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Quaternary Fault and Fold Database of the United States

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Benton Spring fault (Class A) No. 1320

Last Review Date: 1998-08-28

citation for this record: **Sawyer, T.L., and Adams, K., compilers, 1998, Fault number 1320, Benton Spring fault, 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 02:15 PM.**

Synopsis	This long, northwest-striking right-lateral fault bounds southwest fronts of the Pilot Mountains and Gabbs Valley Range, and obliquely crosses the range; this is one of four or five northwest-striking dextral faults in the "central Walker Lane belt". The Benton Spring fault offsets the Tertiary volcanic section as much as 8 km in a right-lateral sense. Reconnaissance photogeologic mapping, locally detailed field mapping, and bedrock mapping of the fault zone are the sources of data.
Name comments	Refers to faults mapped by Nielsen (1965 #2544), Slemmons (1966, unpublished Walker Lake 1:250,000-scale map), Dohrenwend (1982 #2481; 1982 #2870; 1982 #2900), Ekren and Byers (1984 #2902; 1985 #2903; 1985 #2905; 1986 #2906), Dohrenwend and others (1996 #2846), Oldow and Dockery (1993 #4479), and Bell (1995 #2422). Nielsen (1965 #2544) referred to it as the Soda Springs Valley fault. Bell (1995 #2422) referred to

	it as the Benton Spring fault. The fault zone extends from the Mineral-Esermalda county line north of the Candelaria Hills northwest along west front of the Pilot Mountains and Gabbs Valley Range, and crosses the Gabbs Valley Range between State Highway 361 and southwestern Gabbs Valley. **Fault ID:** Refers to fault numbers WL28C and WL28D (Benton Spring fault) of dePolo (1998 #2845).
County(s) and State(s)	ESMERALDA COUNTY, NEVADA MINERAL COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location based on 1:24,000-scale Bell (1995 #2422), 1:62,500-scale (Dohrenwend, 1982 #2900), 1:250,000-scale maps (Dohrenwend, 1982 #2481). Small-scale mapping by Dohrenwend (1982 #2481) based on 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.
Geologic setting	This long, northwest-striking right-lateral fault bounds southwest fronts of the Pilot Mountains and Gabbs Valley Range, and obliquely crosses the range; this is one of four or five northwest-striking dextral faults in the "central Walker Lane belt" (Stewart, 1988 #1654). The Benton Spring fault offsets the Tertiary volcanic section as much as 8 km in a right-lateral sense (Ekren and Byers, 1984 #2902).
Length (km)	87 km.
Average strike	N24°W
Sense of movement	Right lateral *Comments:* (Ekren and Byers, 1984 #2902; 1985 #2903; 1985 #2905; 1986 #2906; Oldow and Dockery, 1993 #4479). Bell (1995 #2422) measured slickenside striations along the Pilot Mountains alluvial-bedrock contact that plunge 25–35° N., suggesting 1.5:1 to 2:1 horizontal-to-vertical slip ratio. Normal sense of movement from Molinari (1984 #1584).

Dip Direction	SW
Paleoseismology studies	
Geomorphic expression	The northern part of the fault has piedmont faults in Soda Spring Valley and in southwestern Gabbs Valley, a range-bounding fault along front of the northwest-trending Gabbs Valley Range, and intermontane faults within the range. At the mouths of Dunlap and Bettles Well Canyons late Wisconsin (>22 to 25 ka) surfaces are vertically offset up to 3.8 m and older alluvial-fan surfaces (60–100 ka) are vertically offset about 7.6 m (Bell, 1995 #2422). The range-front fault is marked by scarps juxtaposing Quaternary deposits against bedrock and the piedmont faults are marked by scarps and lineaments on Quaternary piedmont-slope deposits (Dohrenwend, 1982 #2481, 1982 #2870; Bell, 1995 #2422). Near Long Canyon in the Pilot Mountains, several north-striking faults that cut alluvium of Quaternary and Quaternary/Tertiary age (Dohrenwend, 1982 #2900) and a northwest-striking fault that juxtaposes Quaternary and/or Tertiary alluvium against Paleozoic bedrock (Dohrenwend, 1982 #2900; Molinari, 1984 #1584) are recognized. Scarps on young alluvium and range front faults that juxtapose young alluvium against bedrock characterize the northern part of the fault along the west side of the Pilot Mountains (Dohrenwend, 1982 #2900). Also included are a series of subparallel north to northeast-striking faults that juxtapose Pleistocene to Tertiary alluvium against late Quaternary alluvium in the center of Soda Spring Valley about 4 km north of Rhodes Salt Marsh.
Age of faulted surficial deposits	Late Holocene through Pleistocene, and Tertiary. Dohrenwend (1982 #2481, 1982 #2870; 1982 #2900), Bell (1995 #2422), Ekren and Byers (1986 #2906) mapped faults displacing Quaternary piedmont-slope deposits. Bell (1995 #2422) mapped several faults offsetting late Holocene through Pleistocene alluvial-fan deposits along the southwest side of the Gabbs Valley Range and a few faults on Holocene piedmont-slope deposits of the Pilot Mountains. Several faults also have been mapped displacing Tertiary bedrock (Ekren and Sargent, 1965 #1509; Dohrenwend, 1982 #2481, 1982 #2870; 1982 #2900; Ekren and Byers, 1984 #2902; 1985 #2903; 1985 #2905).
Historic earthquake	

Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* There is general agreement that the most recent event is latest Quaternary (Dohrenwend, 1982 #2481, 1982 #2870; Bell, 1995 #2422; Dohrenwend and others, 1996 #2846). Bell (1995 #2422) constrained the time of the most recent event between 900 and 4,300 yr BP based on surficial stratigraphy and radiocarbon dates.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Bell (1995 #2422) indicates that the slip rate on this fault is 0.13–0.4 mm/yr based on vertical offset of a late Wisconsin surface (>22 to 25 ka) to be as much as 3.8 m and an older (60 to 100 ka) surface to be offset about 7.6 m at the mouths of Bettles Well and Dunlap Canyons. The average of Bell's range falls within the assigned slip-rate category, and if the ratio of lateral movement vs. vertical based on the orientation of slickensides (Bell, 1995 #2422) is considered (2:1), it seems justifiable to assign this slip-rate category.
Date and Compiler(s)	1998 Thomas L. Sawyer, Piedmont Geosciences, Inc. Kenneth Adams, Piedmont Geosciences, Inc.
References	#2422 Bell, J.W., 1995, Quaternary map of the Mina quadrangle, Nevada: Nevada Bureau of Mines and Geology Field Studies Map 10, 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. #2481 Dohrenwend, J.C., 1982, Map showing late Cenozoic faults in the Walker Lake 1° by 2° quadrangle, Nevada-California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-D, 1 sheet, scale 1:250,000. #2870 Dohrenwend, J.C., 1982, Surficial geologic map of the Walker Lake 1° by 2° quadrangle, Nevada-California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-C, 1 sheet, scale 1:250,000.

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#2544 Nielsen, R.L., 1965, Right-lateral strike-slip faulting in the Walker Lane, west-central Nevada: Geological Society of America Bulletin, v. 76, no. 11, p. 1301-1308.

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#4479 Oldow, J.S., and Dockery, H.A., 1993, Geologic map of the Mina quadrangle, Nevada: Nevada Bureau of Mines and Geology Field Studies Map 6, 1 sheet, scale 1:24,000.

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