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Quaternary Fault and Fold Database of the United States

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Smith Valley fault zone, unnamed southern section (Class A) No. 1291c

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Synopsis	**General:** This very long, nearly continuous fault zone has: (1) range-front faults bounding east front of Pine Nut Mountains from south end of range to east of Boyle Tunnel and bounding east front of Buckskin Range, Wellington Hills and Sweetwater Mountains; (2) piedmont and intrabasin faults throughout much of Sweetwater Flat, in western and southern Smith Valley, in northwest arm of Smith Valley, and on east piedmont slope of Buckskin Range; and (3) a few intermontane faults east of Desert Creek Peak and in volcanic plateau flanking east side of Pine Nut Mountains near Lyon Peak. Pine Nut Mountains and Wellington Hills represent a west-tilted structural block and Smith Valley probably is a west-tilted half graben based on presence of a marsh on west side of valley near Beaman Lake. Generally, the fault is expressed as scarps on Holocene, upper Pleistocene, and older Pleistocene alluvium and juxtaposes Holocene and upper

	Pleistocene alluvium. Range-front faults juxtapose piedmont-slope deposits against bedrock and are expressed as locally abrupt fronts of Pine Nut Mountains, Wellington Hills, and Sweetwater Mountains. Piedmont faults are marked by a small group of scarps at south end of Smith Valley, adjacent to front of Pine Nut Mountains, Sweetwater Mountains, and Buckskin Range. Some of intrabasin faults in southern Smith Valley and in Sweetwater Flat are characterized by short scarps. Intermontane faults east of Desert Creek Peak are delimited by aligned drainage valleys and ridge-crest saddles, and near Lyon Peak are marked by prominent escarpments, two of which bound a large closed depression that appears to be a graben. Although many of these faults displace only bedrock, some also displace Pleistocene alluvium or juxtapose younger against older Pleistocene alluvium, providing evidence for young movement. Detailed work has not been conducted along entire fault zone; reconnaissance photogeologic and field-based mapping of fault zone are the sources of data. Trench investigations have not been completed, but characterization of the scarp morphology has been accomplished for parts of fault zone in Smith Valley and Sweetwater Flat. **Sections:** This fault has 3 sections. Although detailed work has not been conducted along entire fault zone, the sections are defined based on general movement history of fault zone (*e.g.*, Hayes, 1985 #2508; Dohrenwend and others, 1996 #2846). The most recent offset along the central section of the fault is clearly young and probably latest Quaternary; the northern and southern parts of the fault do not seem to exhibit young faulting and are assigned a Quaternary age here. The three sections are described together as a zone because of similar trends, style of movement, and reasonable continuity from north to south.
Name comments	**General:** Refers to faults mapped by Moore (1961 #2879), Slemmons (1966, unpublished Walker Lake 1:250,000-scale map; 1968, unpublished Reno 1:250,000-scale map), Dohrenwend (1982 #2481; 1982 #2870), Dohrenwend and Brem (1982 #2872), Brem (1984 #2887), Hayes (1985 #2508), Stewart and others (1982 #2873; 1989 #2885), Stewart and Dohrenwend (1984 #2886), Stewart and Reynolds (1987 #2888), and Greene and others (1991 #3487) along east side of Pine Nut Mountains from south end of range to east of Boyle Tunnel, and along east side of Wellington Hills and Sweetwater Mountains. The northern two sections have been referred to as the Smith Valley fault zone (or fault system) by previous investigators. Some of the faults in the southern section are referred to as the Sweetwater Flat fault by

	dePolo (1998 #2845). **Section:** Section includes faults north and east of Desert Creek Peak, faults bounding east front of Sweetwater Mountain, and faults in Sweetwater Flat. **Fault ID:** Refers to fault WL14 of dePolo (1998 #2845).
County(s) and State(s)	MONO COUNTY, CALIFORNIA LYON COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Locations chiefly based on 1:62,500 bedrock and surficial geologic mapping of Dohrenwend and Brem (1982 #2872), Stewart and Mitchell (1987 #2888), and Stewart and others (1989 #2885). Locations checked against 1:250,000-scale maps of Dohrenwend (1982 #2481; 1982 #2870) which were produced 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.
Geologic setting	This very long, nearly continuous fault zone has: (1) range-front faults bounding east front of Pine Nut Mountains from south end of range to east of Boyle Tunnel and bounding east front of Buckskin Range, Wellington Hills and Sweetwater Mountains; (2) piedmont and intrabasin faults throughout much of Sweetwater Flat, in western and southern Smith Valley, in northwest arm of Smith Valley, and on east piedmont slope of Buckskin Range; and (3) a few intermontane faults east of Desert Creek Peak and in volcanic plateau flanking east side of Pine Nut Mountains near Lyon Peak (Moore, 1961 #2879; Dohrenwend, 1982 #2481; 1982 #2870; Dohrenwend and Brem, 1982 #2872; Stewart and others, 1982 #2873; Stewart and Dohrenwend, 1984 #2886; Brem, 1984 #2887; Hayes, 1985 #2508; Stewart and Reynolds, 1987 #2888; Stewart and others, 1989 #2885; Greene and others, 1991 #3487); Pine Nut Mountains and Wellington Hills represent a west-tilted structural block (Stewart, 1978 #2866).
Length (km)	This section is 36 km of a total fault length of 88 km.

Average strike	N5°W (for section) versus N6°W (for whole fault)
Sense of movement	Normal *Comments:* (Moore, 1961 #2879; Dohrenwend, 1982 #2481; 1982 #2870; Stewart and others, 1982 #2873; Brem, 1984 #2887; Hayes, 1985 #2508; Stewart and Reynolds, 1987 #2888; Stewart and others, 1989 #2885)
Dip Direction	E; W; SE
Paleoseismology studies	
Geomorphic expression	At north end of section, east of Desert Creek, faults are expressed as north-trending anastomosing and echelon scarps on possibly late Pleistocene alluvium (Dohrenwend, 1982 #2870; Stewart and others, 1989 #2885); however, map by Dohrenwend and others (1996 #2846) suggests these scarps are much older. To the south, primarily intermontane faults are expressed as a series of north-trending bedrock horst and graben that have sharp, linear bedrock-alluvium contacts (Hayes, 1985 #2508). Some of these faults involve Pleistocene alluvium, providing evidence for young movement. In vicinity of Sweetwater Flat, faults are expressed as piedmont scarps on Pleistocene alluvium, and range-front faults on east side of Sweetwater Mountains juxtapose Pleistocene and Tertiary alluvium against bedrock, and as north-striking intermontane faults on west side of Pine Grove Hills (Moore, 1961 #2879; Dohrenwend, 1982 #2481; 1982 #2870; Dohrenwend and Brem, 1982 #2872; Stewart and others, 1982 #2873; Brem, 1984 #2887; Hayes, 1985 #2508; Stewart and Reynolds, 1987 #2888; Stewart and others, 1989 #2885; Dohrenwend and others, 1996 #2846). A southeast-facing scarp in Sweetwater Flat, near the airstrip, has a height of 2.5 m and a slope of 23? (Hayes, 1985 #2508). dePolo (1998 #2845) reported basal facets up to 98-146 m high along east front of Sweetwater Flat.
Age of faulted surficial deposits	Holocene to late Pleistocene(?); Pleistocene; late Tertiary. Faults primarily displace Pleistocene deposits, but some involve deposits as young as Holocene to late Pleistocene(?) and as old as late Tertiary (Dohrenwend, 1982 #2481; 1982 #2870; Dohrenwend and Brem, 1982 #2872; Stewart and others, 1982 #2873; Brem, 1984 #2887; Hayes, 1985 #2508; Stewart and Reynolds, 1987 #2888; 1989 #2885). One fault north of Gulch Spring is mapped

	as juxtaposing Holocene alluvial-fan deposits against bedrock (Dohrenwend, 1982 #2870).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Although the time of the most recent event is not well constrained, a Quaternary time is suspected based on mapping of Dohrenwend and others (1996 #2846). Locally, there is indication that the most recent event may be late Quaternary or even latest Quaternary, such as the scarp at Gulch Spring.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No detailed data exists to determine slip rates for this section. dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.231 mm/yr 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 apparent lack of evidence to suggest that this part of the fault is as young nor as active as the section to the north suggests the slip rate during this period is of a lesser magnitude. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
Date and Compiler(s)	1999 Kenneth Adams, Piedmont Geosciences, Inc. Thomas L. Sawyer, Piedmont Geosciences, Inc.
References	#2887 Brem, G.F., 1984, Geologic map of the Sweetwater Roadless area, Mono County, California and Lyon and Douglas Counties, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1535-B, scale 1:62,500. #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.

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#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.

#3487 Greene, R.C., Stewart, J.H., John, D.A., Hardyman, R.F., Silberling, N.J., and Sorensen, M.L., 1991, Geologic map of the Reno 1° by 2° quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2154-A, scale 1:250,000.

#2508 Hayes, G.F., 1985, Late Quaternary deformation and seismic risk in the southern Sierra Nevada Great Basin boundary zone near the Sweetwater Mountains, California and Nevada: Reno, University of Nevada, unpublished M.S. thesis, 135 p.

#2879 Moore, J.G., 1961, Preliminary geologic map of Lyon, Douglas, Ormsby and part of Washoe Counties, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-80, scale 1:200,000.

#2866 Stewart, J.H., 1978, Basin-range structure in western North America—A review, *in* Smith, R.B., and Eaton, G.P., eds., Cenozoic tectonics and regional geophysics of the western cordillera: Geological Society of America Memoir 152, p. 1-31, scale 1:2,500,000.

#2886 Stewart, J.H., and Dohrenwend, J.C., 1984, Geologic map

	of the Wellington quadrangle, Nevada: U.S. Geological Survey Open-File Report 84-211, scale 1:62,500. #2888 Stewart, J.H., and Reynolds, M.W., 1987, Geologic map of the Pine Grove Hills quadrangle, Nevada: U.S. Geological Survey Open-File Report 87-658, scale 1:62,500. #2885 Stewart, J.H., Brem, G.F., and Dohrenwend, J.C., 1989, Geologic map of the Desert Peak quadrangle, Lyon and Douglas Counties, Nevada, and Mono County, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2050, scale 1:62,500. #2873 Stewart, J.H., Carlson, J.E., and Johannesen, D.C., 1982, Geologic map of the Walker Lake 1° by 2° quadrangle, California and Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-A, scale 1:250,000.