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Quaternary Fault and Fold Database of the United States

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Steptoe Valley fault system (Class A) No. 1272

Last Review Date: 2011-11-27

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Synopsis	The Steptoe Valley fault system is primarily a series of down-to-the-east range-bounding faults that juxtapose bedrock and Quaternary sediment along the eastern base of the Egan and Cherry Creek Ranges. South of Ely, Nev., the fault curves to the southeast out into the southern Steptoe Valley. A broad group of lineaments mapped by Dohrenwend and others (1992 #2480) in the central part of Steptoe valley are not included because it is not known if they are tectonic or watershed features. Although the faults of this very long system are not continuous (such as in the areas north of Ely and west of Steptoe and Glenn crossings) and have not been extensively studied; data are insufficient to provide a basis for separating the fault into sections.
Name comments	Refers to the Steptoe Valley fault system of dePolo (1998 #2845) and the west Steptoe and north Steptoe faults mapped by Schell (1981 #2843). Because dePolo (1998 #2845) does not identify a

	boundary between his faults EY9 and EY9A, the fault is not divided into sections for this compilation. Faults are also mapped by Dohrenwend and others (1991 #286,1992 #2480). This long fault extends more than 120 km along the eastern range front of the Egan and Cherry Creek Ranges, from Willow Creek 14 km south of Ely, Nev., northward to the northern end of the Cherry Creek Range at Phalen Canyon. Included within this fault system are subparallel faults interior to the northernmost part of the Cherry Creek Range (Dohrenwend and others, 1991 #286). **Fault ID:** Refers to faults EY9A and EY9B of dePolo (1998 #2845), and faults 126 and 129 of Schell (1981 #2843). Schell's map, in the Elko 1:250,000-scale map, only covers a short (about 7 km) part of the fault.
County(s) and State(s)	ELKO COUNTY, NEVADA 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 (Dohrenwend and others, 1992 #2480).
Geologic setting	The Steptoe Valley fault system is typical of Basin and Range extensional faults. It is a major down-to-the-east, range front fault that forms the eastern margin of the Egan and Cherry Creek Ranges and defines the western margin of the basin beneath Steptoe Valley. In the Elko 1:250,000-scale map the fault system includes a north striking, antithetic, down-to-the-west fault in Steptoe Valley (Dohrenwend and others, 1991 #286). A broad group of lineaments mapped by Dohrenwend and others (1992 #2480) in the area is not included because it is not known if they

	are tectonic or watershed features. Geologic mapping by Brokaw (1967 #115) and Brokaw and others (1973 #117) suggests that faulting and displacement along the range front south of Ely, Nev., may have displaced and rotated Tertiary volcanic tuffs down to the east. North of Ely, Nev., Tertiary volcanic rocks are absent and faulting juxtaposes Paleozoic carbonates and Quaternary sediment. Although the faults of this very long system are not continuous, such as in the areas north of Ely and west of Steptoe and Glenn crossings, studies have not been in detail. We believe there is insufficient data to provide a basis for separating the fault into sections. dePolo (1998 #2845) considered the fault system composed of two parts but he did not show where the division is located.
Length (km)	146 km.
Average strike	N2°E
Sense of movement	Normal *Comments:* Shown as a normal fault by Schell(1981 #2844).
Dip Direction	E
Paleoseismology studies	Site 1272-1 Egan Range trench (Koehler and Wesnousky, 2011 #7175) excavated across a 1.3-m-high scarp on intermediate Quaternary fan surface (Qfi) located south of Log Canyon. the trench revealed evidence of single episode of coseismic surface deformation that occurred about 42–60 ka.
Geomorphic expression	In general, the fault trace coincides with an abrupt change in slope at the eastern base of the Cherry Creek and Egan Ranges. On the basis of photogeologic reconnaissance (Dohrenwend and others, 1991 #286; 1992 #2480), the northern and southern parts of the fault are expressed mainly as a bedrock/alluvium contact along which no alluvial scarps are apparent on aerial photography. The central part of the fault is expressed as scarps on deposits or surfaces of Quaternary age alternating with stretches along which the trace is expressed as a bedrock/alluvium contact with no apparent alluvial scarps. Dohrenwend and others (1991 #286; 1992 #2480) show (and we include) a basinward fault splay that extends about 6 km northwest into Steptoe Valley. No morphometric data are reported for the alluvial scarps. Generally they face east or southeast except for an antithetic, west facing scarp in Steptoe Valley east of McDermid Creek in the Elko

	1:250,000-scale map.
Age of faulted surficial deposits	Schell (1981 #2843) showed that the faults displace rocks as old as Paleozoic, and sediments and/or surfaces as young as his "intermediate-age alluvial fan" (15–700 ka); it is overlain by his "young-age alluvial fan" (<15 ka). Dohrenwend and others (1991 #286; 1992 #2480) interpreted the Quaternary sediments and/or surface offsets by the main fault to be of late Pleistocene age (<130 ka).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Koehler and Wesnousky (2011 #7175). Earlier studies concur that youngest units displaced are 15-700 ka (Schell, 1981 #2843) and <130 ka (Dohrenwend and others, 1991 #286; 1992 #2480).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Low rate of deformation is suggested by a single episode of coseismic surface deformation in the past 42–60 ka (Koehler and Wesnousky, 2011 #7175). dePolo (1998 #2845) assigned a preferred reconnaissance vertical displacement rate of 0.05 mm/yr for the northern part of the fault and 0.054 mm/yr for the southern part based on "known" data. However, that data is not presented or they are presented more recently by dePolo and Anderson (2000 #4471). In the absence of documentation for a published slip rate, we conclude that 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 slow. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
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	#115 Brokaw, A.L., 1967, Geologic map and sections of the Ely quadrangle White Pine County, Nevada: U.S. Geological Survey

Geologic quadrangle Map GQ-697, 1 sheet, scale 1:24,000.

#117 Brokaw, A.L., Bauer, H.L., and Breitrick, R.A., 1973, Geologic map of the Ruth quadrangle White Pine County, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-1085, 1 sheet, 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.

#4471 dePolo, C.M., and Anderson, J.G., 2000, Estimating the slip rates of normal faults in the Great Basin, USA: Basin Research, v. 12, p. 227-240.

#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.

#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.