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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.

Butte Mountains fault zone (Class A) No. 1277

Last Review Date: 2011-11-30

citation for this record: **Redsteer, M.H., Anderson, R.E., and Haller, K.M., compilers, 2011, Fault number 1277, Butte Mountains 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 02:16 PM.**

Synopsis	This long fault zone with down-to-the-west displacement of Quaternary sediment against bedrock extends the length of the Butte Mountains. The central part of the fault consists of a single set of aligned bedrock and alluvial scarps at the western base of a single range block. Alluvial scarps have a maximum reported slope angle of 29° and scarp height of 12 m (multiple faulting events). To the north and south where the range degrades into series of hills and ridges, both piedmont scarps, lineaments and block-bounding faults with varied geomorphic expressions, characterize the fault. Reconnaissance photogeologic mapping and limited analysis of scarp morphology are the sources of data for the Butte Mountains fault zone. Trench investigations and detailed studies of scarp morphology have not been conducted.
Name comments	Refers to the Butte Mountains fault zone of dePolo (1998 #2845) which was earlier named the East Long Valley fault by Schell

	(1981 #2843). Fault traces were mapped by Dohrenwend and others (1992 #2480). The fault extends from directly west of White Rock Spring (at the north end of the Butte Mountains in the Elko 1:250,000-scale map) south about 70 km to the area west of Sammy Springs, Indian Springs, and Willow Spring, which are located 7 km north of Illipah, Nev.,m in the Ely 1:250,000-scale map. **Fault ID:** Refers to fault EY6 of dePolo (1998 #2845) and fault number 68 (East Long Valley fault) by Schell (1981 #2843).
County(s) and State(s)	WHITE PINE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location based on 1:250,000-scale map of Dohrenwend and others (1991 #286; 1992 #2480) that was accomplished by photogeologic analysis of primarily 1:24,000-scale color aerial photography supplemented with 1:60,000-scale black-and-white aerial photography; transferred by inspection to 1:62,500-scale topographic maps and photographically reduced and directly transferred to 1:250,000-scale topographic maps. Subsequent mapping by photogeologic analysis of 1:58,000-nominal-scale color-infrared photography transferred directly to 1:100,000-scale topographic quadrangle maps enlarged to scale of the photographs. Schell (1981 #2843) mapped numerous short discontinuous lineaments in Long Valley directly west of the northern Butte Mountains that are not compiled here.
Geologic setting	The Butte Mountains fault zone is a major down-to-the west range front fault that separates the western margin of the Butte Mountains from the eastern margin of the basin beneath Long Valley. It is typical of range-bounding extensional faults in the Basin and Range province. Folded Paleozoic bedrock and Tertiary volcanic rock are exposed in the Butte Mountains by uplift along the Butte Mountains fault (Hose and Blake, 1976 #4341).
Length (km)	73 km.
Average strike	N3°E
Sense of	

Sense of movement	Normal
Dip Direction	W
Paleoseismology studies	Site 1277-1 trench excavated across a 4.2-m-high scarp on an intermediate-age Quaternary fan (Qfi, Koehler and Wesnousky, 2011 #7175) above pluvial Lake Hubbs highstand. The degree of soil development suggests tens of thousands of years separated the three cosiesmic surface ruptures. All of which occurred prior to the latest Pleistocene pluvial highstand in the valley and since the deposition of Qfi (middle to late Pleistocene).
Geomorphic expression	The central part of the Butte Mountains fault zone is expressed as a single trace at the western base of a well-defined, high range block averaging about 7 km in width between Butte and Long Valleys. The fault is located at the abrupt change in relief that coincides with an aligned series of cliffs (escarpments) at the bedrock-alluvium contact. Schell (1981 #2843) indicated a maximum scarp-slope angle of 29° and a height of 12 m for compound scarps on alluvium. To the north, about 7 km south of the boundary between the Ely and Elko 1:250,000-scale maps, the range becomes more subdued and broadens into a series of hills and ridges totaling about 12 km in width. As the range broadens, the fault separates into subparallel strands that bound uplifted blocks of mixed geomorphic expression (Dohrenwend and others, 1991 #286; 1992 #2480). Similarly, to the south, the Butte Mountains fault loses it youthful appearance and bounds a series of degraded hills and ridges south of Dry Lake Well. In that area, the Butte Mountains fault zone extends into the piedmont slope of eastern Long Valley and is marked by a series of discontinuous subparallel scarps and lineaments. Also, some strands of the fault bound low hills and ridges of the southernmost Butte Mountains (Dohrenwend and others, 1992 #2480).
Age of faulted surficial deposits	Late Pleistocene (Schell, 1981 #2844), early to middle and/or late Pleistocene, (Dohrenwend and others, 1991 #286; 1992 #2480), Paleozoic and Tertiary, (Hose and Blake, 1976 #4341).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* The timing of the most recent prehistoric event is not well constrained. Based on diffusion modeling of single-event

	scarps, the most recent coseismic surface rupture resulting in 0.95–1.3 m of offset occurred 18–22 ka (Koehler and Wesnousky, 2011 #7175). Earlier reconnaissance studies by Dohrenwend and others (1991 #286; 1992 #2480) suggests that the last movement could have been as recent as late Pleistocene (10–130 ka) based on photogeologic interpretation. Schell (1981 #2843; 1981 #2844) suggests that mostly late Pleistocene (10–130 ka) units are offset.
Recurrence interval	*Comments:* Several tens of thousands of years is suggested by Koehler and Wesnousky (2011 #7175).
Slip-rate category	Less than 0.2 mm/yr *Comments:* Displacement of about 4.2 m of middle to late Pleistocene fan surface and no evidence of surface rupture in the Holocene suggests rate of deformation that falls within the assigned slip-rate category. In addition, Koehler and Wesnousky (2011 #7175) estimate vertical-separation data for 20-k.y. and 60-k.y. timeframes that suggest low rates of vertical deformation. dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.01 mm/yr for the fault based on the presence of scarps on alluvium and the absence of basal facets.
Date and Compiler(s)	2011 Margaret Hisa Redsteer, U.S. Geological Survey R. Ernest Anderson, U.S. Geological Survey, Emeritus Kathleen M. Haller, U.S. Geological Survey
References	#2845 dePolo, C.M., 1998, A reconnaissance technique for estimating the slip rate of normal-slip faults in the Great Basin, and application to faults in Nevada, U.S.A.: Reno, University of Nevada, unpublished Ph.D. dissertation, 199 p. #286 Dohrenwend, J.C., Schell, B.A., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Elko 1° by 2° quadrangle, Nevada and Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2179, 1 sheet, scale 1:250,000. #2480 Dohrenwend, J.C., Schell, B.A., and Moring, B.C., 1992, Reconnaissance photogeologic map of young faults in the Ely 1° by 2° quadrangle, Nevada and Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2181, 1 sheet, scale 1:250,000.

#4341 Hose, R.K., and Blake, M.C., Jr., 1976, Geology and mineral resources of White Pine County, Nevada: Nevada Bureau of Mines and Geology Bulletin 85, 105 p.

#7175 Koehler, R.D., and Wesnousky, S.G., 2011, Late Pleistocene regional extension rate derived from earthquake geology of late Quaternary faults across the Great Basin, Nevada, between 38.5 degrees N and 40 degrees N latitude: Geological Society of America Bulletin, v. 123, no. 3-4, p. 631–650, doi:10.1130/B30111.1.

#7773 Koehler, R.D., III, 2009, Late Pleistocene regional extension rate derived from earthquake geology of late Quaternary faults across Great Basin, Nevada between 38.5° and 40° N. latitude: Reno, University of Nevada, unpublished Ph.D. dissertation, 119 p.

#2843 Schell, B.A., 1981, Faults and lineaments in the MX Sitting Region, Nevada and Utah, Volume I: Technical report to U.S. Department of [Defense] the Air Force, Norton Air Force Base, California, under Contract FO4704-80-C-0006, November 6, 1981, 77 p.

#2844 Schell, B.A., 1981, Faults and lineaments in the MX Siting Region, Nevada and Utah, Volume II: Technical report to U.S. Department of [Defense] the Air Force, Norton Air Force Base, California, under Contract FO4704-80-C-0006, November 6, 1981, 29 p., 11 pls., scale 1:250,000.