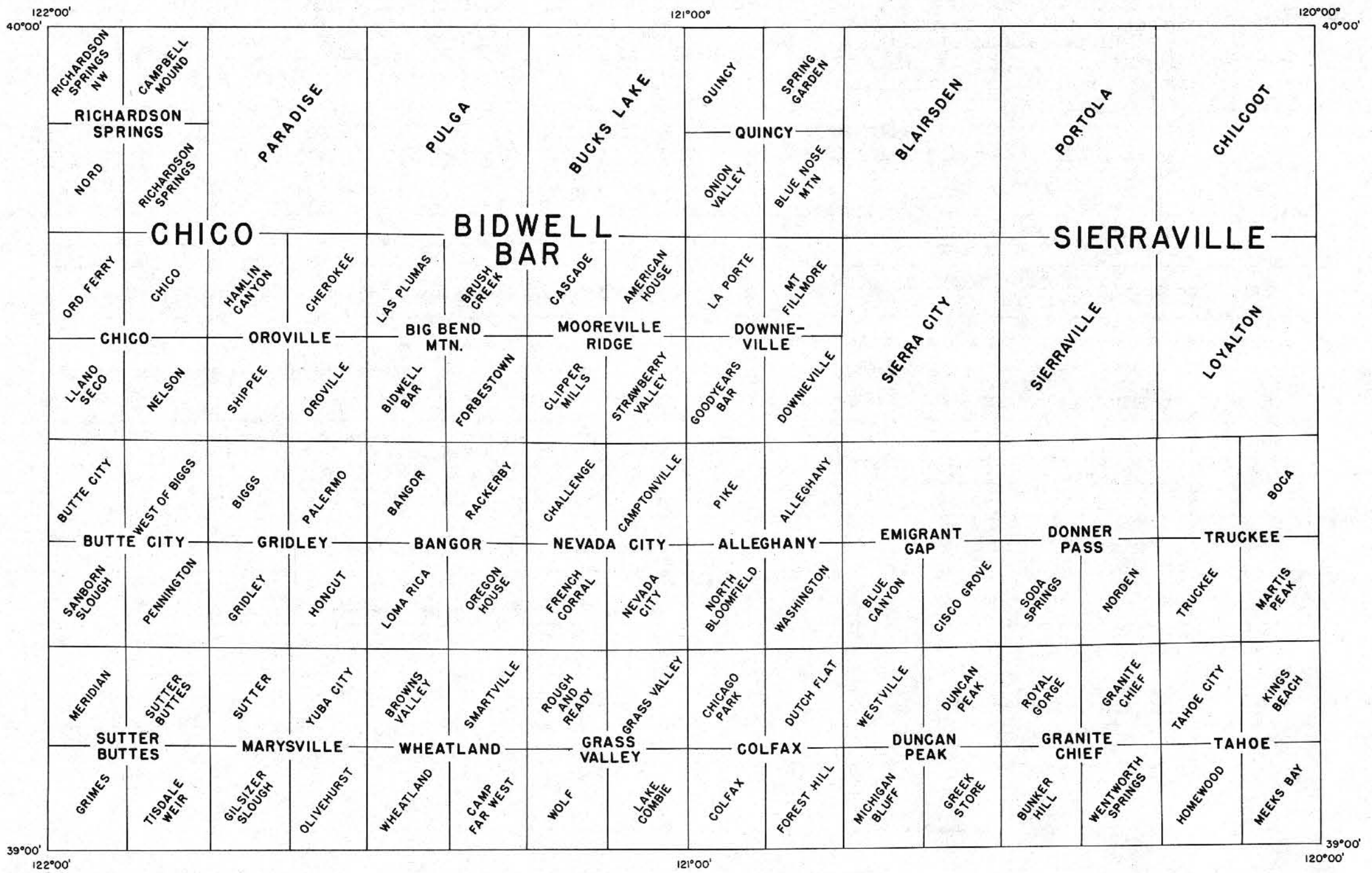
1. Not necessarily in stratigraphic sequence inasmuch as interrelationships of these formations are not completely understood.
2. Formation as redefined and mapped by V. E. McMath, "Geology of the Taylorsville area", UCLA PhD thesis, 1958.
3. Considered to be correlative. Upper and lower parts of these formations are largely volcanic and are shown as JRv on this compilation.



View east along U. S. Highway 40, of the summit region of the Sierra Nevada. Lake Van Norden (right middleground) lies in a valley filled with glacial deposits. Barren rounded topography (left middleground) represents a remnant of an Eocene erosion surface developed on granitic rocks. Castle Peak (elev. 9103 feet) in the center middleground is marked by a prominent black basalt capping which overlies light-colored tuff and agglomerate.

Photo by Clyde Sunderland, Oakland

TOPOGRAPHIC QUADRANGLES  
 WITHIN THE CHICO SHEET  
 AVAILABLE FROM THE U.S. GEOLOGICAL SURVEY  
 1962



View west toward Sutter Buttes, an eroded inactive Pliocene volcano, which pierces the flat alluvial plain of the Sacramento Valley and stands as a prominent landmark 10 miles in diameter and 2100 feet above the valley floor. A central crater filled with vent tuff lies within an andesite porphyry core. Surrounding the steep-sided and craggy core is a ring of rounded hills composed of folded and faulted Cretaceous, Eocene, and early Pliocene sedimentary beds. These beds in turn are girdled by an outer ring of andesite tuff which forms long gentle ridges that merge into the valley alluvium. Scattered through the sedimentary beds and central core are later intrusions of rhyolite porphyry.

*Photo by Clyde Sunderland, Oakland*