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.

Maacama fault zone, southern section (Class A) No. 30b

Last Review Date: 2001-03-15

Compiled in cooperation with the California Geological Survey

citation for this record: **Hart, E.W., and Bryant, W.A., compilers, 2001, Fault number 30b, Maacama fault zone, southern 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 02:52 PM.**

Synopsis	**General:** This is a major dextral fault that extends from near Laytonville in Mendocino County nearly to Mark West Creek in Sonoma County. It has been interpreted as a right-stepping northern extension of the Rogers Creek fault [32] and is defined mainly by geomorphic features mapped by Herd and others (1977 #4858), U.S. Army Corps of Engineers (1978 #4867), Huffman and Armstrong (1980 #4862), Pampeyan and others (1981 #1250), Smith (1981 #4863; 1981 #4864; 1981 #4865; 1982 #4866), Bryant (1982 #4851) and Upp (1982 #4868; 1989 #4869). Based on Holocene surface traces, the California Division

	of Mines and Geology established it as a regulatory Earthquake Fault Zone under the Alquist-Priolo Act (Hart and others, 1983 #4857). McLaughlin (1981 #4859) inferred about 20 km of dextral offset during the Quaternary. Fault creep measured near Ukiah and Willits shows about 5.6 mm/yr, and 7.6 mm/yr, respectively, of dextral slip (Galehouse, 1995 #4853). The fault is fairly well defined by seismicity (Goter and others, 1994 #4855). A paleoseismic study indicates that the most recent event is prehistoric and occurred between 1520 A.D. and 1650 A.D. (Sickler and others, 1999 #4861) whereas other trench investigations indicate Holocene rupture in several places near Ukiah and Willits. Sickler and others (1999 #4861) estimated a preliminary maximum dextral slip rate of 11-14 mm/yr, based on a dextrally offset terrace riser of middle to early Holocene age **Sections:** This fault has 2 sections. Jennings (1994 #2878) identifies two Maacama fault sections—a northern and central one (his number 114) and a southern one (his number 141). His twofold sectioning (which is adopted herein) is largely based on surface traces of Holocene faults and is similar that zoned under the Alquist-Priolo Act by the California Division of Mines and Geology (Hart and others, 1983 #4857; 1997 #4856). The two sections vary in strike by about 15 degrees. Working Group on California Earthquake Probabilities (1996 #1216) divided the fault into three sections—north, central and south (their H6, H5, and H4 faults). Petersen and others (1996 #4860) adopted the Working Group on California Earthquake Probabilities sectioning scheme. The northern endpoint of the fault used by Working Group on California Earthquake Probabilities and Petersen extends much farther north than that of Jennings (1994 #2878) or Hart and others (1983 #4857) and appears to be somewhat arbitrary and not based on geomorphic expression. Upp (1989 #4869) recognized 4 "sub zones" for the northern and central sections of others and describes 10 named discontinuous faults. The basis for sectioning and the selection of endpoints used by Working Group on California Earthquake Probabilities, Petersen and others, and Upp is partly unclear.
Name comments	**General:** Apparently first named by Gealey (1951 #4854) who showed the fault as a zone of subparallel traces that crossed Maacama Creek in the Healdsburg 15-minute quadrangle. Fault mapped as extending to the southeast and northwest by Herd and others (1977 #4858), U.S. Army Corps of Engineers (1978 #4867), Huffman and Armstrong (1980 #4862), Pampeyan and others (1981 #1250), Smith (1981 #4863; 1981 #4864; 1981

	#4865; 1982 #4866), Bryant (1982 #4851), and Upp (1982 #4868; 1989 #4869). Different fault strands have at times been given different names, none of which are prominent in the literature. **Section:** Usage similar to Jennings (1994 #2878), Working Group on California Earthquake Probabilities (1996 #1216) and Petersen (1996 #4860). No other names have been used consistently **Fault ID:** Refers to number 114 (Maacama fault, northern and central parts) of Jennings (1994 #2878), and number H5 (Maacama central) and H6 (Maacama north) of Working Group on California Earthquake Potential (1996 #1216).
County(s) and State(s)	MENDOCINO COUNTY, CALIFORNIA SONOMA COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Location based on digital revisions to Jennings (1994 #2878) using original mapping by Herd and others (1977 #4858), McLaughlin (1981 #4859), Huffman and Armstrong (1980 #4862), Pampeyan and others (1981 #1250), Upp (1982 #4868), and Smith (1982 #4866), and Bryant (1982 #4851) is at 1:24,000 scale
Geologic setting	Major dextral component of the San Andreas fault system. Connects via a 6 km right step with the Rodgers Creek fault [32] to the south. Extension to the north of Laytonville is not well documented, but suggested by seismicity (Goter and others, 1994 #4855) or it may connect structurally with late Quaternary Brush Mountain shear zone [154] to the northwest (Jennings, 1994 #2878). The fault offsets Pliocene-Pleistocene sediment of the Glen Ellen Formation and all older units (Wagner and Bortugno, 1982 #4870). Locally offsets late Quaternary alluvium near Maacama Creek (Huffman and Armstrong, 1980 #4862), Ukiah (Smith, 1981 #4863), and Willits (Upp, 1989 #4869). McLaughlin (1981 #4859) estimated about 20 km of dextral slip has occurred during the Quaternary based on inferred offset of the Pliocene Sonoma Volcanics.
Length (km)	This section is 53 km of a total fault length of 160 km.

Average strike	N37°W (for section) versus N28°W (for whole fault)
Sense of movement	Right lateral *Comments:* Right-lateral deflection of drainages and associated strike-slip features indicate dextral slip (Huffman and Armstrong, 1980 #4862; Bryant, 1982 #4851; Smith, 1982 #4866). Also, dextral motion is supported by its apparent connection with and intermediate position between the dextral Maacama North section [30a] and the dextral Rodgers Creek fault [32].
Dip	90° *Comments:* Interpreted as 90? by Gealey (1951 #4854). Presumed to be near vertical based on linearity and strike-slip sense of movement.
Paleoseismology studies	
Geomorphic expression	Linear troughs, scarps and sidehill benches, closed depressions, and dextrally deflected drainages define discontinuous, recently active surface traces between Big Sulphur Creek on the north and Martin Creek on the south. This degree of geomorphic expression diminishes to the south and the fault trace is largely obscured by landslides north of Big Sulphur Creek (Herd and others, 1977 #4858; Huffman and Armstrong, 1980 #4862; Bryant, 1982 #4851; Smith, 1982 #4866). Fault creep was reported by D. Radbruch-Hall at a point 2 km (1.6 mi) SW of Big Sulphur Creek where two fences were offset right-laterally about 152 mm (Huffman and Armstrong, 1980 #4862), p. 19).
Age of faulted surficial deposits	Mostly offsets Pliocene-Pleistocene sediment and rocks of older formations. Locally offsets late Pleistocene terrace deposits (Huffman and Armstrong, 1980 #4862).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of most recent paleoevent is poorly constrained. Latest Pleistocene to Holocene activity is based on geomorphic features and apparent connection with the north section of the Maacama fault [30a].

Recurrence interval	*Comments:* A calculated recurrence interval of 220 years is based on an assumed slip of 2 m and the slip rate on the Rodgers Creek [32] and Hayward [55] faults (Working Group on California Earthquake Probabilities, 1996 #1216; Petersen and others, 1996 #4860).
Slip-rate category	Greater than 5.0 mm/yr *Comments:* Not determined for this section. Based on slip rate to south on Rodgers Creek [32] and Hayward [55] faults (Working Group on California Earthquake Probabilities, 1996 #1216; Petersen and others, 1996 #4860).
Date and Compiler(s)	2001 Earl W. Hart, California Geological Survey William A. Bryant, California Geological Survey
References	#4850 Bogar, R., McBee, L., and Prentice, C.S., 1996, A paleoseismic site along the Maacama fault near Ukiah, California: Eos, Transactions of the American Geophysical Union, v. 77, no. 46, p. 744. #4851 Bryant, W.A., 1982, Healdsburg, Maacama and related faults, Sonoma County: California Division of Mines and Geology Fault Evaluation Report FER-135, microfiche copy in California Division of Mines and Geology Open-File Report 90-10, 18 p., scale 1:24,000. #4853 Galehouse, J.S., 1995, Theodolite measurement of creep rates on San Francisco Bay region faults: Technical report to U.S. Geological Survey, Reston, Virginia, under Contract 1434-94-G2420. #4852 Galehouse, J.S., Sowma-Bawcom, J.A., and Prentice, C.S., 1992, The Maacama fault—Preliminary creep and paleoseismic data, Mendocino County, California [abs.]: Eos, Transactions of the American Geophysical Union, v. 73, no. 43, p. 123. #4854 Gealey, W.K., 1951, Geology of the Healdsburg quadrangle, California: California Department of Conservation, Division of Mines and Geology Bulletin 161, 50 p., 3 pls., scale 1:62,500. #4855 Goter, S.K., Oppenheimer, D.H., Mori, J.J., Savage, M.K.,

and Masse, R.P., 1994, Earthquakes in California and Nevada: U.S. Geological Survey Open-File Report 94-647, 1 sheet, scale 1:1,000,000.

#4856 Hart, E.W., and Bryant, W.A., 1997, Fault-rupture hazard zones in California: California Division of Mines and Geology Special Report 42, 38 p.

#4857 Hart, E.W., Bryant, W.A., and Smith, T.C., 1983, Summary report—Fault evaluation program, 1981-1982 area, northern Coast Ranges region, California: California Department of Conservation, Division of Mines and Geology Open-File Report 83-10, 17 p., 1 pl.

#4858 Herd, D.G., Helley, E.J., and Rogers, B.W., 1977, Map of Quaternary faulting along the southern Maacama fault zone, California: U.S. Geological Survey Open-File Report 77-453, 7, scale 1:24,000.

#4862 Huffman, M.E., and Armstrong, C.F., 1980, Geology for planning in Sonoma County: California Division of Mines and Geology Special Report 120, 31 p., 5 pls., scale 1:62,500.

#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.

#4859 McLaughlin, R.J., 1981, Tectonic setting of pre-Tertiary rocks and its relation to geothermal resources in The Geyser-Clear Lake area, *in* McLaughlin, R.J., and Donnelly-Nolan, J.M., eds., Research in The Geysers-Clear Lake geothermal area, northern California: U.S. Geological Survey Professional Paper 1141, p. 3-23.

#1250 Pampeyan, E.H., Harsh, P.W., and Coakley, J.M., 1981, Preliminary map showing recently active breaks along the Maacama fault zone between Laytonville and Hopland, Mendocino County, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1217, 9 p. pamphlet, 2 sheets, scale 1:24,000.

#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.

#4861 Sickler, R.R., Prentice, C.S., Dengler, L.A., Noce, T.E., Bennett, M.J., and Hamilton, J., 1999, A paleoseismic study of the Maacama fault near Ukiah, Mendocino County, CA [abs.]: Eos, Transactions of the American Geophysical Union, v. 80, p. F734.

#4863 Smith, T.C., 1981, Maacama fault (Ukiah and Willits segments), Mendocino County, California: California Division of Mines and Geology Fault Evaluation Report FER-111, Supplement No. 1, microfiche in California Division of Mines and Geology Open-File Report 90-10, 25 p., scale 1:24,000.

#4864 Smith, T.C., 1981, Maacama fault, Willits SE and Redwood Valley quadrangles, Mendocino County, California: California Division of Mines and Geology Fault Evaluation Report FER-111, Supplement No. 1, microfiche in California Division of Mines and Geology Open-File Report 90-10, 11 p., scale 1:24,000.

#4865 Smith, T.C., 1981, Maacama fault, Brooktrail Ranch to Spy Rock Road area, northern Mendocino County, California: California Division of Mines and Geology Fault Evaluation Report FER-125, Supplement No. 1, microfiche in California Division of Mines and Geology Open-File Report 90-10, 12 p., scale 1:24,000.

#4866 Smith, T.C., 1982, Maacama and related faults, Purdys Garden to Asti quadrangles, Mendocino and Sonoma Counties, California: California Division of Mines and Geology Fault Evaluation Report FER-124, Supplement No. 1, microfiche in California Division of Mines and Geology Open-File Report 90-10, 17 p., scale 1:24,000.

#4868 Upp, R.R., 1982, Holocene activity on the Maacama fault, Mendocino County, California: Stanford, California, Stanford University, unpublished Ph.D. dissertation, 196 p., scale 1:24,000.

#4867 U.S. Army Corps of Engineers, 1978, Maacama fault study, Sonoma and Mendocino Counties: January 1978 report, 31 p., 3 appendices.