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.

West Spring Mountains fault (Class A) No. 1073

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Synopsis	The West Spring Mountains fault forms scarps on surficial materials of Pleistocene age across the western piedmont of the Spring Mountains, east of Pahrump, Nev. The range front fault (the Grapevine fault) is not included herein because it apparently lacks young scarps and evidence for Quaternary movement. The piedmont fault has an irregular trace with an overall northward strike. The main fault probably has normal slip on a steep west-dipping plane, but the scarps along the southern extension into Pahrump Valley show a left-stepping pattern that may suggest possible right-oblique displacement. The 11-km-long central part contains the largest scarps as well as small scarps recording the youngest displacement event, which is estimated to be latest Pleistocene or early Holocene. Scarps as large as 13.4 m (9.4 m of surface offset) on alluvium estimated to be 200–500 ka may suggest long average recurrence intervals and low long-term slip rates.

Name comments	Name first used by Hoffard (1991 #1543) for a fault on the western flank of the northern Spring Mountains. Name also used by Piety (1995 #915), although she included the Grapevine fault (Carr, 1984 #1472), a range-front structure along the bedrock flank of the northwestern Spring Mountains. **Fault ID:** Equivalent to fault symbol WSM of Piety (1995 #915) and referred to as fault LV6 by dePolo (1998 #2845).
County(s) and State(s)	CLARK COUNTY, NEVADA NYE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault traces taken from 1:100,000-scale mapping by Reheis (1991 #1602) modified by aerial photogeology, field studies and mapping by Anderson and others (1995 #897).
Geologic setting	The West Spring Mountains fault is a northwest- to north-northwest--striking predominantly normal fault the bounds the western slope of the northern Spring Mountains. The northern part of the fault cuts the piedmont slope directly southwest of the range front and is expressed as a zone of scarps on surficial deposits. The range front fault (the Grapevine fault of Carr, 1984 #1472) is not included herein because it apparently lacks young scarps and evidence for Quaternary movement (Dohrenwend, 1991 #288; Anderson and others, 1995 #897). As the West Spring Mountains fault is traced southward, it diverges from the range front onto the piedmont, crosses alluvial fans formed west of the range, and extends southward to the central part of Pahrump Valley, east and southeast of Pahrump, Nev. (Piety, 1995 #915). The fault has an sinuous trace that is about N. 22° W. with a northern part at about N. 35° W., a central part at about N. 14° W. and a southern part and southern extension at about N. 20° W. (Anderson and others, 1995 #897).
Length (km)	48 km.
Average strike	N7°W
Sense of	Normal

movement	*Comments:* The irregular map trace of the West Spring Mountains fault, especially the central part, seems to preclude a significant lateral component of displacement (Hoffard, 1991 #1543; Reheis, 1992 #1604; Anderson and others, 1995 #897). A left-stepping pattern exhibited by fault traces east and southeast of Pahrump may suggest a component of sinistral displacement on the part of the fault that extends into Pahrump Valley (Hoffard, 1990 #1542; Reheis, 1992 #1604).
Dip Direction	W; E
Paleoseismology studies	
Geomorphic expression	The northern part is expressed as a broad (1.5- to 2.5-km-wide) zone of subparallel piedmont scarps, the central part as a single fault and narrow graben, and the southern part as a 80- to 150-m-wide zone that includes a conspicuous graben. The fault probably continues south from the graben beneath a gap in surface expression and connects southward with a series of left-stepping piedmont scarps in Pahrump Valley (Anderson and others, 1995 #897). Scarps are best developed along the central section, where single-event scarps are formed on the sides of deep (typically 6–10 m) arroyos that are cut into large multiple-event scarps. On the basis of scarp profiles, maximum fault displacement during the youngest event is estimated at 1.8–2.0 m and the time is estimated as latest Pleistocene or early Holocene (Anderson and others, 1995 #897). Multiple-event scarps have heights as much as 13.6 m, reflecting about 9.4 m of surface offset.
Age of faulted surficial deposits	The age of the deposits or surfaces cut by the youngest event in the low areas of transverse drainages is not recorded. On the basis of formation of a strong, thick, petrocalcic horizon (stage IV) (Machette, 1985 #1267) and mature degree of dissection, the old alluvium on which the large multiple-event scarps are formed is estimated to be at least 130 ka and is perhaps as old as 500 ka (Anderson and others, 1995 #897). Dohrenwend and others (1991 #288) estimated a late and (or) middle Pleistocene age for the faulted alluvium on the basis of the degree of fluvial dissection, drainage pattern, and presence of weakly to moderately developed soils, but without field studies.
Historic earthquake	

Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* On the basis of the morphology of small scarps representing the youngest surface faulting event, their age is estimated at latest Pleistocene (<20 ka) or early Holocene (>5 ka) (Anderson and others, 1995 #897). Unfaulted deposits are estimated to be of middle to late Holocene (<5 ka).
Recurrence interval	28–124 k.y. *Comments:* Using 1.8–2.0 m as a typical offset per event, Anderson and others (1995 #897) estimated that about five similar-sized events may have created the largest scarps (9.4 m of surface offset). If the old fan alluvium on which the large scarps are formed is older than 130 ka to as much as 500 ka, and the youngest event is between 5 and 20 ka, the range of recurrence intervals is roughly estimated to be 28-124 k.y. (Anderson and others, 1995 #897).
Slip-rate category	Less than 0.2 mm/yr *Comments:* The vertical displacement rate on the most active part of the Western Spring Mountains fault, the central part, could range from less than 0.02 to as much as 0.07 mm/yr (Anderson and others, 1995 #897). dePolo (1998 #2845) cites a preferred rate of 0.07 mm/yr, based on the same data.
Date and Compiler(s)	1998 R. Ernest Anderson, U.S. Geological Survey, Emeritus
References	#897 Anderson, R.E., Bucknam, R.C., Crone, A.J., Haller, K.M., Machette, M.N., Personius, S.F., Barnhard, T.P., Cecil, M.J., and Dart, R.L., 1995, Characterization of Quaternary and suspected Quaternary faults, regional studies, Nevada and California: U.S. Geological Survey Open-File Report 95-599, 70 p., 2 sheets. #1462 Burchfiel, B.C., Hamill, G.S., IV, and Wilhelms, D.E., 1983, Structural geology of the Montgomery Mountains and the northern half of the Nopah and Resting Spring Ranges, Nevada and California: Geological Society of America Bulletin, v. 94, p. 1359-1376. #1472 Carr, W.J., 1984, Regional structural setting of Yucca Mountain, southwestern Nevada, and late Cenozoic rates of tectonic activity in parts of the southwestern Great Basin, Nevada and California: U.S. Geological Survey Open-File Report 84-854,

114 p.

#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.

#288 Dohrenwend, J.C., Menges, C.M., Schell, B.A., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Las Vegas 1° by 2° quadrangle, Nevada, California, and Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-2182, 1 sheet, scale 1:250,000.

#1542 Hoffard, J.L., 1990, Quaternary fault patterns in Pahrump Valley, Nevada, and Stewart Valley, California: Geological Society of America Abstracts with Programs, v. 22, no. 3, p. 29.

#1543 Hoffard, J.L., 1991, Quaternary tectonics and basin history of Pahrump and Stewart valleys, Nevada and California: Reno, University of Nevada, unpublished M.S. thesis, 138 p., 5 pls.

#1267 Machette, M.N., 1985, Calcic soils of the southwestern United States, *in* Weide, D.L., ed., Soils and Quaternary geology of the southwestern United States: Geological Society of America Special Paper 203, p. 1–21.

#915 Piety, L.A., 1995, Compilation of known and suspected Quaternary faults within 100 km of Yucca Mountain, Nevada and California: U.S. Geological Survey Open-File Report 94-112, 404 p., 2 pls., scale 1:250,000.

#1602 Reheis, M.C., 1991, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the eastern parts of the Saline Valley 1:100,000 quadrangle, Nevada and California, and the Darwin Hills 1:100,000 quadrangle, California: U.S. Geological Survey Open-File Report 90-500, 6 p., 2 pls., scale 1:100,000.

#1604 Reheis, M.C., 1992, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the Cactus Flat and Pahute Mesa 1:100,000 quadrangles and the western parts of the Timpahute Range, Pahranagat Range, Indian Springs, and Las Vegas 1:100,000 quadrangles, Nevada: U.S. Geological Survey Open-File Report 92-193, 14 p., 3 pls., scale 1:100,000.

	#1195 Reheis, M.C., and Noller, J.S., 1991, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the eastern part of the Benton Range 1:100,000 quadrangle and the Goldfield, Last Chance Range, Beatty, and Death Valley Junction 1:100,000 quadrangles, Nevada and California: U.S. Geological Survey Open-File Report 90-41, 9 p., 4 sheets, scale 1:100,000.