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.

Toiyabe Range fault zone (Class A) No. 1337

Last Review Date: 2011-07-20

citation for this record: **Sawyer, T.L., Lidke, D.J., and Haller, K.M., compilers, 2011, Fault number 1337, Toiyabe Range 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 02:14 PM.**

Synopsis	This prominent fault zone along the eastern front of the Toiyabe Range shows abundant and nearly continuous geomorphic evidence of late Pleistocene movement. This fault zone juxtaposes Quaternary deposits against bedrock and forms short scarps on Quaternary fan deposits near the abrupt range front. Single- and multiple-event fault scarps are suggested by scarp morphology. The principle sources of data consist of geologic mapping, photogeologic mapping supplemented by field verification, reconnaissance photogeologic mapping, and limited analysis of scarp and basal-facet morphology.
Name comments	Refers to the prominent fault zone present along much of the eastern side of the Toiyabe Range which has been mapped by Schell (1981 #2844), Dohrenwend and others (1992 #283; 19916 #2846), and D.B. Slemmons (unpublished data, written commun., 1998). Parts of the fault zone have also been mapped by Ferguson

	and Cathcart (1954 #2926), McKee (1968 #4365; 1976 #4348), Stewart and McKee (1977 #4351), and Kleinhampl and Ziony (1985 #2851). Schell (1981 #2844) referred to the zone as the Toiyabe fault. dePolo (1998 #2845) later referred to the fault zone as the Toiyabe Range fault system, and a slight modification of that name is used herein. The fault zone extends from the north end of Big Smoky Valley east of Austin, south along the eastern front of the Toiyabe Range to about 11 km southwest of Seyler Peak. **Fault ID:** Refers to fault 9 of Schell (1981 #2844) and fault T9 of dePolo (1998 #2845).
County(s) and State(s)	LANDER COUNTY, NEVADA NYE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Based on maps by Schell (1981 #2844), Dohrenwend and others (1992 #283), unpublished map of the Tonopah 1?x2? sheet by J.C. Dohrenwend published at 1:100,000-scale by Dohrenwend and others (1996 #2846), and unpublished maps of Slemmons (written commun., 1998). Mapping by Schell (1981 #2843; 1981 #2844) included field verification based primarily on photogeologic analysis of 1:24,000-scale, color aerial photography supplemented by some 1:60,000-scale, black-and-white aerial photography. Faults identified on the aerial photographs were transferred by inspection to 1:62,500-scale topographic maps that were photographically reduced to 1:250,00-scale for compilation of the faults on 1:250,000-scale topographic maps. Mapping by Dohrenwend and others (1992 #283; 1996 #2846) was based on photogeologic analysis of 1:58,000-nominal-scale, color-infrared photography transferred directly to 1:100,000-scale topographic maps enlarged to the scale of photographs; these maps were then reduced and compiled at 1:250,000 scale. Unpublished map of D.B. Slemmons (written commun., 1998) was based on photogeologic analysis of 1:12,000-scale low-sun-angle aerial photography, transferred to 1:24,000 and 1:62,500-scale topographic maps.
Geologic setting	This long, high-angle, down-to-the-east fault zone bounds much

	of the prominent eastern front of the north-northwest trending, westward-tilting Toiyabe Range, separating it to the east from the Big Smoky Valley that directly flanks about the southern two-thirds of the range. Referring to this fault zone, Kleinhampl and Ziony (1985 #2851) stated "the range is elevated and tilted westward by frontal faults of large throw, which cut Quaternary sediments along the west side of the Big Smoky Valley." Maximum topographic relief is 1800 m (Koehler and Wesnousky, 2011 #7175).
Length (km)	116 km.
Average strike	N20°E
Sense of movement	Normal *Comments:* Not specifically reported. However, Ferguson and Cathcart (1954 #2926) and McKee (1976 #4348) showed the fault as principally a down-to-the-east normal fault in cross sections that bisect the northern part of the fault zone. East-facing scarps on piedmont-slope deposits adjacent to the range front, as well as the down-to-the-east, range-front character or much of the fault zone (Dohrenwend and others, 1992 #283) probably suggest that mostly normal, dip-slip offset has occurred along this section of the fault. A minor component of sinistral movement is suggested by the orientation of grooves on a fault surface exposed along southernmost part of the range front fault (Ferguson and Cathcart, 1954 #2926).
Dip	60° E. to 90° *Comments:* In cross sections that cross the fault zone, Ferguson and Cathcart (1954 #2926) showed a dip of about 65 degrees and McKee (1976 #4348) showed a dip of 70-90 degrees. Ferguson and Cathcart (1954 #2926) report a fault surface dipping 60 degrees along the southern section of the fault zone.
Paleoseismology studies	Site 1337-1 Tar Creek trench (Koehler and Wesnousky, 2011 #7175), located at the northern end of the fault. The trench exposed evidence of two coseismic surface ruptures resulting in 1.8 m of vertical offset.
Geomorphic expression	This fault is primarily expressed by the impressive eastern front of the Toiyabe Range, which has large and small triangular facets,

	"wineglass" canyons, and in many places an over-steepened base (dePolo, 1998 #2845). The steepest part of the range front is west of Carvers along the eastern foot of the highest point in the range, Toiyabe Dome (elev. 3463 m). The range front fault juxtaposes Quaternary piedmont-slope deposits against bedrock and has a few short scarps but is generally hidden by young alluvial fan and colluvial deposits that thinly cover much of the piedmont slope and overlap the abrupt range front. Groups of subparallel piedmont faults are marked by scarps on older alluvial-fan deposits (Schell, 1981 #2844; Dohrenwend and others, 1992 #283; 1996 #2846). dePolo (1998 #2845) reported more than 42 m of vertical displacement of a middle to late Pleistocene alluvial terrace at Alice Gendon Creek and suggested there are both single and multiple-event scarps along the fault zone based on his reconnaissance scarp morphology analysis. Schell (1981 #2844) reported Quaternary scarps as much as 12 m high and slope angles of as much as 30?; locations of scarp measurements are uncertain. A left-stepping zone of scarps on the floor of Big Smoky Valley near Carvers coincides with a series of springs and hot springs; possibly suggesting that a fault in shallow bedrock is concealed in this area. dePolo (1998 #2845) reports a maximum preferred basal fault facet height of 171?24 m.
Age of faulted surficial deposits	Scarps have been mapped on late Pleistocene and on early to middle Pleistocene deposits (Schell, 1981 #2844; Dohrenwend and others, 1992 #283; 1996 #2846).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Although the timing of the most recent prehistoric faulting event is not well constrained, the most recent coseismic surface deformation occurred in the latest Pleistocene based on trenching (Koehler and Wesnousky, 2011 #7175). Earlier topical studies suggest late Pleistocene (Schell, 1981 #2844; Dohrenwend and others, 1992 #283; 1996 #2846; dePolo, 1998 #2845).
Recurrence interval	
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 low rates of vertical deformation that fall within the assigned slip-rate category. dePolo (1998 #2845) calculated a preferred vertical displacement rate of 0.22 mm/yr for a site on this fault based on an assumed 43.4 m of vertical displacement at Alice Gendron Creek. He estimated the offset alluvial-terrace deposits to be middle- to late- Pleistocene (130–700 ka; 200 ka preferred) inferred from degree of soil development. The age of the faulted deposit is so poorly constrained that the actual slip rate could fall in a lower slip-rate category.
Date and Compiler(s)	2011 Thomas L. Sawyer, Piedmont Geosciences, Inc. David J. Lidke, U.S. Geological Survey 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. #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. #2846 Dohrenwend, J.C., Schell, B.A., Menges, C.M., Moring, B.C., and McKittrick, M.A., 1996, Reconnaissance photogeologic map of young (Quaternary and late Tertiary) faults in Nevada, *in* Singer, D.A., ed., Analysis of Nevada's metal-bearing mineral resources: Nevada Bureau of Mines and Geology Open-File Report 96-2, 1 pl., scale 1:1,000,000. #2926 Ferguson, H.G., and Cathcart, S.H., 1954, Geology of the Round Mountain quadrangle: U.S. Geological Survey Geologic quadrangle Map GQ-40, scale 1:125,000. #2851 Kleinhampl, F.J., and Ziony, J.I., 1985, Geology of Northern Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 99A, 172 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.

#4365 McKee, E.H., 1968, Geologic map of the Spencer Hot Springs quadrangle, Lander County, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-770, 1 sheet, scale 1:62,500.

#4348 McKee, E.H., 1976, Geologic map of the Austin quadrangle, Lander County, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-1307, 1 sheet, scale 1:62,500.

#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.

#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.