Jump to Navigation

Quaternary Fault and Fold Database of the United States

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Simpson Park Mountains fault zone (Class A)
No. 1178

Last Review Date: 2011-09-01

citation for this record: **Lidke, D.J., Anderson, R.E., and Haller, K.M., compilers, 2011, Fault number 1178, Simpson Park 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 northeast-striking fault zone consists mainly of range-front faults that place bedrock against Pleistocene piedmont-slope deposits along the western flank of the Simpson Park Mountains. It continues north to the southwestern end of the Cortez Mountains and may represent a southward continuation of the Cortez Mountains fault zone [1157] to the northeast. Some of the faults form scarps on piedmont-slope deposits that are reportedly as young as Holocene. Although there evidence along the fault zone for at least one faulting event that could be Holocene, estimates of offsets along individual faults, or along the entire fault zone have not been reported. The fault zone has not been studied in great detail and little is actually known with certainty about the nature and character of these faults.

Name comments	dePolo (1998 #2845) referred to this fault zone as the Simpson Park Mountains fault zone and that name is used herein. Refers to faults along the western flank of the Simpson Park Mountains and the southwestern end of the Cortez Mountains. Faults in this zone were mapped by Lehner and others (1961 #4363), McKee (1968 #4364), Stewart and McKee (1977 #4351), Dohrenwend and Moring (1991 #282), and Dohrenwend and others (1992 #283). This zone of mainly northeast-striking faults extends from the southwest end of the Cortez Mountains southwest to about Steiner Creek along the western flank of the Simpson Park Mountains and the southeastern edge of Crescent Valley. **Fault ID:** Refers to faults that dePolo (1998 #2845) portrayed and labeled as MI15.
County(s) and State(s)	EUREKA COUNTY, NEVADA LANDER COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Location is from 1:250,000-scale maps of Dohrenwend and Moring (1991 #282; 1991 #284) and Dohrenwend and others (1992 #283). These maps show mapping that was based on photogeologic analysis of 1:58,000-nominal-scale, color-infrared photography, which was transferred directly to 1:100,000-scale topographic maps enlarged to the scale of the photographs. The 1:100,000-scale maps were reduced and compiled at 1:250,000-scale for final publication.
Geologic setting	This northeast-striking fault zone is characterized mainly by a relatively continuous, down-to-the-west, range-front fault that separates the Grass Valley basin from the Simpson Park and Cortez Mountains structural blocks. In general, the faults place bedrock of the Simpson Park Range against Quaternary piedmont-slope deposits of the Grass Valley (Dohrenwend and Moring, 1991 #282; Dohrenwend and others, 1992 #283). It extends north to form the southwest margin of the Cortez Mountains, and may be a structural continuation of the Cortez Mountains fault zone [1157] to the northeast. Locally, west-facing scarps are present along the range-front faults and on piedmont-slope deposits of the adjacent Grass Valley (Dohrenwend and

	Moring, 1991 #282; Dohrenwend and others, 1992 #283). The down-to-the-west range-front faults combined with the predominantly west-facing scarps indicate mainly down-to-the-west fault offsets that probably reflect continued Quaternary uplift of the Simpson Park and Cortez Mountains relative to the adjacent Grass Valley.
Length (km)	67 km.
Average strike	N°14E
Sense of movement	Normal *Comments:* Not specifically reported, however, the presence of mostly west-facing scarps on piedmont-slope deposits, as well as the down-to-the-west, range-front faults, suggest principally down-to-the-west fault offsets, which in this extensional regime probably reflects principally normal, dip-slip movement along westerly dipping faults.
Dip Direction	W; NW *Comments:* Not measured directly, but probably steep, based on dips of other Quaternary faults in localities nearby and elsewhere in the Basin and Range Province. McKee (1968 #4364) showed a vertical to about 85° west dip for the range-front fault in his cross section A–A'.
Paleoseismology studies	1178-1 Trench 1 of Koehler and Wesnousky (2011 #7175) crossed a 2-m-high fault scarp that offsets the highstand shoreline of pluvial Lake Gilbert. The stratigraphy suggests evidence for two coseismic surface ruptures. 1178-2 Pine Creek (Koehler and Wesnousky, 2011 #7175) 4-m-high scarp interpreted to be the result of a single event. Evidence of the penultimate event in Trench 1 was not observed in this trench.
Geomorphic expression	This fault is expressed mainly by a relatively prominent and continuous range-front fault along the western flank of the Simpson Park Mountains (Dohrenwend and others, 1992 #283). This range-front fault juxtaposes Tertiary and Paleozoic bedrock of the Simpson Park Mountains against Quaternary piedmont-slope deposits of the adjacent Grass Valley. Along Mount Tenabo,

	the bedrock escarpment rises more than 600 m (2000 feet) at a relatively uniform steep slope (no obvious basal facets), possibly suggesting relatively uniform long-term slip rate there. Scarps are present locally along the range-front fault, and scarps and other linear features are also present locally along the piedmont and piedmont slope (McKee, 1968 #4364; Stewart and McKee, 1977 #4351; Dohrenwend and Moring, 1991 #282; Dohrenwend and others, 1992 #283). Pearthree (1990 #148) conducted morphometric analyses of 23 scarp from unspecified localities along the fault zone. dePolo (1998 #2845) reported the presence of basal fault facets along the range-front, but he did not specify the locations of the facets and did not discuss or present the heights of these facets. dePolo (1998 #2845) reported the presence of basal fault facets along the range-front, but he did not specify the locations of the facets and did not discuss or present the heights of these facets. Along the southern part of the fault scarps are up to 4 m on intermediate Quaternary fans alluvium (Qfi) and old Quaternary fans (Qfo); where as to the north pluvial Lake Gilbert landforms are offset 1–10 m (Koehler and Wesnousky, 2011 #7175).
Age of faulted surficial deposits	Dohrenwend and Moring (1991 #282) and Dohrenwend and others (1992 #283) assigned ages no older than early Pleistocene to all of the faulted deposits and assigned late Pleistocene, latest Pleistocene to Holocene, and Holocene ages to some of the faulted deposits. Mapping by Wallace (1979 #203) is consistent with the characterization of Dohrenwend and Moring (1991 #282).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The fault offsets the highstand shoreline of pluvial Lake Gilbert(Koehler and Wesnousky, 2011 #7175); furthermore by using diffusion-modeling of single-event scarps, the authors suggest the most recent surface deformation occurred 6.5–9 ka Dohrenwend and Moring, 1991 #282) estimated the timing of the most recent rupture at the south end to be Holocene (0–10 ka) on the basis of photogeologic reconnaissance. Pearthree (1990 #148) reported a mean scarp age of 5.8 ka (4.2–7.5 ka) based on geomorphic scarp dating analyses of 23 scarp profiles from unspecified localities along the fault zone.

Recurrence interval	*Comments:* Koehler and Wesnousky (2011 #7175) suggest that the most recent surface rupture occurred in the Holocene and the penultimate event occurred in the late Quaternary.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Koehler and Wesnousky (2011 #7175) estimate vertical-separation data for 20-k.y. and 60-k.y. timeframes that suggest vastly different rates of vertical deformation that fall within and below the assigned slip-rate category. dePolo (1998 #2845) calculated a preferred vertical slip rate of 0.22 mm/yr is based on field data. However, there is no documentation of any such data, as is with other similar data that he uses for his model calibration based on an empirical relationship between his preferred maximum basal facet height and vertical slip rate. We assign this fault to the 0.2–1 mm/yr slip-rate category based on his assessment.
Date and Compiler(s)	2011 David J. Lidke, 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. #282 Dohrenwend, J.C., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Winnemucca 1° by 2° quadrangle, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-2175, 1 sheet, scale 1:250,000. #284 Dohrenwend, J.C., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the McDermitt 1° by 2° quadrangle, Nevada, Oregon, and Idaho: U.S. Geological Survey Miscellaneous Field Studies Map MF-2177, 1 sheet, scale 1:250,000. #283 Dohrenwend, J.C., Schell, B.A., and Moring, B.C., 1992, Reconnaissance photogeologic map of young faults in the Millett 1° by 2° quadrangle, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-2176, 1 sheet, scale 1:250,000.

#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.

#4363 Lehner, R.E., Tagg, K.M., Bell, M.M., and Roberts, R.J., 1961, Preliminary geologic map of Eureka County, Nevada: U.S. Geological Survey Mineral Investigations Field Studies Map MF-178, 1 sheet, scale 1:250,000.

#4364 McKee, E.H., 1968, Geologic map of the Ackerman Canyon quadrangle, Lander and Eureka Counties, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-761, 1 sheet, scale 1:62,500.

#148 Pearthree, P.A., 1990, Geomorphic analysis of young faulting and fault behavior in central Nevada: Tucson, University of Arizona, unpublished Ph.D. dissertation, 212 p.

#4353 Stewart, J.H., and McKee, E.H., 1969, Geologic map of the west-central part of Lander County, Nevada: U.S. Geological Survey Open-File Report 69-270, 2 sheets, scale 1:62,500.

#4351 Stewart, J.H., and McKee, E.H., 1977, Geology and mineral deposits of Lander County, Nevada: Nevada Bureau of Mines and Geology Bulletin 88, 106 p., 3 pls.

#203 Wallace, R.E., 1979, Map of young fault scarps related to earthquakes in north-central Nevada: U.S. Geological Survey Open-File Report 79-1554, 2 sheet, scale 1:125,000.