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Quaternary Fault and Fold Database of the United States

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Desatoya Mountains fault zone (Class A) No. 1193

Last Review Date: 2000-09-27

citation for this record: **Lidke, D.J., compiler, 2000, Fault number 1193, Desatoya 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 02:17 PM.**

Synopsis	This northeast-striking fault zone is comprised of two parts separated by a large left step. The northern part is mainly characterized by relatively continuous faults that have down-to-the-east stratigraphic offset; these faults place bedrock of the Desatoya Mountains against Quaternary piedmont-slope deposits of the Smith Creek Valley. A single east-facing scarp on alluvium is preserved along the northern part of the fault. The southern part of the fault zone is also characterized by relatively continuous, down-to-the-east, range front faults that place bedrock against Quaternary piedmont-slope deposits. East-facing scarps are abundant along the southern part and are present east and northeast of the range front faults on piedmont-slope and piedmont deposits of the Smith Creek Valley. The down-to-the-east offset along faults and the east-facing direction of the scarps implies principally down-to-the-east offset movement along the

	entire fault zone. There is evidence for at least one Quaternary faulting event along the northern part, and evidence for at least one faulting event that may be Holocene at the north end of the southern part. In general, the southern part of the fault probably moved in the late Quaternary. The fault zone has not been studied in detail and little is actually known with certainty about its nature, character, and movement history. The principal sources of data consist of geologic mapping, reconnaissance photogeologic mapping and reconnaissance geomorphic study of fault scarps and basal fault facets.
Name comments	Refers to faults mapped by McKee (1968 #4366), Stewart and McKee (1977 #4351), and Dohrenwend and others (1992 #283) along the eastern flank of the Desatoya Mountains and western side of the Smith Creek Valley. Barrows (1971 #4361) portrayed and referred to the southern part of this fault as the West Basin fault. dePolo (1998 #2845) later portrayed and referred to the two separate groups of faults as the Desatoya Mountains fault zone, the name we use here. The fault extends from about 3 km southwest of New Pass discontinuously southwest along the eastern flank of the Desatoya Mountains to about the mouth of Long Canyon. **Fault ID:** Refers to faults that dePolo (1998 #2845) portrayed and labeled MI6A and MI6B.
County(s) and State(s)	CHURCHILL 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 map of Dohrenwend and others (1992 #283) that shows mapping based on photogeologic analysis of 1:58,000-nominal-scale, color-infrared photography that was transferred directly to 1:100,000-scale topographic maps enlarged to the scale of the photographs. The 1:100,000-scale fault maps were reduced and compiled at 1:250,000-scale for final publication.
Geologic setting	This northeast-striking fault zone bounds the eastern side of the Desatoya Mountains and the western side of the Smith Creek

	Valley. The Desatoya Mountains consist almost entirely of east-tilted Tertiary volcanic rock (Stewart and McKee, 1977 #4351; Barrows, 1971 #4361; Willden and Speed, 1974 #3645). The fault zone is expressed at the surface as two parts that are separated by a 6-km-wide left step. Range front faults along both parts of the fault zone place Tertiary bedrock of the Desatoya Mountains against Quaternary piedmont-slope deposits of the Smith Creek Valley. Mapping by Dohrenwend and others (1992 #283) seems to indicate that the southern group of faults is more prominent than those to the north. Stratigraphic relations across the range front faults as well as the east-facing direction of fault scarps imply mostly down-to-the-east offset along the fault zone that probably reflects some continued Quaternary uplift of the Desatoya Mountains relative to the adjacent Smith Creek Valley.
Length (km)	45 km.
Average strike	N32°E
Sense of movement	Normal *Comments:* Not specifically reported; down-to-the-east range front faults and an east-facing scarp suggest mostly down-to-the-east offsets, which in this extensional regime, probably reflects principally normal, dip-slip movement along easterly dipping faults.
Dip Direction	SE *Comments:* Not reported but probably steep, based on dip measurements of other Quaternary faults in localities nearby and elsewhere in the Basin and Range Province.
Paleoseismology studies	
Geomorphic expression	The fault zone is mostly expressed by a series of north-northeast-striking, relatively continuous, range front faults that place bedrock of the eastern flank of the Desatoya Mountains against Quaternary piedmont-slope deposits of the adjacent Smith Creek Valley (Dohrenwend and others, 1992 #283). The southern part of the fault zone appears to be more prominent and consists of southeast-facing scarps and linear features that are present on the younger piedmont deposits of the central part of the Smith Creek Valley. In the central part of the fault zone, a few southeast-facing

	scarps are present along the range front faults. The northern part of the fault zone is almost entirely expressed by a series of north-northeast-striking, relatively continuous, range front faults that place bedrock of the eastern flank of the Desatoya Mountains against Quaternary piedmont-slope deposits of the adjacent Smith Creek Valley (Dohrenwend and others, 1992 #283). The fault zone appears to widen near the southern end of this nearly continuous part of the fault, inasmuch as it consists of several faults that fan outward and apparently terminate to the south (Dohrenwend and others, 1992 #283). According to Dohrenwend and others (1992 #283), the central part of this section contains at least one short, east-facing fault scarp. dePolo (1987 #1495) reported a preferred maximum basal fault facet height of 110 m (98–122 m) along the southern range front and 98 m (85-110 m) along the northern range front.
Age of faulted surficial deposits	Based on reconnaissance photogeologic mapping, Dohrenwend and others (1992 #283) assigned a variety of ages to the scarps along this fault. In general the southern part of the fault is characterized as late Quaternary. However, Holocene age deposits appear to be faulted in central Smith Creek Valley. These deposits are near the lowest part of the basin, within the limits of a latest Pleistocene lake that occupied Smith Creek Valley. To the north, Dohrenwend and others (1992 #283) suggest that faulting occurred during the Quaternary.
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* The timing of the most recent prehistoric faulting event is relatively well constrained. Reconnaissance photogeologic mapping by Dohrenwend and others (1992 #283) indicates that the most recent prehistoric faulting event along the range front probably is no older than late Pleistocene (<130 ka or <30 ka). In the north-central part of Smith Creek Valley, mapping by Dohrenwend and others (1992 #283) indicates that the most recent faulting event probably is no older than Holocene (<10 ka). The most conservative age assignment is made here.
Recurrence interval	
Slip-rate	Less than 0.2 mm/yr

category	*Comments:* dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.214 mm/yr for the southern part of the fault and 0.199 mm/yr for the northern part based on an empirical relationship between his preferred maximum basal facet height and vertical slip rate. The size of the facets (tens to hundreds of meters, as measured from topographic maps) indicates they are the result of many seismic cycles, and thus the derived slip rate reflects a long-term average. However, the late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) suggest the slip rate during this period is of a slightly lesser magnitude. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
Date and Compiler(s)	2000 David J. Lidke, U.S. Geological Survey
References	#4361 Barrows, K.J., 1971, Geology of the southern Desatoya Mountains, Churchill and Lander Counties, Nevada: Los Angeles, University of California, unpublished Ph.D. dissertation, 348 p., 1 pl., scale 1:24,000. #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. #1495 dePolo, C.M., Bell, J.W., and Ramelli, A.R., 1987, Geometry of strike-slip faulting related to the 1932 Cedar Mountain earthquake, central Nevada: Geological Society of America Abstracts with Programs, v. 19, no. 6, p. 371. #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. #4366 McKee, E.H., 1968, Geologic map of southwestern part of Lander County, Nevada: U.S. Geological Survey Open-File Report 68-173, 1 sheet, 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. #3645 Willden, R., and Speed, R.C., 1974, Geology and mineral deposits of Churchill County, Nevada: Nevada Bureau of Mines and Geology Bulletin 83, 95 p.