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.

Hat Creek fault zone (Class A) No. 9

Last Review Date: 1995-10-01

Compiled in cooperation with the California Geological Survey

citation for this record: **Sawyer, T.L., compiler, 1995, Fault number 9, Hat Creek fault zone, 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 03:15 PM.**

Synopsis	Although the fault was first recognized by Diller in 1908 (1908 #5173), only reconnaissance mapping is available. There have been no detailed studies (for example, involving trenching).
Name comments	Fault first mapped and named the Hat Creek fault by Finch (1933 #5111). Includes the Hat Creek East fault, Hat Creek West fault, and Fall River fault zone of Woodward-Clyde Consultants (1987 #5105). Will be referred to as the Hat Creek fault zone in this compilation. **Fault ID:** Refers to numbers 29 (Hat Creek fault) and 30 (unnamed faults) of Jennings (1994 #2878) and NE02 of Working Group on Northern California Earthquake Potential (1996 #1216).

County(s) and State(s)	LASSEN COUNTY, CALIFORNIA SHASTA COUNTY, CALIFORNIA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Woodward-Clyde Consultants (1987 #5105) and Wills (1990 #5107) at 1:62,500.
Geologic setting	The Hat Creek fault zone is comprised of high-angle, down-to-west, left-stepping normal faults that bound the west side of Hat Creek Rim. There is more than 500 m of Quaternary displacement across the fault zone (Muffler and others, 1994 #5113).
Length (km)	59 km.
Average strike	N15°W
Sense of movement	Normal *Comments:* Predominately normal, but left-stepping pattern suggests a dextral component (Wills, 1990 #5107).
Dip Direction	W
Paleoseismology studies	No trenching has been conducted to date, but Marie D. Jackson is addressing the number and timing of events represented by young scarps along the Hat Creek fault, using techniques and approaches of Jackson and others (1992 #5112; cited in Muffler and others, 1994 #5113).
Geomorphic expression	The Hat Creek fault forms a prominent 250- to 500-m-high compound escarpment that is capped by early Pleistocene basalt. The base of the escarpment is buried by stabilized talus along significant portions of the fault. This talus has been disrupted by scarps and linear troughs and ridges resulting from recent activity. Some individual scarps turn into monoclinal flexures near their ends (Muffler and others, 1994 #5113).
Age of faulted surficial	Holocene alluvium, latest Pleistocene glacial outwash, late Pleistocene basalt, and the lower Pleistocene Burney basalt

deposits	(Wills, 1990 #5107).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The most recent paleoevent postdates late Tioga outwash and postdates a Holocene debris flow levee.
Recurrence interval	 *Comments:* Unknown, possibly 1-3 k.y. based on a 20- to 30-m-high scarp on the Hat Creek lava flow (20-30 ka, Wills, 1991 #475).
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Generally rates are eaqual to or slightly greater than 1 mm/yr. Reported slip rate for the Hat Creek fault is 1 mm/yr for the past 20-30 k.y. based on a 20- to 30-m-high scarp on the Hat Creek basalt, which is thought to be 20-30 ka (Wills, 1991 #475). Late Tioga outwash that is displaced 20 m at Lost Creek (locality 4C of Muffler and others, 1994 #5113) gives a slighly higher rate. Sawyer (1995 #5114) measured a 2.6-m-high scarp on a debris-flow levee thought to be Holocene in age across a second fault trace at Lost Creek. Near the north end of the fault zone, Bauchhuber and others (2000 #5110) measured a minimum of 84 m of offset of a basalt having an 40Ar/39Ar date of 86?76 ka.
Date and Compiler(s)	1995 Thomas L. Sawyer, Piedmont Geosciences, Inc.
References	#5110 Bachhuber, J., Page, W.D., and Renne, P.R., 2000, Evaluation surface-fault rupture risk to a penstock using the 40Ar/39Ar dating method, *in* Noller, J.S., Sowers, J.M., and Lettis, W.R., eds., Quaternary geochronology—Methods and applications: American Geophysical Union, AGU Reference Shelf, v. 4, p. 509-516. #5173 Diller, J.S., 1908, Geology of the Taylorsville region, California: U.S. Geological Survey Bulletin 353, 128 p. #5111 Finch, R.H., 1933, Slump scarps: Journal of Geology, v. 41, p. 647-649. #5112 Jackson, M.D., Endo, E.T., Delaney, P.T., Arnadottir, T.,

and Rubinn, A.M., 1992, Ground ruptures of the 1974 and 1983 Kaoiki earthquakes, Mauna Loa volcano, Hawaii: Journal of Geophysical Research, v. B97, no. 6, p. 8775-8796.

#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.

#5113 Muffler, L.J.P., Clynne, M.A., and Champion, D.E., 1994, Late Quaternary normal faulting of the Hat Creek Basalt, northern California: Geological Society of America Bulletin, v. 106, no. 2, p. 195-200.

#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.

#5114 Sawyer, T., 1995, Field trip stop 2-1 and Figure 2-1-2, *in* Page, W.D., ed., Quaternary Geology along the boundary between Modoc Plateau, southern Cascade Mountains, and northern Sierra Nevada: Friends of the Pleistocene, 1995 Pacific Cell, field trip guidebook.

#5107 Wills, C.J., 1990, Hat Creek, McArthur and related faults, Shasta, Lassen, Modoc and Siskiyou Counties, California: California Division of Mines and Geology Fault Evaluation Report FER-209, 14 p.

#475 Wills, C.J., 1991, Active faults north of Lassen Volcanic National Park, northern California: California Geology, v. 44, p. 51-58.

#5105 Woodward-Clyde Consultants, 1987, Pit 1 Forebay Dam (97-110)—Evaluation of seismic geology, seismicity, and earthquake ground motion: Technical report to Pacific Gas and Electric Company, p. 2-7-2-10.

#1216 Working Group on Northern California Earthquake Potential (WGNCEP), 1996, Database of potential sources for earthquakes larger than magnitude 6 in northern California: U.S.

	Geological Survey Open-File Report 96-705, 40 p.