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EXPLANATORY DATA
BAKERSFIELD SHEET
GEOLOGIC MAP OF CALIFORNIA
OLAF P. JENKINS EDITION
Compiled by Arthur R. Smith, 1964

THIS DATA SHEET IS A REPRINT OF THE DATA SHEET ACCOMPANYING THE BAKERSFIELD SHEET, GEOLOGIC MAP OF CALIFORNIA, OLAF P. JENKINS EDITION, FIRST PUBLISHED IN 1964. IT HAS NOT BEEN ALTERED. THE GEOLOGY SHOWN ON THE BAKERSFIELD SHEET OF THE BOUGUER GRAVITY MAP OF CALIFORNIA IS ALSO REPRINTED FROM THE GEOLOGIC MAP OF CALIFORNIA, 1964. THE GRAVITY DATA PRESENTED WERE COMPILED IN 1974 AND PUBLISHED IN 1975.

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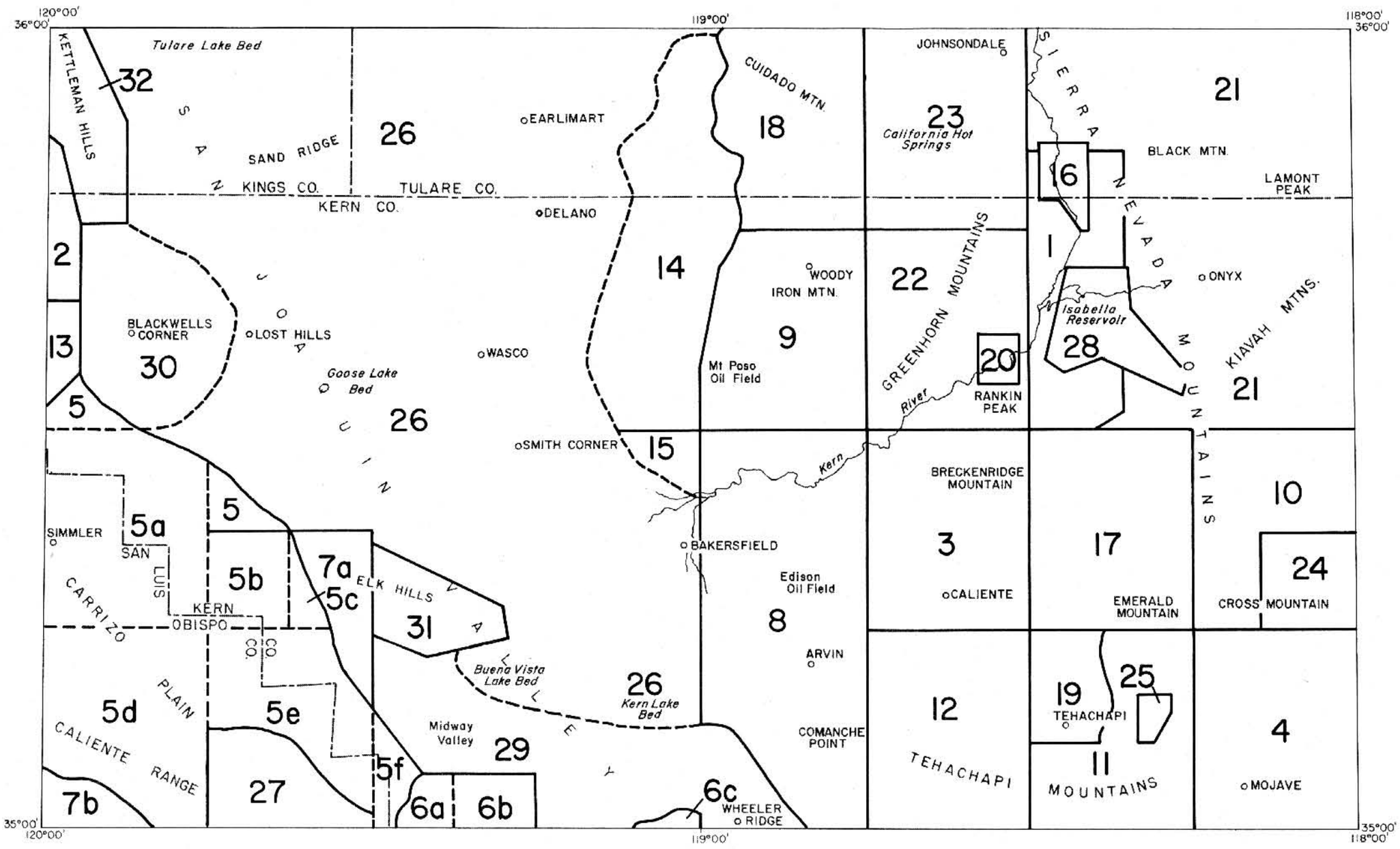
USED IN THE COMPILATION OF THE BAKERSFIELD SHEET



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For a complete list of published geologic maps of this area see Division of Mines and Geology Special Reports 52 and 52-A.

STRATIGRAPHIC NOMENCLATURE— BAKERSFIELD SHEET

AGE	STATE MAP SYMBOL	STATE MAP UNIT State Map Units listed here are not necessarily in stratigraphic sequence; the sequence used has been standardized for all sheets of the Geologic Map of California	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.)
CENOZOIC – QUATERNARY – Recent	Qs	**RECENT DUNE SAND**	Wind blown sand, including dune sand.
	Qal	**RECENT ALLUVIUM**	Alluvium, unconsolidated valley and stream deposits; locally includes dissected fans; lake and marsh deposits in the Sierra Nevada probably Pleistocene age in part; coarse granitic fanglomerate along eastern base of Sierra Nevada.
	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.
	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**	Clay, silt, and fine sand of lake beds in the San Joaquin Valley; playa deposits in Carrizo Plain (Soda Lake); fine-grained sediments, deposited under lacustrine conditions in basin-like depressions in the higher Sierra Nevada (Kernville 30′ quadrangle).
	Qt	**QUATERNARY NONMARINE TERRACE DEPOSITS**	Unconsolidated sand, clay, and gravel stream terrace deposits.
Pleistocene	Qc	**PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS**	Older alluvium, consisting mainly of slightly consolidated and dissected fan deposits, but may locally include Quaternary terrace deposits, e.g. the Tehachapi Valley.
	QP	**PLIOCENE-PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS**	[1] Tulare Formation—*continental beds of poorly consolidated alternating sand and gravel with lenticular gypsiferous deposits* (western and southern parts San Joaquin Valley). Paso Robles Formation—*unconsolidated conglomerate composed of siliceous shale pebbles, unsorted fragments of sandstone, granitic rocks, schist, and marble, intermixed with marly clay and sand* (west side of San Joaquin Valley). Kern River Formation—*poorly bedded, loosely consolidated gravel composed mainly of ill-sorted, subrounded cobbles and boulders of various rock types* (western flank Sierra Nevada). Tehachapi Formation—*moderately consolidated and poorly sorted cobbles, gravel, and sand* (north side, Tehachapi Valley).
Pliocene	Pc	**UNDIVIDED PLIOCENE NONMARINE SEDIMENTARY ROCKS**	Morales Formation [2] —*alternating brown, reddish, and green claystone and sandstone with local pebble gravels; local basal conglomerate of angular Monterey shale and limestone fragments* (Caliente Range) (lower part is gray gypsiferous claystone in the area south of Cuyama River); Quatal Formation [3] —*gray, gypsiferous claystone, and minor interbedded sandstone* (Caliente Range); Panorama Hills Formation—*crudely bedded, gray, pebble-cobble gravel and coarse sand, including in its lower part some marine sand as it grades southeastward into Bitterwater Creek Shale* (see under Pml; west side Temblor Range).
	Pu	**UPPER PLIOCENE MARINE SEDIMENTARY ROCKS**	San Joaquin Formation—*silty sandstone, silt, clay, blue sandstone, and conglomerate* (Kettleman Hills).
	Pmlc	**MIDDLE AND/OR LOWER PLIOCENE NONMARINE SEDIMENTARY ROCKS**	Chanac Formation—*coarse angular sandstone with rhyolitic fragments of variegated color, claystone, and conglomerate with some boulders up to 9 feet in diameter* (Tejon Hills, southeast San Joaquin Valley). Horned Toad Formation—*interbedded gypsiferous clay, reddish brown sandstone, minor marly linestone, and a basal granitic conglomerate* (Mojave quadrangle). Ricardo Formation—*reddish to buff, lenticular, calcareous arkosic conglomerate and sandstone, clay and siltstone* (eastern part, Cross Mountain quadrangle).
	Pml	**MIDDLE AND/OR LOWER PLIOCENE MARINE SEDIMENTARY ROCKS**	[1] Bitterwater Creek Shale (earlier mapped as Santa Margarita Shale)—*indistinctly bedded, brown, semi-siliceous shale, grading northwesterly through marine sandstone into nonmarine gravels of the Panorama Hills Formation* (Elkhorn Hills to Bitterwater Creek, Temblor Range). Etchegoin Formation—*coarse grained sandstone including blue sandstone, conglomerate, silty sand, and siltstone* (Kettleman Hills); Jacalitos Formation—*alternating strata of poorly indurated sandstone and shale* (Devils Den District, northwest edge Bakersfield sheet).
		PLIOCENE VOLCANIC ROCKS:	
	Pv^r	**RHYOLITIC**	Rhyolite and dacite flows, possibly includes some shallow intrusive rock (age uncertain and may be Mio-Pliocene; Emerald Mountain quadrangle).
	Pv^a	**ANDESITIC**	Flows and intrusive rock, ranging from basalt to andesite (age uncertain and may be Mio-Pliocene; Emerald Mountain quadrangle).
Miocene	Mc	**UNDIVIDED MIOCENE NONMARINE SEDIMENTARY ROCKS**	Bena Gravels—*poorly consolidated gravel (mainly granitic debris), sand and clay with local interfingering marine sedimentary rocks* (southwest slope Sierra Nevada, east of Bakersfield.
	Muc	**UPPER MIOCENE NONMARINE SEDIMENTARY ROCKS**	Bopesta Formation—*gray to tan, arkosic sandstone, interbedded pebbly, green, sandy clay, volcanic tuff, and agglomerate with a basal conglomerate locally* (Tehachapi and Mojave quadrangles).
	Mu	**UPPER MIOCENE MARINE SEDIMENTARY ROCKS**	[1] Santa Margarita Formation—*interbedded white sandstone and shale with local very coarse fanglomerate and granitic breccia* (Temblor Range and Caliente Range). Reef Ridge Shale—*shale and sandy shale, in part diatomaceous* (Temblor Range); Monterey Formation, upper part—*sandstone, siltstone, and shale* Temblor Range: McLure Shale Member; Antelope Shale Member; McDonald Shale Member. Unnamed upper and middle Miocene, buff standstone (east side San Joaquin Valley).
	Mm	**MIDDLE MIOCENE MARINE SEDIMENTARY ROCKS**	[1] Round Mountain Silt—*brown siltstone with diatomite member* (east side San Joaquin Valley). Escudo Sandstone—*poorly sorted, buff, calcareous sandstone* (Devils Den District). Monterey Formation, lower part—*sandstone, siltstone, and shale* Temblor Range: Twisselman Sandstone Member (in part upper Miocene); Devilwater-Gould Shale Member. Caliente Range: Whiterock Bluff Shale Member; Saltos Shale Member (in part lower Miocene). [1] Branch Canyon Formation—*sandstone and shale with numerous calcareous reef deposits and three basalt flows* (northeast flank Caliente Range). Button Bed Sandstone Member of Temblor Formation—*arkosic sandstone with large numbers of small, fossil, discoidal sea urchins* (Temblor Range).
	Ml	**LOWER MIOCENE MARINE SEDIMENTARY ROCKS**	Olcese Sand—*unconsolidated, light gray sandstone with a few pebble and siltstone beds* (lower to middle Miocene; east side San Joaquin Valley, especially in the Round Mountain vicinity); Freeman Silt—*brown siltstone with interbedded light-colored ashy beds* (east side San Joaquin Valley); Jewett Sand—*fine-grained, silty sandstone generally with a gritty lower member* (east side San Joaquin Valley); Vedder Sand—*interbedded sandstone and siltstone with well developed basal grit and prominent ash bed at the top* (east side San Joaquin Valley). Temblor and/or Vaqueros Formation—*sandstone, siltstone, shale and limestone* Temblor Range: Media Shale Member; Carneros Sandstone Member; Upper Santos Shale Member; Agua Sandstone Lentil; Lower Santos Shale Member; "Phacoides" Sandstone; "Salt Creek" Shale. Caliente Range: Painted Rock Sandstone Member; Soda Lake Sandstone and Shale Members. Pleito Formation—*buff sandstone with "cannon ball" concretions, bluish gray conglomerate, and a basal, red sandstone and conglomerate* (in part Oligocene; Maricopa area, Temblor Range).
		MIOCENE VOLCANIC ROCKS:	
	Mv^r	**RHYOLITIC**	Light-colored, fine-grained, holocrystalline rhyolite flows, locally porphyritic, may include rhyolite intrusive rock (southern Sierra Nevada).
	Mv^a	**ANDESITIC**	Andesite and dacite flows, andesite agglomerate with interbeds of sandstone, conglomerate, and basalt (southern Sierra Nevada).
	Mv^b	**BASALTIC**	Ilmon Basalt—*dark brown, dense, vasicular basalt* (Breckenridge Mountain quadrangle). Basalt flows interbedded in the Monterey Formation (Caliente Range).
	Mv^p	**PYROCLASTIC**	Kinnick Formation [4] —*brown andesitic breccia, green tuffs, tuff breccia with interbedded olivine basalt and red, vesicular andesite and minor interbedded sandstone and chert* (Cache Creek, Tehachapi areas). Gem Hill Formation—*massive, white, rhyolitic tuff breccia* (near Mojave).
Oligocene	Φc	**OLIGOCENE NONMARINE SEDIMENTARY ROCKS**	Simmler Formation—*pink to dark red, massive sandstone with thin interbeds of dark maroon and greenish siltstone* (may be either Oligocene or lower Miocene; Caliente Range).
	Φ	**OLIGOCENE MARINE SEDIMENTARY ROCKS**	Tumey Formation—*tan, coarse-grained sandstone* (Devils Den area, northwest border Bakersfield sheet).
Eocene	E	**EOCENE MARINE SEDIMENTARY ROCKS**	[1] Kreyenhagen Shale—*shale with lenticular sandstone* (Temblor Range). Point of Rocks Sandstone—*cream to brown, massive, quartzose sandstone, locally pebbly with minor silty claystone* (locally interfingers with the Kreyenhagen Shale; occurs in Temblor Range). Gredal Shale or Canoas Siltstone—*silty claystone and clay shale* (locally includes the Mabury Sandstone at the base; Temblor Range).
Undivided	Tc	**TERTIARY NONMARINE SEDIMENTARY ROCKS**	Witnet Formation [1] —*tan, arkosic standstone with interbeds of red, silty shale and gray to red conglomerate* (Cache Creek area, Tehachapi and Mojave quadrangles). Walker Formation—*pinkish gray sandstone and conglomerate, green claystone, tuff and tuff breccia* (age may range from Eocene to early Miocene; east side San Joaquin Valley). Bealville Fanglomerate—*gray, loosely consolidated "torrential" fanglomerate with granitic rubble up to 3 feet in diameter* (similar indefinite time relation as the Walker Formation, i.e. early Tertiary; east side San Joaquin Valley). Caliente Formation [5]—*variegated red and green, gritty claystone, sandstone, and pebble-cobble conglomerate with interbedded basalt* (Caliente Range).
		TERTIARY INTRUSIVE (HYPABYSSAL) ROCKS:	
	Ti^r	**RHYOLITIC**	Bobtail Quartz Latite Member of the Gem Hill Formation—*porphyritic and felsitic intrusive rhyolite and quartz latite, comprising plugs and dikes intrusive into quartz monzonite* (Mojave area). Porphyritic rhyo-dacite and intruding rhyolite dikes (Emerald Mtn. quadrangle). Rhyolite to dacite intrusive rocks and volcanic flows (Cross Mountain quadrangle). Prominent rhyolite dikes along Garlock fault zone and along western part of Emerald Mountain quadrangle (somewhat exaggerated in size as shown on the State Map). Unnamed tan to pinkish white felsite (Mojave quadrangle).
	Ti^a	**ANDESITIC**	Andesite dikes or flows (Tehachapi Mountains, southern Sierra Nevada).

STRATIGRAPHIC NOMENCLATURE—Continued

AGE	STATE MAP SYMBOL	STATE MAP UNIT State Map Units listed here are not necessarily in stratigraphic sequence; the sequence used has been standardized for all sheets of the Geologic Map of California	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 – TERTIARY – Undivided		**TERTIARY VOLCANIC ROCKS:**	
	Tv	**UNDIFFERENTIATED**	Primarily olivine basalt and red andesite flows (may possibly be Miocene age or younger; Kernville and adjoining quadrangles).
	Tv[b]	**BASALTIC**	Basalt flows interbedded in the Caliente Formation (Pliocene and Miocene) and the Monterey and Branch Canyon Formations (Caliente Range).
MESOZOIC – CRETACEOUS	Ku	**UPPER CRETACEOUS MARINE SEDIMENTARY ROCKS**	Unnamed olive brown, arkosic sandstone, interbedded gray black shales, and a basal, brown, cobble conglomerate (Temblor and Caliente Ranges).
MESOZOIC – CRETACEOUS	Kl	**LOWER CRETACEOUS MARINE SEDIMENTARY ROCKS**	Shale and thinly bedded sandstone (Temblor Range).
MESOZOIC		**MESOZOIC GRANITIC ROCKS**	
MESOZOIC	gr	**UNDIFFERENTIATED**	Granitic rocks ranging in composition from granite to gabbro with local inclusions of metamorphic rocks (Sierra Nevada).
MESOZOIC	gr[a]	**GRANITE AND ADAMELLITE (QUARTZ MONZONITE)**	Coarse-grained, equigranular, rusty appearing biotite granite (Jawbone Canyon area, southeast Sierra Nevada). Holocrystalline, medium-grained quartz monzonite, locally ranging from granodiorite to granite (Mojave and adjoining quadrangles).
MESOZOIC	gr[g]	**GRANODIORITE**	Isabella Granodiorite—*a granitic pluton, mainly granodiorite; locally pegmatitic and porphyritic with large orthoclase phenocrysts, and few dark minerals* (Kernville and adjoining quadrangles). Biotite granodiorite with local compositional variation and inclusion of metamorphic rocks.
MESOZOIC	gr[t]	**TONALITE (QUARTZ DIORITE) AND DIORITE**	Sacatar Quartz Diorite—*inequigranular, biotite hornblende tonalite varying in composition from granodiorite to diorite* (local areas of contaminated or mixed rock containing an abundance of fine-grained gabbroic material; Kernville and adjoining quadrangles). Hornblende biotite quartz diorite, commonly ranging to diorite, locally foliated and containing dark, fine-grained inclusions (Breckenridge Mountain and adjacent quadrangles). Small isolated masses of equigranular, hornblende diorite within a more silicic granite (Mojave quadrangle).
MESOZOIC	bi	**MESOZOIC BASIC INTRUSIVE ROCKS**	Summit Gabbro—*medium- to fine-grained, hornblende gabbro, locally porphyritic* (small plutons in the Kernville area). Gabbro and gabbro-diorite including olivine norite (Breckenridge Mountain quadrangle). Fine-grained gabbro ranging from diorite to hornblendite, in places pegmatitic (White River quadrangle).
MESOZOIC	ub	**MESOZOIC ULTRABASIC INTRUSIVE ROCKS**	Small, irregular masses of coarse-grained hornblendite, hornblende diorite, and other basic rocks within quartz diorite (southwest part of Breckenridge Mountain quadrangle). Isolated small areas of altered serpentine (White River quadrangle).
MESOZOIC	gr-m	**PRE-CENOZOIC GRANITIC AND METAMORPHIC ROCKS**	Mixed granitoid and metamorphic rock (generally indefinite areas that are mainly granitoid but contain abundant inclusions of metamorphic rocks; Tehachapi and Cross Mountain quadrangles).
MESOZOIC	m	**PRE-CRETACEOUS METAMORPHIC ROCKS, UNDIFFERENTIATED**	Kernville "Series"—*undifferentiated phyllite, quartzite, schist, marble, gneiss, and metavolcanic rocks* (Kernville area, Sierra Nevada). Unnamed and undifferentiated metamorphic rocks elsewhere in the Sierra Nevada.
MESOZOIC	ls	**LIMESTONE AND/OR DOLOMITE**	White to gray, coarsely crystalline, metamorphosed limestone.
MESOZOIC	ms	**PRE-CRETACEOUS METASEDIMENTARY ROCKS**	Quartzite or rocks predominantly quartzite of the Kernville "Series" (Kernville area, Sierra Nevada). Pampa Schist—*quartz-biotite schist and mica schist with chiastolite* (Breckenridge Mountain and adjacent quadrangles to the west). "Kernville Schist"—*mica schist, interbedded quartzite, and crystalline limestone* (Breckenridge Mountain quadrangle). Elsewhere unnamed metamorphic rocks composed mainly of micaceous schist and quartzite, derived mainly from sedimentary rocks.
MESOZOIC	mv	**PRE-CRETACEOUS METAVOLCANIC ROCKS**	Pampa Schist (greenstone unit)—*chlorite schist probably derived from either a basic tuff or lava flow* (Breckenridge Mountain quadrangle). Small area of mixed metamorphosed volcanic and sedimentary rocks with local intruded ultrabasic rocks (White River quadrangle).

NOTES

[1] Not necessarily in stratigraphic sequence.

[2] Considered to be Pleistocene by some geologists (see G. T. James, 1963, Paleontology and nonmarine stratigraphy of the Cuyama Valley Badlands, California; Univ. Calif. Dept. Geol. Sci. Bull., vol. 45).

[3] May be in part upper Miocene according to M. L. Hill, S. A. Carlson, and T. W. Dibblee, Jr., 1958, Stratigraphy of Cuyama Valley—Caliente Range area, California: Amer. Assoc. Petrol. Geol. Bull., vol. 42, no. 12, pp. 2973-3000.

[4] Middle Miocene age (see J. P. Buwalda and G. E. Lewis, 1955, A new species of Merrychippus: U. S. Geol. Survey Prof. Paper 264-G, pp. 147-152).

[5] Pliocene and Miocene age (see C. A. Repenning and J. G. Vedder, 1961, Continental vertebrates and their stratigraphic correlation with marine mollusks, eastern Caliente Range, California: U. S. Geol. Survey Prof. Paper 424-C, Art. 235, pp. 235-239).

View north along the Kern Canyon fault transected by Packsaddle Canyon in the foreground and Brush Creek in the background (below road). Prominent marble ridges in a metamorphic complex crop out west of the fault trace; granitic rocks comprise the terrain on the east. The Kern Canyon fault, an imposing structure in the southern Sierra Nevada, extends from a point near Mount Whitney to Walker Basin about 84 miles to the south. *Photo by R. C. Frampton, 1957.*

TOPOGRAPHIC QUADRANGLES

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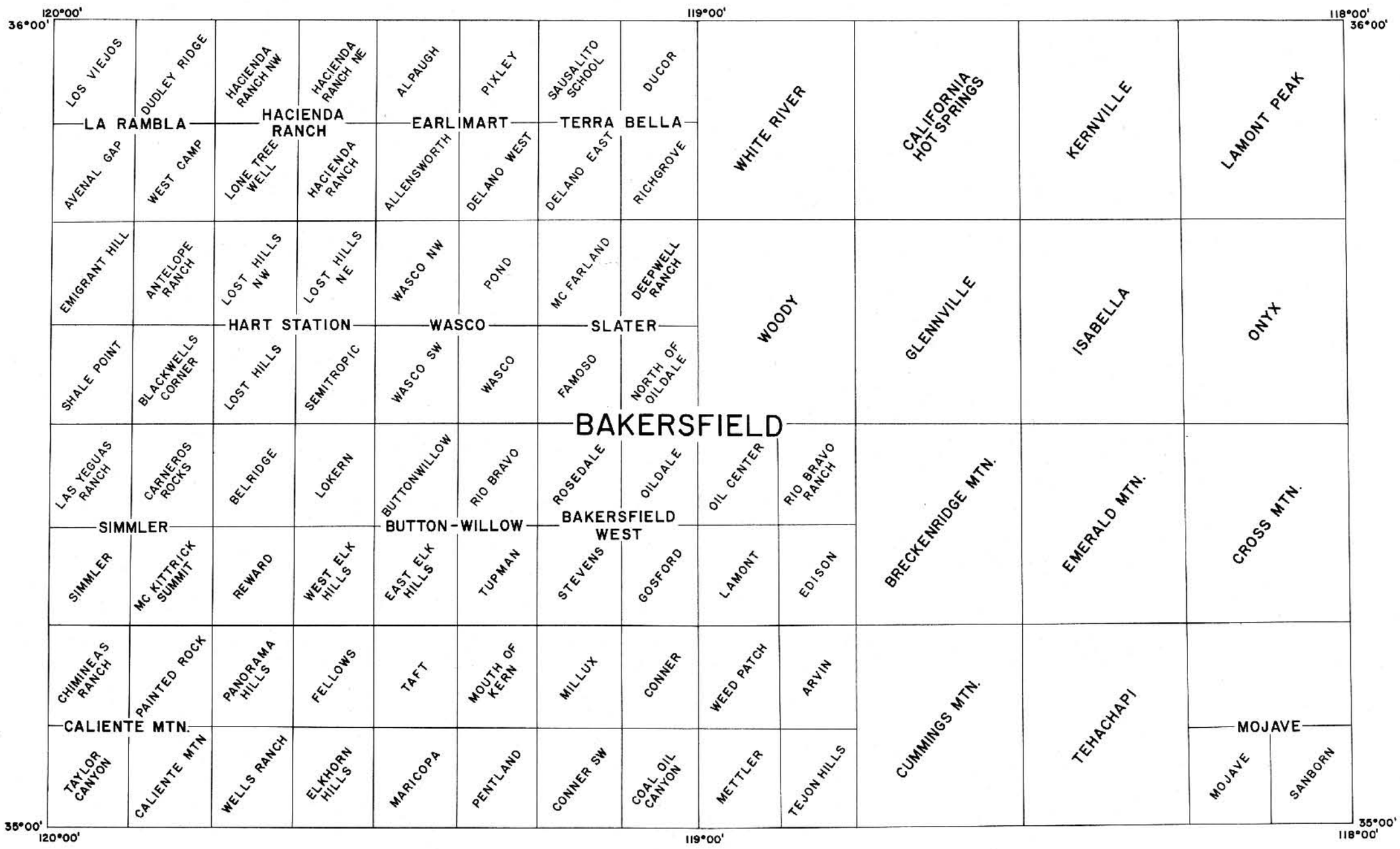

San Andreas fault in the Elkhorn Hills; view southeast from above the Carrizo Plain. A classic example of lateral fault displacement exemplified by pronounced offsets in the stream drainage where the fault slices through the Plio-Pleistocene gravels in the central part of the photo. *Photo by R. C. Frampton and J. S. Shelton, 1948.*

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