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.

Big Pine fault zone, Western Big Pine section (Class A) No. 86a

Last Review Date: 2017-03-01

citation for this record: **Bryant, W.A., compiler, 2017, Fault number 86a, Big Pine fault zone, Western Big Pine 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 03:16 PM.**

Synopsis	**General:** Significant east to northeast-striking fault zone along the northern Transverse Range-southern Coast Range margin. Fault zone has not been studied in detail until recently. Originally thought by Hill and Dibblee (1953 #923) to be a major, through-going sinistral strike-slip fault, but Onderdonk and others (2005 #7913) have shown the fault to consist of three distinct structures: the Western Big Pine, Eastern Big Pine, and Lockwood Valley faults. Only the easternmost Lockwood Valley fault exhibits predominantly sinistral strike-slip offset. The Western Big Pine fault is a north-dipping reverse fault and the Eastern Big Pine fault is characterized by south-dipping reverse displacement. Direct evidence of Holocene displacement has not been observed except for the eastern Lockwood Valley fault near the San Andreas fault (Smith, 1977 #7914; Bryant-Park and Assoc., 1975 #7901). DeLong and others (2007 #7903) inferred that the central

	reach of the Eastern Big Pine fault may have evidence of Holocene displacement. At a site near Camp Scheideck, DeLong and others (2007 #7903) estimated an age of about 14–25 ka for an offset stream terrace, based on OSL dating; the terrace is vertically displaced about 10 m. Using an average dip of 50°, they estimated a dip-slip rate of about 0.9 mm/yr. They argued that the 10 m vertical displacement probably did not occur in a single rupture event but ruptured several times since 14–15 ka. **Sections:** This fault has 3 sections. Following the structural nomenclature of Onderdonk and others (2005 #7913) the Big Pine fault zone is divided into three sections. From west to east the sections are: Western Big Pine section, Eastern Big Pine section, and Lockwood Valley section. The boundary between the Western and Eastern Big Pine sections is delineated at the intersection with the Pine Mountain fault [261] where the fault dip changes from north (Western Big Pine fault) to south (Eastern Big Pine fault). The boundary between the Eastern Big Pine and Lockwood Valley sections marks the change from predominantly south-dipping reverse displacement along the Eastern Big Pine section to predominately sinistral strike-slip displacement along the Lockwood Valley section.
Name comments	**General:** Big Pine fault first mapped and named by Nelson (1925 #7912), based on north-dipping reverse fault along the south side of Big Pine Mountain. Onderdonk and others (2005 #7913) suggested that Big Pine fault zone actually was three distinct faults they termed the Western Big Pine fault, Eastern Big Pine fault, and Lockwood Valley fault. **Section:** Western Big Pine section extends 42 km from near the Little Pine fault [255] (about 5 km SW of San Rafael Mountain) eastward through remote, mountainous terrain of the Los Padres National Forest. The eastern boundary of the Western Big Pine section is located where the fault intersects the Pine Mountain fault [261] about 5 km SW of the intersection of Highway 33 and Lockwood Valley Road. Here the fault changes from a north-dipping reverse fault to a south-dipping reverse fault. Vedder and others (1973 #7916) mapped the Pine Mountain fault [261] as truncated by the Big Pine fault. However, Onderdonk (2003) and Onderdonk and others (2005 #7913) reported that the Western Big Pine section is continuous with the north-dipping Pine Mountain fault. **Fault ID:** Refers to numbers 307 (Big Pine fault, western part)

	and 318 (Big Pine fault, eastern part) of Jennings and Bryant (2010 #7904).
County(s) and State(s)	SANTA BARBARA COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 and 1:48,000 scale. *Comments:* Digital compilation is based on 1:24,000-scale mapping by Vedder and Stanley (2001 #7915) and Vedder and others (1995 #7917); mapping at 1:48,000-scale is based on Vedder and others (1973 #7916).
Geologic setting	The Big Pine fault zone is an east to northeast striking fault zone that extends for about 80 km from the Big Bend of the San Andreas fault zone [1] westward along the boundary between the northern Transverse Ranges and the southern Coast Ranges. Displacement along the Big Pine fault zone originally was thought to have been predominantly sinistral strike-slip displacement (*e.g.*, Hill and Dibblee, 1953 #923). Hill and Dibblee (1953 #923) postulated about 16 km of cumulative sinistral displacement. In contrast, Onderdonk and others (2005 #7913) consider the Big Pine fault zone to consist of three separate structures, from west to east: the Western Big Pine fault, Eastern Big Pine fault, and Lockwood Valley fault. The Western and Eastern Big Pine faults are characterized by predominantly reverse displacement and the Lockwood Valley fault displays predominantly sinistral strike-slip offset (Onderdonk and others, 2005 #7913). Cumulative displacement for the Western Big Pine fault is not known due to the discontinuity in structural grain and stratigraphy across the fault (Onderdonk and others, 2005 #7913). Cumulative displacement across the Eastern Big Pine fault is not well constrained due to incomplete exposures of older units in the footwall and erosion of younger units in the hanging wall, but Onderdonk and others (2005 #7913) estimate between 3 and 4 km of reverse separation has occurred. Cumulative displacement along the Lockwood Valley fault has not been reported.
Length (km)	km.
Average strike	

Sense of movement	Reverse *Comments:* Onderdonk and others. (2005 #7913)
Dip	40–60° N. *Comments:* Onderdonk and others. (2005 #7913)
Paleoseismology studies	
Geomorphic expression	Onderdonk and others (2005 #7913) reported that geomorphic features such as linear mountain fronts and linear drainages, combined with high topographic relief in the hanging wall are suggestive of possible Quaternary displacement.
Age of faulted surficial deposits	Western Big Pine fault offsets Eocene through Pliocene sedimentary rocks. Mid to late Quaternary sediments conceal traces of the Western Big Pine section.
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Timing of most recent paleoevent is not known. Jennings (1994 #2878) showed western part of Big Pine fault as pre-Quaternary. However, Onderdonk and others (2005 #7913) suggest that fault may exhibit evidence of (early ?) Quaternary displacement, based on topographic relief in hanging wall and geomorphic features suggestive of early Quaternary displacement
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Little is known about the amount of cumulative displacement along the Western Big Pine section. Onderdonk and others (2005 #7913) noted that the rugged relief in the hanging wall and linear mountain fronts and linear drainages suggest Quaternary displacement.
Date and Compiler(s)	2017 William A. Bryant, California Geological Survey

References	#7901 Bryant-Park and Associates, Inc., 1975, Geologic investigation of the Seventh Day Adventist church and school site, Lake of the Woods, Kern County, California: Unpublished consulting report dated February 1975, 7 p., 3 figures (CGS file number AP 72), *in* Fault Investigation Reports for development sites within Alquist-Priolo earthquake fault zones in southern California, 1974–2000: California Geological Survey CGS CD 2003-02 (2003). #7903 DeLong, S.B., Minor, S.A., and Arnold, L.J., 2007, Late Quaternary alluviation and offset along the eastern Big Pine fault, southern California: Geomorphology, v. 90, p. 1–10. #923 Hill, M.L., and Dibblee, T.W., Jr., 1953, San Andreas, Garlock, and Big Pine faults, California: Geological Society of America Bulletin, v. 64, p. 443–458. #7904 Jennings and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000. #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. #7912 Nelson, R.N., 1925, Geology of the hydrographic basin of the upper Santa Ynez River: University of California Publications, v. 15, p. 327–396. #7913 Onderdonk, N.W., Minor, S.A., and Kellogg, K.S., 2005, Taking apart the Big Pine fault—Redefining a major structural feature in southern California: Tectonics, v. 24, TC6002, doi:10.1029/2005TC001817, 11 p. #7914 Smith, T.C., 1977, Big Pine fault (eastern segment): California Division of Mines and Geology Fault Evaluation Report FER-17, 12 p., 5 plates, map scale 1:24,000 *in* Fault Evaluation Reports Prepared Under the Alquist-Priolo Earthquake Fault Zoning Act, Region 1 – Central California: California Geological Survey CGS CD 2002-01 (2002). #7915 Vedder, J.G, and Stanley, R.G., 2001, Geologic map and digital database of the San Rafael Mtn. 7.5-minute quadrangle,

Santa Barbara County, California: U.S. Geological Survey Open-File Report 2001-290, scale 1:24,000.

#7916 Vedder, J.G., Dibblee, T.W., Jr., and Brown, R.D., Jr., 1973, Geologic map of the upper Mono Creek-Pine Mountain area, California: U.S. Geological Survey Map I-752, scale 1:48,000.

#7917 Vedder, J.G., McLean, H., and Stanley, R.G., 1995, Preliminary geologic map of the Big Pine Mountain quadrangle, California: U.S. Geological Survey Open-File Report 95-554, scale 1:24,000.

Questions or comments?