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Warm Springs Valley fault zone (Class A) No. 1605

Last Review Date: 2017-04-10

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Synopsis	Dextral strike-slip to dextral normal fault zone that locally offsets Holocene alluvial deposits (Bell, 1981 #2875; Wills, 1990 #5129; Grose and others, 1990 #5131). The Warm Springs Valley fault zone is one of five principal right-lateral structures in the Pyramid Lake block of the Walker Lane Belt that form a prominent left-stepping pattern. Approximately 5.5 km of Cenozoic right-lateral displacement is suggested by offset Mesozoic plutonic and metamorphic rocks. Intrabasin faults in Warm Springs Valley are expressed as northeast-facing scarps on latest Pleistocene lacustrine and eolian sediments and commonly bound pressure ridges composed of Quaternary-Tertiary gravel. A small, enclosed depression south of Sugarloaf and Vinegar Peak is bounded by intra basin faults expressed as southwest-facing scarps that juxtapose Quaternary alluvium and colluvium against Tertiary bedrock. Range-front faults adjacent to State Line Peak are marked by abrupt topographic escarpments on the northeastern and eastern sides of the peak. Intermontane faults extend from the northern part of Winnemucca Valley,

	northeast to State Line Peak and primarily involve Tertiary bedrock, but are characterized by prominent topographic lineaments, including aligned stream valleys, hill top saddles, and side-hill benches. Detailed- and regional-geologic mapping and reconnaissance photogeologic mapping are the sources of data.
Name comments	The Warm Springs Valley fault zone in California was first mapped along the northeastern face of the Fort Sage Mountains by Lydon and others (1960 #5127). In Nevada, this fault zone includes faults mapped by Bonham (1969 #2999), Slemmons (1968 unpublished Reno 1:250,000-scale map), Grose (1984 #3022), Bell (1984 #105), and Dohrenwend and others (1991 #285) that extend from Warm Springs Valley northwest between State Line Peak in the Fort Sage Mountains and Sugarloaf and Vinegar Peak and into Honey Lake Valley. Stewart (1988 #1654) referred to these faults as the Warm Springs Valley fault, but Nitchman (1991 #2552) and dePolo (1998 #2845) referred to these faults as the Warm Springs Valley fault zone and Gold and others (2013 #7758) refer to it as a fault system. **Fault ID:** In California, refers to number 61 (Warm Springs Valley fault and unnamed faults) of Jennings (1994 #2878). Fault was referred to as number R4 by dePolo (1998 #2845) in Nevada.
County(s) and State(s)	LASSEN COUNTY, CALIFORNIA WASHOE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* In Nevada, north of 40° N. latitude, fault locations are primarily based on 1:24,000-scale map of Grose (1984 #3022) and supplemented by 1:250,000-scale map of Dohrenwend and others (1991 #285). To the south of 40° N. latitude, fault locations are based on the 1:250,000-scale map of Bell (1984 #105) and 1:62,500-scale map of Nitchman (1991 #2552). Mapping by Dohrenwend and others (1991 #285) is from 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. Mapping by Bell (1984 #105) is from photogeologic analysis of 1:40,000-scale low sun-angle aerial photography, supplemented with 1:12,000-scale aerial photography of selected areas, several low-altitude aerial reconnaissance flights, and field reconnaissance of major structural and stratigraphic relations. Locations in California are based on digital revisions to Jennings (1994 #2878) using original mapping by Wagner and Saucedo (1990 #5130) and Grose and others (1989 #5132) at 1:62,500 scale, and

	reconnaissance geomorphic mapping by Wills (1990 #5129) at 1:24,000 scale.
Geologic setting	This long northwest-striking, high-angle, dextral strike-slip fault zone is comprised of subparallel to anastomosing faults, and linear intrabasin, intermontane, and range-front faults. The intrabasin and intermontane faults are along the axes of Warm Springs and Winnemucca valleys, and extend into Honey Lake Valley in northeastern California. The range-front faults flank State Line Peak in the Fort Sage Mountains and Sugarloaf and Vinegar peaks. The Warm Springs Valley fault zone is one of five principal right-lateral structures in the Pyramid Lake block of the Walker Lane Belt that form a prominent left-stepping pattern (Stewart, 1988 #1654). Approximately 5.5 km of Cenozoic right-lateral displacement is suggested by offset Mesozoic plutonic and metamorphic rocks (Grose, 1984 #3022).
Length (km)	70 km.
Average strike	N41°W
Sense of movement	Right lateral *Comments:* A combination of dextral (right-lateral) and normal movement is shown on published maps (Bonham, 1969 #2999; Bell, 1984 #105; Grose, 1984 #3022; Nitchman, 1991 #2552). Dextral slip inferred from the left-stepping pattern (Wills, 1990 #5129) and from the similar expression of the right-lateral Honey Lake fault zone [1639]; a down-to-northeast normal component is suggested from the steep escarpment along northeast side of Fort Sage Mountains.
Dip Direction	NE; SW
Paleoseismology studies	
Geomorphic expression	Intrabasin faults in Warm Springs Valley are expressed as northeast-facing scarps about 1 m high on latest Pleistocene lacustrine and eolian sediments and bound pressure ridges composed of Quaternary-Tertiary gravel (Bell, 1981 #2875; 1984 #105; Nitchman, 1991 #2552). Intermontane faults primarily involve Tertiary bedrock but are delineated by prominent topographic lineaments including aligned stream valleys, hill top saddles, and sidehill benches (Bonham, 1969 #2999; Grose, 1984 #3022). A small, enclosed depression south of Sugarloaf and Vinegar Peak is bounded by intra basin faults expressed as southwest-facing scarps that juxtapose Quaternary alluvium and colluvium against Tertiary bedrock. Other intra basin faults southeast of State Line Peak are expressed as arcuate south-facing scarps on Quaternary alluvium. Range-front faults adjacent to State Line Peak are

	delineated by abrupt topographic escarpments on the northeastern and eastern sides of the peak (Grose, 1984 #3022). In California the fault zone forms a steep, 60- to 300-m-high escarpment along the northeastern side of the Fort Sage Mountains; expressed on the floor of Honey Lake basin as 3- to 5-m-high scarps on lacustrine deposits (Wills, 1990 #5129).
Age of faulted surficial deposits	Holocene alluvial and basin-fill deposits are faulted north of Herlong and pre-Holocene deposits are faulted along the Fort Sage Mountains (Wills, 1990 #5129; Wills and Borchardt, 1993 #3601). Nitchman (1991 #2552) reported that latest Pleistocene lacustrine and eolian sediments are faulted. Grose (1984 #3022) mapped faults displacing undifferentiated Quaternary deposits and Tertiary bedrock and juxtaposing Quaternary deposits against bedrock.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Wills (1990 #5129) reports that the most recent event probably occurred during the late Quaternary (Lahontan high-stand shoreline; >12.5 ka, <130 ka) along the front of the Fort Sage Mountains, whereas Bell (1981 #2875) considered the southernmost part of the fault zone to have been active during the Holocene. Although the timing of the most recent event is not well constrained, a latest Quaternary time is suggested in several studies (Bell, 1984 #105; Nitchman, 1991 #2552; dePolo, 2006 #6907; Gold and others, 2013 #7758). Bell (1984 #105) showed a single Holocene fault strand in the middle part of Warm Springs Valley. Slemmons (1968, unpublished Reno 1? X 2? sheet) also considered the fault to be a latest Quaternary feature. Northwest of the Fort Sage Mountain, faults thought to be the northwestern extent of the Warm Springs Valley fault zone offset latest Pleistocene and Holocene deposits in the Honey Lake basin (Grose and others, 1989 #5132; Wills, 1990 #5129; Wagner and Saucedo, 1990 #5130; Wills and Borchardt, 1993 #3601).
Recurrence interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Revised slip-rate category based on 1.8±0.8–2.4+1.2, -1.1 mm/yr of a 41.4–55.7 ka deposit; however, post-15.8 ka slip rate of <0.2 mm/yr (Gold and others, 2013 #7758). Geodetic measurements permit moderate rates of dextral shear in the Pyramid Lake region (Thatcher and others, 1999 #3023).
Date and	1999

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Questions or comments?