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GREAT VALLEY

"Out of sight—out of mind." It must not be ever so.

—Anonymous

Between the Sierra Nevada and the Coast Ranges is the elongate lowland known as the Great Valley. About 640 kilometers (400 miles) long and 80 kilometers (50 miles) wide, this lowland rises from slightly below sea level to about 120 meters (400 feet) at its north and south ends. The valley is unusual for a lowland because it is a relatively undeformed basin surrounded by highly deformed rock units. The Sacramento River drains the northern portion and the San Joaquin River the southern part. The lowland is also referred to as the Central Valley, its northern segment as the Sacramento Valley, and its southern segment as the San Joaquin Valley. The locations of some major features of the province are shown in Figures 12-1 and 12-2.

GEOGRAPHY

The Great Valley is monotonous geologically, representing primarily the alluvial, flood, and delta plains of its two major rivers and their tributaries (Figure 12-3). The region persisted as a lowland or shallow marine embayment during the entire Cenozoic and at least the later Mesozoic. In the late Cenozoic, much of the area was occupied by shallow brackish and freshwater lakes. This was particularly true in the San Joaquin section, which has had interior drainage in its southern third since the Pliocene. Lake Corcoran, now extinct, spread over much of the northern San Joaquin Valley during the middle and late Pleistocene. Today the only outward drainage is through Carquinez Strait, into San Francisco Bay. The valley's most fertile lands lie at the head of this strait, where the deltas of the two main rivers converge.

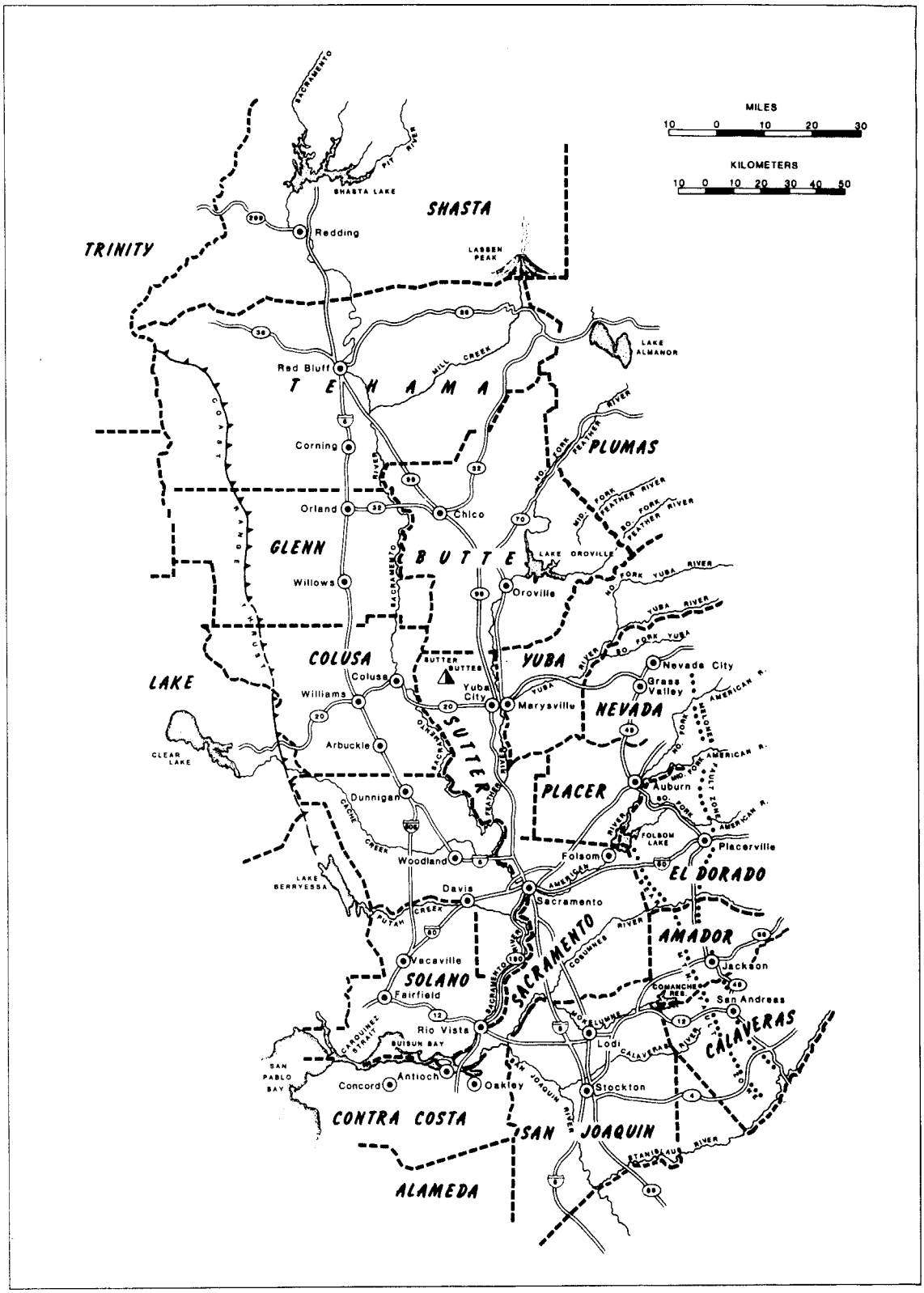

FIGURE 12-2 Place names, Sacramento Valley.

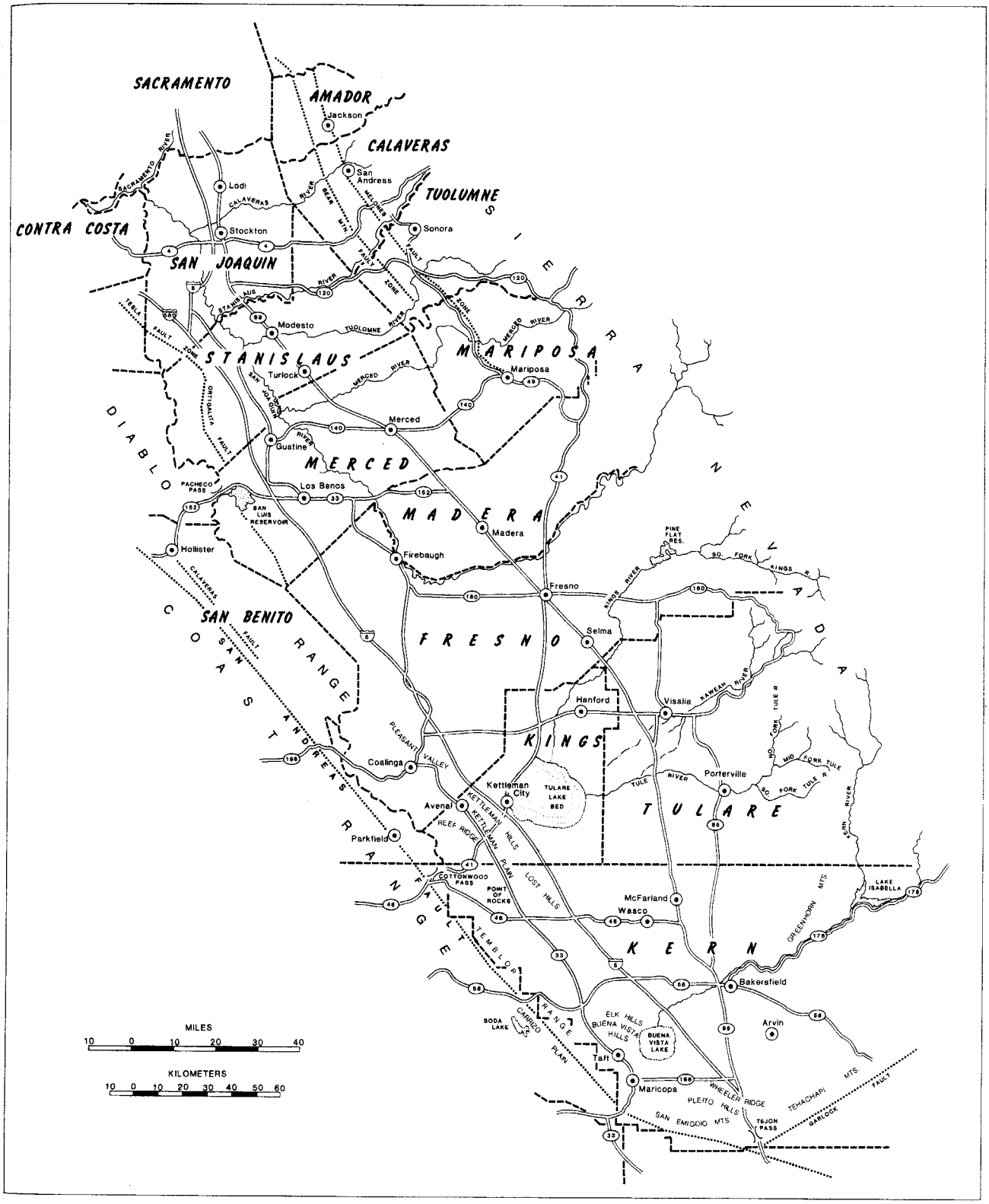

FIGURE 12-1 Place names, San Joaquin Valley.

FIGURE 12-3 San Joaquin-Sacramento Delta region. The Sacramento River is the large channel on the upper left and the San Joaquin the one on the lower right. Montezuma Hills border the Sacramento River to the north and the city of Antioch is on the south bank of the San Joaquin to the left of the bridge. These two rivers together account for about 40 percent of the total river discharge in California. Of this, the Sacramento is responsible for 31 percent and the San Joaquin about 9 percent. (Photo by Ames Research Center, National Aeronautics and Space Administration)

Annual rainfall ranges from 120 to 500 millimeters (5–20 inches). The land is well watered, however, because its rivers are fed by the heavy rain and snowfall of the Sierra Nevada. In fact, during severe floods the valley's playas may fill and inundate thousands of acres of crops.

Only two topographic breaks occur on the flat lowland floor: Sutter (Marysville) Buttes in the Sacramento Valley and the Kettleman Hills and other anticlinal arches on the western and southern sides of San Joaquin Valley. Sutter Buttes reach 640 meters (2,100 feet) in elevation, but have an area of only a few square kilometers (Figure 12-4). The Kettleman, Elk, and Buena Vista Hills are outliers of the Coast Ranges and have elevations of about 550 meters (1,800 feet).

FIGURE 12-4 Sutter Buttes from the southwest. The highest peak is South Butte (646 meters or 2,117 feet). The Sacramento River is in the foreground. Sutter County. (Photo by John Burnett, courtesy California Division of Mines and Geology).

FIGURE 12-5 Wheeler Ridge south of Bakersfield, Kern County. Pliocene and Quaternary sedimentary rocks have been arched upward because of strong north-south crustal shortening on the buried Wheeler Ridge fault. The sharp line at the base of the hills in the upper part of the photo is the trace of the Pleito thrust fault. (Photo by John S. Shelton)

In the extreme southern end of the San Joaquin Valley are several very young fold features, most prominent of which is Wheeler Ridge (Figure 12-5). Compression probably associated with development of the Transverse Ranges is now elevating this ridge as well as several smaller nearby features.

ROCKS

The surface of the Central Valley is composed of unconsolidated Quaternary sediments. Where streams have cut channels into these sediments, lake beds are occasionally exposed that include clays, diatomites, and other rocks that can be correlated and mapped. Generally, rock sequences must be inferred from well records and by extension of formations that are exposed on valley margins and then dip beneath the valley floor. Fortunately, information from the thousands of oil and gas wells drilled has permitted a fairly accurate reconstruction of the valley's geologic history. Thousands of water wells have been drilled also, but they can help with only the latest geologic record; water wells rarely exceed depths of 450 to 600 meters (1,500–2,000 feet) and seldom penetrate any pre-Pliocene rocks.

The rock sequences of the Great Valley can be divided into two sections, a division supported by geophysical studies and well records. First is a belt along the west base of the Sierra Nevada; this includes minimally deformed alluvial fans and lake deposits that feather east onto the Sierran basement. Second is a linear belt from 16 to 32 kilometers (10–20 miles) wide at the east base of the Coast Ranges; this is composed of deformed Mesozoic and Cenozoic rocks that dip east beneath the valley. The sedimentary cover of gravels and sands is thinner in the western belt (Figure 12-6).

Composite Geologic Column, San Joaquin Valley

HOLOCENE	Alluvium, dune sand, lake beds	
PLEISTOCENE	Corcoran (nonmarine) Tulare (nonmarine)	
PLIOCENE	San Joaquin (marine) Etchegoin, Jacalitos (marine), Chanac (nonmarine)	
MIOCENE	Santa Margarita (marine) Reef Ridge (marine) McLure (marine) Temblor (marine) Vaqueros, Media, Salt Creek, Leda (marine)	
OLIGOCENE	Tumey (marine), Simmler (nonmarine)	
EOCENE	Kreyenhagen, Point of Rocks, Domengine (marine)	Walker (nonmarine)
PALEOCENE	Arroyo Hondo, Lodo, Cantua (marine)	Walker (nonmarine)

FIGURE 12-6 Geologic columns, Great Valley province.

(*Continued*)

Composite Geologic Column, San Joaquin Valley (*Continued*)

CRETACEOUS	Moreno (marine) Panoche Group { Brown Mountain (marine); Ragged Valley (marine); Joaquin Ridge (marine) }
JURA-CRETACEOUS	Franciscan (West side basement), Sierran granitic rock, (east side basement)

Composite Geologic Column, Sacramento Valley

HOLOCENE	Alluvium, Modesto
PLEISTOCENE	Riverbank, Montezuma (nonmarine) Arroyo Seco, Red Bluff (nonmarine)
PLIO-PLEISTOCENE	Fair Oaks (nonmarine) Laguna (nonmarine)
PLIOCENE	Tehama, Red Bluff (nonmarine) Mehrten (nonmarine) } Sutter Buttes volcanics
MIOCENE	San Pablo (Cierbo, Neroly) (marine) Valley Springs (nonmarine)
EOCENE	Ione (nonmarine) Markley, Capay, Domengine (marine)
PALEOCENE	Martinez (marine)
CRETACEOUS	Chico (marine)
JURA-CRETACEOUS	Sierran granitic basement

FIGURE 12-6 (*Continued*)

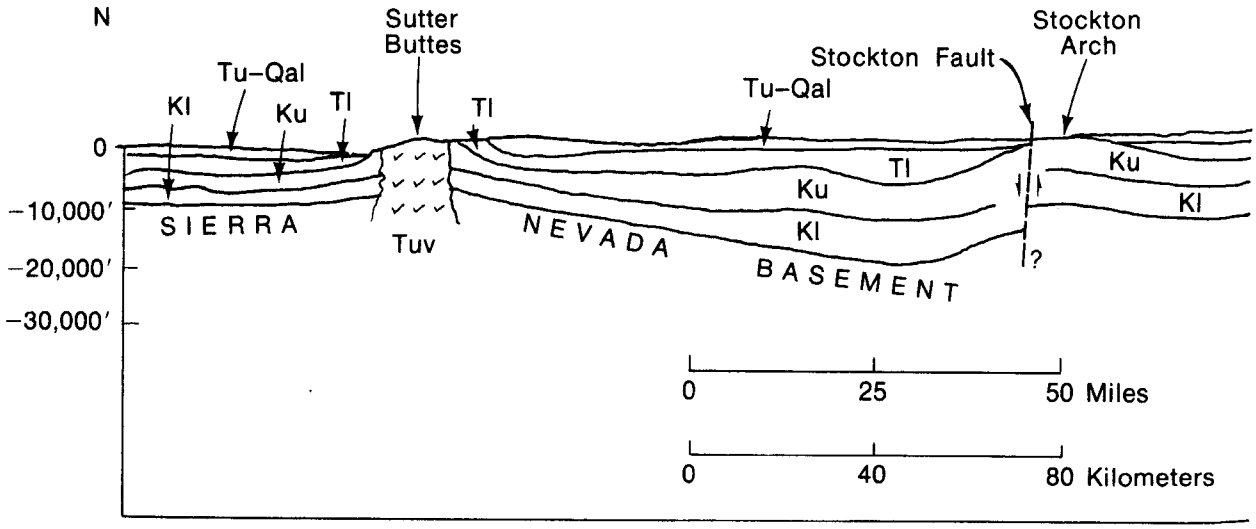

FIGURE 12-7 North-south diagrammatic section of the Great Valley. (Sources: California Division of Mines and Geology and Sacramento Geological Society)