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.

Mesquite Lake fault (Class A) No. 123

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Compiled in cooperation with the California Geological Survey

citation for this record: **Bryant, W.A., compiler, 2003, Fault number 123, Mesquite Lake fault, 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 02:16 PM.**

Synopsis	The Mesquite Lake fault is a Holocene active dextral strike-slip fault in the Eastern California Shear zone. Surface rupture associated with the Mw7.1, 1999 Hector Mine earthquake occurred on northern strands of the Mesquite Lake fault (Treiman and others, 2002 #6692; Treiman, 2002 #6701). Detailed reconnaissance-level geologic and geomorphic mapping of the fault zone includes Bader and Moyle (1960 #6644), Kupfer and Bassett (1962 #6697), Dibblee (1967 #6688; Dibblee, 1968 #6708), Bacheller (1978 #6675), Morton and others (1980 #6636), Bryant (1986 #6645), and Hart (1987 #6702). Madden and others (2001 #6703) reported evidence of at least three surface-rupturing earthquakes at the Mesquite Lake playa site

	(site 123-1). Recurrence intervals and slip-rate data have not been determined for the Mesquite Lake fault, although pending radiocarbon dates for offset deposits at the Mesquite Lake playa site may identify the age of the most recent event and allow a Holocene recurrence interval to be estimated. Madden and others (2001 #6703) inferred a recurrence interval for the Mesquite Lake fault as similar to other Eastern California Shear Zone dextral faults, about 5 k.y.
Name comments	Fault first mapped in 1953 by Kupfer and Bassett (1962 #6697). Kupfer and Bassett (1962 #6697) named the fault the Mesquite Dry Lake fault. Bader and Moyle (1960 #6644) mapped but did not name the fault. Dibblee (1967 #6688) also mapped but did not name the fault on the Deadman Lake 15-minute quadrangle. Dibblee (1968 #6708) named the fault the Mesquite Lake fault. Rogers (1967 #489) termed the fault the Mesquite fault, based on mapping by Dibblee (1967 #6688) and unpublished mapping by Dibblee on the Twentynine Palms 15-minute quadrangle. Subsequent publication of Dibblee's mapping of the Twentynine Palms 15-minute quadrangle in 1968 included naming the fault the Mesquite Lake fault. Mesquite Lake fault is the most commonly used name in the literature and will be used in this compilation. Includes Airfield fault first mapped and named by Fife (1978 #6725). **Fault ID:** Refers to number 422 (Mesquite Lake 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 1:24,000 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Bryant (1986 #6645), Hart (1987 #6702), Treiman (2002 #6701), and Treiman and others (2002 #6692).
Geologic setting	The Mesquite Lake fault is within the Eastern California Shear Zone, within the Mojave Desert (Dokka and Travis, 1990 #3188). It is a continuous zone of Holocene and late Pleistocene dextral

	faults that extend about 35 km southeastward from the about 5 km north of Deadman Lake, across Mesquite Lake playa, cuts the western side of Campbell Hills, and truncates or complexly joins with the eastern Pinto Mountain fault zone [118]. Cumulative dextral displacement is not known. Dokka (1983 #6632) reported 6.4-14.4 km of cumulative dextral displacement along the Pisgah-Rodman faults, based on offset of Miocene Kane Spring transfer fault. Dokka and Travis (1990 #3188) indicated about 10.5 km of dextral offset.
Length (km)	49 km.
Average strike	N27°W
Sense of movement	Right lateral
Dip Direction	V *Comments:* Dibblee (1968 #6708) Wahler Associates (1984 #6704).
Paleoseismology studies	Site 123-1 by Madden and others (2001 #6703) involved the excavation of 2 fault-normal trenches across traces of the Mesquite Lake fault at the northern margin of the Mesquite Lake playa. Trenches exposed well-bedded to massive, locally tilted lacustrine deposits overlain by well-bedded alluvial sand, lacustrine silts and clays and thin, massive to cross-bedded eolian sand. Madden and others (2001 #6703) reported evidence of at least three surface rupturing events.
Geomorphic expression	The Mesquite Lake fault forms a significant ground water barrier. The fault generally forms a linear boundary between latest Pleistocene to Holocene eolian deposits in the Mesquite Lake playa area. Geomorphic evidence of Holocene dextral strike-slip offset includes scarps and a linear trough in Holocene alluvium, closed depressions, dextrally deflected drainages, and sharp linear vegetation contrasts in Holocene alluvium (Bryant, 1986 #6645).
Age of faulted surficial deposits	Fault offsets late Quaternary alluvium, latest Pleistocene and Holocene alluvium, lacustrine deposits and eolian deposits (Dibblee, 1967 #6688; Dibblee, 1968 #6708; Wahler Associates, 1984 #6704; Bryant, 1986 #6645; Madden and others, 2001 #6703).

Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of the most recent event is not well constrained. Strands of the northern part of the Mesquite Lake fault ruptured in 1999 Mw7.1 Hector Mine earthquake (Treiman and others, 2002 #6692; Treiman, 2002 #6701). Madden and others (2001 #6703) identified at least two earthquakes that probably occurred in the Holocene, but dating of these events is pending radiocarbon dates.
Recurrence interval	*Comments:* Madden and others (2001 #6703) observed at least three Holocene events at the Mesquite Lake playa site (site 123-1). Radiocarbon dates on detrital charcoal were pending at the time of this compilation, but Madden and others (2001 #6703) interpreted that the Mesquite Lake fault is characterized by a long recurrence interval similar to other faults in the Eastern California Shear Zone (on the order of several thousand years).
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Slip rates for the Mesquite Lake fault have not been determined. The geomorphic expression and recurrence interval inferred by Madden and others (2001 #6703) are consistent with other dextral strike-slip faults in the Mojave Desert with slip rates of about 0.5 mm/yr and recurrence intervals of about 5 k.y. Slip rate assigned by Petersen and others (1996 #4860) for combined Pisgah-Bullion fault zone [122] and Mesquite Lake fault 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)	2003 William A. Bryant, California Geological Survey
References	#6675 Bacheller, J., III, 1978, Quaternary geology of the Mojave Desert-eastern Transverse Ranges boundary in the vicinity of Twentynine Palms, California: Los Angeles, University of California, unpublished M.S. thesis, 157 p., scale 1:24,000. #6644 Bader, J.S., and Moyle, W.R., 1960, Data on water wells and springs in the Yucca Valley-Twentynine Palms area, San

Bernardino and Riverside Counties, California: California Department of Water Resources Bulletin 91-2, 163 p., scale 1:62,500.

#6645 Bryant, W.A., 1986, Pinto Mountain, Mesquite Lake, Copper Mountain, and related faults, San Bernardino County, California: California Division of Mines and Geology Fault Evaluation Report, FER-181 (microfiche copy in California Division of Mines and Geology Open-File Report 90-14), scale 1:24,000.

#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.

#6632 Dokka, R.K., 1983, Displacements on late Cenozoic strike-slip faults of the central Mojave Desert, California: Geology, v. 1, p. 305-308.

#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.

#6725 Fife, D.L., 1978, Airfield Fault, Mesquite Playa, San Bernardino County, California: California Geology, v. 31, no. 3, p. 51-53.

#6702 Hart, E.W., 1987, Northwest extension of the Mesquite Lake fault, San Bernardino county, California: California Division of Mines and Geology Fault Evaluation report FER-181, Supplement no. 1, microfiche copy in California Division of Mines and Geology Open-File Report 90-14, 3 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.

#6697 Kupfer, D.H., and Bassett, A.M., 1962, Geologic reconnaissance map of part of the southeastern Mojave desert, California: U.S. Geological Survey Mineral Investigations Field Studies Map MF-205, scale 1:125,000.

#6703 Madden, C., Rubin, C.M., and Streig, A., 2001, Preliminary paleoseismic results from the Mesquite Lake fault, Twentynine Palms, California: Geological society of America, Abstracts with Programs, v. 33, p. A 79-A 80.

#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.

#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.

#489 Rogers, T.H., compiler, 1967, Geologic map of California, Olaf R. Jenkins edition, San Bernardino sheet: California Division of Mines and Geology, 1 sheet, scale 1:250,000.

#6701 Treiman, J.A., 2002, Lavic Lake, Bullion and related faults, San Bernardino County, California: California Geological Survey Fault Evaluation Report FER-246, 18 p., scale 1:24,000, website, [ftp://ftp.consrv.ca.gov/pub/dmg/pubs/fer/246/].

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#6704 Wahler Associates, 1984, Marine Corps air-ground combat center, geotechnical study, Twentynine Palms California: Technical report to Commanding Officer, Western Division, Naval Facilities Engineering Command, Volumes I and II (CGS AP file #3085), under Contract NAV105A.