Jump to Navigation

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, West Calico section (Class A) No. 121b

Last Review Date: 2000-08-31

Compiled in cooperation with the California Geological Survey

citation for this record: **Bryant, W.A., compiler, 2000, Fault number 121b, Calico-Hidalgo fault zone, West Calico section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:17 PM.**

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 West Calico section consists of the West Calico fault of Dibblee (1964 #6639; 1966 #1346) and extends from its junction with the Calico section [121a] in the Rodman Mountains southeast along the western flank of the Lava Bed Mountains. Holocene active traces of the West Calico fault extend along the eastern flank of the Hidalgo Mountains for about 4 km south of the junction with the Hidalgo fault, but farther southeast the fault lacks geomorphic evidence of recent faulting. Dibblee (1967 #6688) mapped an unnamed fault, referred to as fault "A" by Bortugno (1987 #6687) that may be a southward extension of the West Calico fault. Alternatively, Treiman and others (2002 #6692) suggested that fault "A", which had minor surface rupture associated with the 1999 Mw 7.1 Hector Mine earthquake, may be a young fault transferring slip from the West Calico to the Hidalgo fault. **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; 1966 #1346) at 1:62,500; mapping by Morton and others (1980 #6636) and Bortugno (1987 #6687) 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 70 km of a total fault length of 117 km.
Average strike	N32°W
Sense of movement	Right lateral *Comments:* Geomorphic expression of fault is consistent with dextral strike-slip offset (Morton and others, 1980 #6636; Bortugno, 1987 #6687). Dokka and Travis (1990 #3188) document 10 km of late Cenozoic dextral strike-slip offset along Calico-Hidalgo fault zone.
Dip Direction	V *Comments:* Dibblee (1964 #6639; 1966 #1346)
Paleoseismology studies	
Geomorphic expression	The West Calico section is delineated by geomorphic features indicative of Holocene dextral strike-slip displacement such as linear drainages, dextrally deflected drainages, aligned notches, truncated spurs, linear sidehill benches, dextrally offset alluvial fans, scarps and linear vegetation contrasts in late Pleistocene and Holocene alluvium (Morton and others, 1980 #6636; Bortugno, 1987 #6687).
Age of faulted surficial deposits	Strands of the West Calico section offset Mesozoic crystalline basement rocks, Tertiary intrusive rocks, Quaternary and late Pleistocene alluvium, and Holocene alluvial fans (Dibblee, 1964 #6639; 1966 #1346; Morton and others, 1980 #6636; Bortugno, 1987 #6687).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* 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).
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* 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). 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]. 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).
Date and Compiler(s)	2000 William A. Bryant, California Geological Survey
References	#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. #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. #6639 Dibblee, T.W., Jr., 1964, Geologic map of the Rodman Mountains quadrangle, San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-430, scale 1:62,500. #1346 Dibblee, T.W., Jr., 1966, Geologic map of the Lavic quadrangle San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-472, 5 p. pamphlet, 1 sheet, scale 1:62,500.

#6657 Dibblee, T.W., Jr., 1967, Geologic map of the Emerson Lake quadrangle, San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-490, scale 1:62,500.

#6688 Dibblee, T.W., Jr., 1967, Geologic map of the Deadman Lake quadrangle, San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-488, scale 1:62,500.

#6708 Dibblee, T.W., Jr., 1968, Geologic map of the Twentynine Palms quadrangle, San Bernardino and Riverside Counties, California: U.S. Geological Survey Miscellaneous Investigations Map I-561, 1 sheet, scale 1:62,500.

#6640 Dibblee, T.W., Jr., 1970, Geologic map of the Daggett quadrangle, San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-592, scale 1:62,500.

#1341 Dibblee, T.W., Jr., and Bassett, A.M., 1966, Geologic map of the Newberry quadrangle San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-461, 4 p. pamphlet, 1 sheet, scale 1:62,500.

#3188 Dokka, R.K., and Travis, C.J., 1990, Late Cenozoic strike-slip faulting in the Mojave Desert, California: Tectonics, v. 9, p. 311-340.

#6648 Gardner, D.L., 1940, Geology of the Newberry and Ord Mountains, San Bernardino County, California: California Journal of Mines and Geology, v. 36, no. 3, p. 257-292, 1 pl., scale approximately 1:250,000.

#3356 Hart, E.A., Bryant, W.A., and Treiman, J.A., 1993, Surface faulting associated with the June 1992 Landers earthquake, California: California Geology, v. 46, p. 10-16.

#6689 Hart, E.W., 1994, Calico fault and adjacent 1992 surface ruptures near Newberry Springs, San Bernardino County: California Division of Mines and Geology Fault Evaluation Report FER-238, 16 p., 1 appendix, scale 1:24,000.

#6690 Hart, E.W., Bryant, W.A., Kahle, J.E., Manson, M.W., and

Bortugno, E.J., 1988, Summary Report-Fault Evaluation Program, 1986-1987, Mojave Desert and other areas: California Division of Mines and Geology Open-File Report 88-1, 40 p.

#2878 Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000.

#6636 Morton, D.M., Miller, F.K., and Smith, C.C., 1980, Photoreconnaissance maps showing young-looking fault features in the southern Mojave Desert, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1051, 7sheets, scale 1:24,000 and 1:62,500.

#6691 Moyle, W.R., Jr., 1984, Bouguer gravity anomaly map of the Twentynine Palms Marine Corps Base and vicinity, California: U.S. Geological Survey Water-Resources Investigations Report 84-4005, scale 1:62,500.

#6024 Petersen, M.D., and Wesnousky, S.G., 1994, Fault slip rates and earthquake histories for active faults in southern California: Bulletin of the Seismological Society of America, v. 84, no. 5, p. 1,608-1,649.

#4860 Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic seismic hazard assessment for the State of California: California Department of Conservation, Division of Mines and Geology Open-File Report 96-08 (also U.S. Geological Open-File Report 96-706), 33 p.

#6692 Treiman, J.A., Kendrick, K.J., Bryant, W.A., Rockwell, T.K., and McGill, S.F., 2002, Primary surface rupture associated with the Mw 7.1 16 October 1999 Hector Mine earthquake, San Bernardino County, California: Bulletin of the Seismological Society of America, v. 92, p. 1,171-1,191.

#6693 Unruh, J.R., Lettis, W.R., and Sowers, J.M., 1994, Kinematic interpretation of the 1992 Landers earthquake: Bulletin of the Seismological Society of America, v. 84, no. 3, p. 537-546, scale 1:48,000.

Questions or comments?