Jump to Navigation

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Pleasant Valley fault zone, China Mountain section (Class A) No. 1136a

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Synopsis	**General:** The M7+ 1915 Pleasant Valley earthquake formed four right-stepping en echelon surface ruptures with down-to-the-west displacement. The fault zone is located in part of the Basin and Range that is generally characterized by down-to-the west faults that may be linked in the subsurface by a through-going zone of extension accommodated by a series of right steps. The local geologic setting is slightly different for each section. The two central sections have the most prominent historical fault scarps and are marked by prehistoric scarps indicating multiple late Quaternary displacements. Return periods on these sections are probably measured in many thousand years, but the slip rate on the Pearce section may be high. The two end sections are less active and contain only sparse evidence of prehistoric displacements. Five trenches have been excavated along the central sections, but the results remain largely unpublished.

	Sections: This fault has 4 sections. The four sections correspond approximately to the four main scarps formed during the 1915 Pleasant Valley earthquake. From north to south, they are the China Mountain [1136a], Tobin [1136b], Pearce [1136c], and Sou Hills [1136d] sections.
Name comments	**General:** Name applied here to the four main faults that were activated in the 1915 Pleasant Valley earthquake to form the "1915 scarps" mapped by Wallace (1984 #169). dePolo (1998 #2845) referred to three of the faults, and a fourth not activated in 1915, as the Pleasant Valley fault system (his faults WI7A, -7B, -7C, and ?7D, respectively). He did not include the northernmost 1915 fault rupture (his China Mountain fault, WI6) in the system. As used here, the Pleasant Valley fault zone extends from the north end of China Mountain (which is also the north end of the Tobin Range) about 60 km S25!W to the area between the Sou Hills and the Stillwater Range. The four sections form a right-stepping echelon pattern in a belt of deformation about 6 km wide and 60 km long. The fault referred to as WI7D by dePolo, is described as unnamed faults [1145]. **Section:** Referred to as the China Mountain scarp by Wallace (1984 #169) and the China Mountain fault by dePolo (1998 #2845). As compiled here, the north-most scarps are in southern Pumpernickel Valley and extend north almost to the Humboldt County line. These scarps, mapped by Dohrenwend and Moring (1991 #284), could be more closely related to the Sulphur Spring fault [1138] than to the China Mountain section. The main China Mountain section extends from about 5 km west of Smelser Pass at the west base of the north end of the Tobin Range south to the upper reaches of Pollard Canyon. **Fault ID:** Refers to fault WI7A of dePolo (1998 #2845).
County(s) and State(s)	PERSHING COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Trace of the 1915 scarp taken from Wallace (1984 #169) who mapped it in detail at a scale of 1:62,500. Traces of

	other scarps and lineaments based on the 1:125,000-scale map of young fault scarps by Wallace (1979 #203) and the 1:250,000-scale map of Dohrenwend and Moring (1991 #284) which was produced by 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	The four sections of the Pleasant Valley fault zone form a right-stepping echelon pattern. The primary sense of movement is down-to-the-west. According to Muller and others (1951 #4357), the Tobin Range is bounded on both sides by well defined fault scarps, but along the eastern front the fault is overlapped by Tertiary gravel, whereas on the western side there is evidence of progressive fault-related east tilting of Tertiary lavas. Rupture on the four sections during the 1915 Pleasant Valley earthquake may reflect failure on a deep crustal zone of extension oriented about N25?E (Wallace, 1984 #169). Despite their displacement-sense similarity, the geologic setting is different for each section. The Tobin and Pearce sections, the two central sections, are both major range-front faults that bound the ranges and place bedrock against basin-fill sediment of the Pleasant Valley. The Tobin section, along the main Tobin Range block, has a strongly convex-west trace. In contrast, the Pearce section is comparatively straight and bounds an east-tilted block that is secondary to the main Tobin Range block. Despite the presence of historic rupture, it is not clear how movement was transferred between the Pearce and Tobin sections, the ends of which overlap about 1.5 km but are separated by about 3.5-km-wide right step. The Sou Hills section, the southern section, bounds the Sou Hills on the west and extends north into the medial part of Pleasant Valley. It is part of a structural transfer zone where the predominant sense of late Cenozoic displacement changes from down-to-the-east at the east base of the Stillwater Range to down-to-the-west at the western base of the Tobin Range. As the Sou Hills are approached along these opposed-sense major range-front faults, fault throw and continuity decrease and the timing and average strike changes (Fonseca, 1988 #134). The China Mountain section at the northern end of the Tobin Range is one of several north-striking normal faults that cut the Paleozoic and Mesozoic rock of China Mountain. It may bound the China Mountain block and place bedrock against basin fill in the southernmost part of Pumpernickel Valley (Stewart and Carlson, 1978 #3413). The surface trace of the 1915 surface rupture along China Mountain is actually located 200-300 m upslope of the base

	of the west-facing bedrock escarpment. The main 1915 rupture [1136b, 1136c] has a convex-west trace, possibly suggesting convex-upward fault geometry rather than the listric geometry tentatively suggested by Wallace (1984 #169).
Length (km)	This section is 16 km of a total fault length of 70 km.
Average strike	N13°E (for section) versus N13°E (for whole fault)
Sense of movement	Normal *Comments:* (Wallace, 1984 #169)
Dip Direction	W
Paleoseismology studies	
Geomorphic expression	The China Mountain fault follows the west-facing bedrock escarpment of China Mountain, an escarpment that faces the southernmost part of Pumpernickel Valley and is neither as straight nor as precipitous as that along the Buffalo Valley fault zone [1140], which lies at the east base of China Mountain. Also, the escarpment lacks well-aligned basal fault facets. The 1915 earthquake scarp is actually located 200-300 m east of the piedmont/hillslope break. The historic scarp is as much as 2.4 m high, and is considered to be an approximate measure of maximum vertical displacement (Wallace, 1984 #169). Most of it follows an older subdued scarplet, but the southeastern part may mark a new rupture in bedrock (Wallace, 1984 #169). Dohrenwend and Moring (1991 #282) mapped scarps or lineaments west of the southern part of the historic rupture, and those may mark larger block-bounding structures. dePolo (1998 #2845) reported a preferred maximum basal facet height of 158 m (134-183 m).
Age of faulted surficial deposits	Pleistocene (10 ka- 1.5 Ma) and late Pleistocene (10-130 ka Dohrenwend and Moring, 1991 #282), as well as Mesozoic and Tertiary bedrock.
Historic earthquake	Pleasant Valley earthquake 1915
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* The 1915 Pleasant Valley earthquake ruptured along

	about 10 km of the range-front fault along the west side of China Mountain, and part of the rupture coincides with a pre-existing Quaternary scarp. Dohrenwend and Moring (1991 #282) show one short (< 1 km) scarp on surficial deposits or erosion surfaces of early to middle and (or) late Pleistocene age, west of the historic rupture. Due to the lack of detailed data, a conservative estimate for the timing of pre-1915 surface faulting is indicated here.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No detailed data exists to determine slip rates for this fault. dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.288 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 maximum. However, the description and illustration of the geomorphic expression of the historic fault trace by Wallace (1984 #169) suggest the slip rate during the late Quaternary 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)	2000 R. Ernest Anderson, U.S. Geological Survey, Emeritus Michael N. Machette, U.S. Geological Survey, Retired
References	#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. #282 Dohrenwend, J.C., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Winnemucca 1° by 2° quadrangle, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-2175, 1 sheet, scale 1:250,000. #284 Dohrenwend, J.C., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the McDermitt 1° by 2° quadrangle, Nevada, Oregon, and Idaho: U.S. Geological Survey Miscellaneous Field Studies Map MF-2177, 1 sheet, scale 1:250,000.

	#134 Fonseca, J., 1988, The Sou Hills—A barrier to faulting in the central Nevada seismic belt: Journal of Geophysical Research, v. 93, no. B1, p. 475-489. #4357 Muller, S.W., Ferguson, H.G., and Roberts, R.J., 1951, Geology of the Mount Tobin quadrangle, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-0007, 1 sheet, scale 1:125,000. #3413 Stewart, J.H., and Carlson, J.E., 1978, Geologic map of Nevada: U.S. Geological Survey, Special Geologic Map, 1, scale 1:500,000. #203 Wallace, R.E., 1979, Map of young fault scarps related to earthquakes in north-central Nevada: U.S. Geological Survey Open-File Report 79-1554, 2 sheet, scale 1:125,000. #169 Wallace, R.E., 1984, Fault scarps formed during the earthquakes of October 2, 1915, *in* Pleasant Valley, Nevada, and some tectonic implications, *in* Faulting related to the 1915 earthquakes in Pleasant Valley, Nevada: U.S. Geological Survey Professional Paper 1274-A, p. A1-A33, 1 pl., scale 1:62,500.