

Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the [interactive fault map](#).

Calico-Hidalgo fault zone, Calico section (Class A) No. 121a

Last Review Date: 2000-08-31

Compiled in cooperation with the California Geological Survey

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Synopsis

General: Major Holocene and locally historically active dextral strike-slip fault located in the central Mojave Desert. Sections, as defined in this compilation, from north to south are: Calico section [121a], West Calico section [121b], and Hidalgo section [121c]. It is possible that dextral slip may transfer northwest from the Calico fault to the Blackwater fault zone [113] across an approximately 11 km right-releasing step-over, although a connection has not been established. Calico-Hidalgo fault zone is delineated by well-defined geomorphic evidence of Holocene dextral strike-slip displacement (Bull, 1978 #6613; Morton and

others, 1980 #6636; Bortugno, 1987 #6687; Hart, 1994 #6689) and locally offsets Holocene alluvium. No paleoseismic studies have been published to date and latest Pleistocene to Holocene slip rates are not well documented. Clark and others (1984 #2876) and Petersen and Wesnousky (1994 #6024) reported long term late Cenozoic dextral slip rates that range from 0.4 mm/yr to 5 mm/yr, based on 10 km dextral offset of the Kane Spring fault (Dokka and Travis, 1990 #3188). Petersen and Wesnousky (1994 #6024) reported a preferred late Cenozoic slip rate of 2.6 mm/yr. Hart and others (1988 #6690) inferred a late Quaternary slip rate of 0.5 to 1.0 mm/yr for the West Calico fault, based on its similar geomorphic expression to the Pisgah fault [122a]. The Newberry fracture zone, a north-northeast striking branch of the Calico fault, had coseismic rupture (generally normal and extensional displacement) associated with the June 1992 Mw 7.3 Landers earthquake (Hart and others, 1993 #3356; Unruh and others, 1994 #6693).

Sections: This fault has 3 sections. There is insufficient data to delineate seismogenic segments. Bortugno (1987 #6687) divided the fault zone into three segments for discussion purposes: the Calico, West Calico, and Hidalgo faults. These divisions are used in this compilation. The Calico section extends from the Quaternary active traces mapped by Dibblee (1970 #6640) in the Calico Mountains southeast to a 2.5 km left-restraining step-over delineating the section boundary between the Calico and West Calico faults. The West Calico fault extends southeast to an approximately 3 km left-restraining step over delineating the section boundary between the West Calico and Hidalgo faults. It is possible that dextral slip may transfer northwest from the Calico fault to the Blackwater fault zone [113] across an approximately 11 km right-releasing step-over, although a connection has not been established.

**Name
comments**

General: The Calico, West Calico, and Hidalgo faults are here grouped as the Calico-Hidalgo fault zone. These faults were first mapped in part by Gardner (1940 #6648) and named by Dibblee (1964 #6639; 1966 #1346; 1967 #6657; 1967 #6688; 1968 #6708; 1970 #6640) and Dibblee and Bassett (1966 #1341). The southern part of the Hidalgo fault is also referred to as the Surprise Spring fault and was named by Moyle (1984 #6691). The Newberry fracture zone, a zone of previously unmapped north northeast-striking faults ruptured during the June 1992 Mw 7.1 Landers earthquake just east of the Calico fault and are considered a splay of the Calico fault (Hart, 1994 #6689). The Newberry fracture

zone was first observed by A. Barrows and S. Bezore (cited in Hart, 1994 #6689) and mapped in detail and named by Unruh and others (1994 #6693).

Section: The Calico section consists of the Calico fault, which extends from the southeastern side of the Calico Mountains near the Daggett area southeast across the Mojave River and along the northeastern flank of the Newberry Mountains. Holocene active traces of the Calico fault extend about 5.5 km south-southeast of the junction with the West Calico fault [121b] in the Rodman Mountains. Calico section includes the Newberry fracture zone, characterized by normal and extensional displacement associated with the 1992 Mw 7.3 Landers earthquake.

Fault ID: Includes numbers 376 (Calico fault), 417 (West Calico fault), and 419 (Hidalgo fault) of Jennings (1994 #2878).

County(s) and State(s)

SAN BERNARDINO COUNTY, CALIFORNIA

Physiographic province(s)

BASIN AND RANGE

Reliability of location

Good
Compiled at 1:62,500 scale.

Comments: Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Dibblee (1964 #6639; 1970 #6640) and Dibblee and Bassett (1966 #1341) at 1:62,500; mapping by Unruh and others (1994 #6693) at 1:48,000; mapping by Morton and others (1980 #6636), Bortugno (1987 #6687), and Hart (1994 #6689) at 1:24,000.

Geologic setting

Holocene and locally historically active, predominantly dextral strike-slip fault zone located in the central Mojave Desert. The north to northwest-striking Calico-Hidalgo fault zone is part of a series of subparallel dextral strike-slip faults in the central Mojave Desert that are part of the eastern California shear zone (Dokka and Travis, 1990 #3188). Quaternary and Holocene active traces of the Calico-Hidalgo fault zone extend for approximately 115 km from the Calico Mountains southeast to the vicinity just north of the Copper Mountains. Cumulative late Cenozoic dextral strike-slip displacement is about 10 km, based on the dextral offset of the Kane Spring fault, a Cenozoic extensional structure (Dokka and Travis, 1990 #3188).

Length (km)	This section is 63 km of a total fault length of 117 km.
Average strike	N28°W
Sense of movement	Right lateral <i>Comments:</i> Dibblee (1964 #6639; 1970 #6640) and Dibblee and Bassett (1966 #1341) mapped the Calico fault principally as a dextral strike-slip fault. The northern end of the fault is mapped as a dextral to dextral reverse fault dipping to the north-northeast (Dibblee, 1970 #6640). Dokka and Travis (1990 #3188) reported 10 km of late Cenozoic dextral slip for the Calico-Hidalgo fault zone and Hart (1994 #6689) reported that the southern bank of the Mojave River floodplain is dextrally offset at least 400 m.
Dip	vertical, locally 50° to 70° NE <i>Comments:</i> Dibblee (1970 #6640) shows northern-most traces of the Calico fault as striking WNW and dipping between 50° and 70° north-northeast. Calico fault principally is vertical (Dibblee, 1964 #6639; Dibblee and Bassett, 1966 #1341; Dibblee, 1970 #6640).
Paleoseismology studies	
Geomorphic expression	Strands of the Calico section are delineated by geomorphic features indicative of Holocene dextral strike-slip displacement such as linear scarps in late Quaternary alluvium, closed depressions, dextrally deflected drainages, linear drainages and ridges, aligned notches and saddles, linear troughs and trenches, and linear vegetation contrasts in alluvium (Morton and others, 1980 #6636; Bortugno, 1987 #6687; Hart, 1994 #6689). The north to northeast-striking Newberry fracture zone is delineated by low scarps and linear vegetation contrasts in late Quaternary alluvium (Hart, 1994 #6689; Unruh and others, 1994 #6693).
Age of faulted surficial deposits	Strands of the Calico section offset Mesozoic crystalline basement rocks, Tertiary volcanic rocks, Miocene sedimentary rocks, Quaternary and late Pleistocene alluvial deposits, and Holocene alluvium and lacustrine deposits (Dibblee, 1964 #6639; Dibblee and Bassett, 1966 #1341; Dibblee, 1970 #6640; Bortugno, 1987 #6687; Hart, 1994 #6689).
Historic	

earthquake	
Most recent prehistoric deformation	<p>latest Quaternary (<15 ka)</p> <p><i>Comments:</i> Timing of the most recent paleoevent is not known. Fault is delineated by geomorphic features indicative of Holocene dextral offset (Morton and others, 1980 #6636; Bortugno, 1987 #6687; Hart, 1994 #6689).</p>
Recurrence interval	
Slip-rate category	<p>Between 0.2 and 1.0 mm/yr</p> <p><i>Comments:</i> Latest Pleistocene to Holocene slip rate is unknown but probably 0.2-1 mm/yr. Dokka and Travis (1990 #3188) reported that the Calico-Hidalgo fault zone has about 10 km of late Cenozoic dextral slip. The onset of slip is not well constrained, but assuming that slip commenced about 6 to 10 Ma, a long term dextral slip rate of 1 to 1.7 mm/yr can be estimated (Hart, 1994 #6689). Petersen and Wesnousky (1994 #6024) calculated a preferred late Cenozoic slip rate of 2.6 mm/yr with a range of 0.43 to 4.8 mm/yr, based on data reported by Dokka and Travis (1990 #3188). Clark and others (1984 #2876) estimated a long-term dextral slip rate of 0.4 to 5 mm/yr, based on 7 to 9 km dextral offset of the Cenozoic Kane Springs fault and the assumption that faulting commenced between 2 and 20 Ma. Slip rate assigned by Petersen and others (1996 #4860) for probabilistic seismic hazard assessment for the State of California was 0.6 mm/yr (with minimum and maximum assigned slip rates of 0.2 mm/yr and 1.0 mm/yr, respectively).</p>
Date and Compiler(s)	<p>2000</p> <p>William A. Bryant, California Geological Survey</p>
References	<p>#6687 Bortugno, E.J., 1987, Calico, West Calico, Hidalgo, and related faults, San Bernardino County, California: California Division of Mines and Geology Fault Evaluation Report FER-184, microfiche copy in California Division of Mines and Geology Open-File Report 90-14, 11 p., scale 1:24,000.</p> <p>#6613 Bull, W.B., 1978, Tectonic geomorphology of the Mojave Desert: Technical report to U.S. Geological Survey Earthquake Hazard Reduction Program, Reston, Virginia, under Contract 14-08-001-G-394, 176 p.</p>

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