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Quaternary Fault and Fold Database of the United States

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Pahrump fault (Class A) No. 1076

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Synopsis	The Pahrump fault strikes northwest and extends from Stewart Valley for about 40 km southeast to Black Butte at the southeast end of Pahrump Valley. This mostly mid-valley fault is considered as one of several dextral-slip faults that comprise the Walker Lane structural zone. The sense of Quaternary slip is inferred to be dextral from studies of bedrock in adjacent ranges and indirect evidence from fault patterns and patterns of basin-fill sedimentation. Evidence for late Quaternary displacement is sparse and limited to a closed depression directly southeast of Stewart Valley playa and a scarp on playa deposits 4 km south of Pahrump. Sinuous scarps along the south part of the fault are high, but probably represent retreating fault-line scarps formed on Tertiary and early Pleistocene deposits. They may not record late or middle Pleistocene displacement, and thus could be considered to be inactive traces of an older Pahrump fault.

Name comments	The name Pahrump fault as used here is equivalent to that of Piety (1995 #915). Several other names have been applied to all or parts of this fault including Pahrump fault zone (Liggett and Childs, 1973 #2388; Stewart, 1988 #1654; Wright, 1989 #1696; Reheis, 1992 #1604), Pahrump Valley fault zone (Hoffard, 1991 #1543; dePolo (1998 #2845), Stewart Valley-Stateline fault (Schweickert, 1989 #1635), and Stateline-Pahrump Valley fault zone (Hoffard, 1990 #1542). As used here, the Pahrump fault includes all or part of the Stewart Valley fault (Stewart and others, 1968 #1655; Burchfiel and others, 1983 #1462; Carr, 1984 #1472). **Fault ID:** Referred to as fault PRP by Piety (1995 #915) and DV11A by dePolo (1998 #2845) and fault number 248A by Jennings (1994 #2878).
County(s) and State(s)	CLARK COUNTY, NEVADA INYO COUNTY, CALIFORNIA NYE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 and 1:750,000 scale. *Comments:* Traces are based on a combination of field studies and photogeology using aerial photos ranging in scale from 1:12,000 (Hoffard, 1991 #1543) to 1:80,000 (Reheis and Noller, 1991 #1195; Reheis, 1992 #1604); location of fault in California from Qt_flt_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written communication to K.Haller, August 15, 2017) attributed to 1:750,000-scale map by Jennings (1994 #2878).
Geologic setting	Most of the Pahrump fault strikes though central Pahrump Valley but has no major topographic high associated with it. The trace of the Stewart Valley part (northwestern part) is not along the bedrock margin of the valley and, therefore, does not appear to be a range-margin fault. The Pahrump fault has been interpreted as a dextral fault (Burchfiel and others, 1983 #1462; Fox and Carr, 1989 #2312; Reheis and Noller, 1991 #1195) or part of a major dextral shear zone (Schweickert, 1989 #1635). It has also been interpreted as the western boundary of the Spring Mountains section of the broadly dextral-slip Walker Lane structural zone that extends east to the Las Vegas shear zone (Reheis, 1992 #1604).

Length (km)	38 km.
Average strike	N39°W
Sense of movement	Right lateral *Comments:* As summarized by Piety (1995 #915), right-oblique displacement was interpreted from (1) west-facing scarps combined with seismic-refraction profiles that indicate down-to-the-west displacement of disrupted basin-fill sediment (Hoffard, 1991 #1543), (2) a westward shift in the locus of deposition of alluvium in Pahrump Valley across the Pahrump fault, and (3) a left-stepping pattern of fault traces. The latter two indicate a right-lateral component of displacement (Hoffard, 1990 #1542; 1991 #1543). Other workers have also suspected a right-lateral component because of (1) left-stepping, en echelon fault traces and possible right-lateral offset of a stream (Liggett and Childs, 1973 #2388; Burchfiel and others, 1983 #1462) and (2) the weak and variable topographic expression of faults within the valley (Reheis and Noller, 1991 #1195). A right-lateral component of displacement on the Stewart Valley part of the Pahrump fault is inferred from the oblique angle between this fault and folds within the Resting Spring Range and Montgomery Mountains and by the stratigraphic relationships in the Montgomery Mountains on opposite sides of the fault (Burchfiel and others, 1983 #1462). However, the direction of displacement on individual fault traces is not known (Reheis and Noller, 1991 #1195).
Dip	Vertical *Comments:* If the Pahrump fault is mainly a strike-slip fault, its average dip is probably steep to vertical. On the basis of shallow geophysical images, Louie and others (1998 #3869) suggested an approximately vertical attitude to depths of about 50 m.
Paleoseismology studies	
Geomorphic expression	The Pahrump fault is in a mid-valley position and it has little geomorphic expression along most of its trace. Scarps are sparse, and those present are commonly formed on soft silty playa deposits that would presumably erode easily. Compelling evidence for Quaternary displacement is generally lacking. Only two spatially restricted, relatively conspicuous features separated by about 19 km provide strong evidence for Quaternary

	displacement. One is a low (<2 m) scarp on silty playa deposits about 5 km south of Pahrump and the other is a closed depression on late Quaternary (probably Holocene and latest Pleistocene) playa deposits directly south of Stewart playa. The 200-m-long, 50-m-wide, 3-m-deep depression may have formed at a slight releasing bend in the fault (Anderson and others, 1995 #897). In southern Pahrump Valley, the main trace is interpreted to coincide with the base of sinuous 8- to 15-m-high escarpments that expose sedimentary strata of Tertiary or early Quaternary age (Hoffard, 1991 #1543). Although the escarpments probably mark the approximate location of faults, their eroded character indicates little, if any, late or middle Quaternary displacement, and they are probably mostly fault-line scarps (Anderson and others, 1995 #898). Other features in that part of the valley include lineaments, fissures, and cemented-fan deposits, all of which lack evidence for significant surface offset (Anderson and others, 1995 #897). If the displacement is mainly strike slip, a lack of evidence for surface offset is not surprising or compelling. On the basis of lineaments and (or) scarps, the Pahrump fault may extend to the vicinity of Black Butte located at the drainage divide between the southeastern end of Pahrump Valley and the northwestern end of Mesquite Valley, to the southeast (Anderson and others, 1995 #897).
Age of faulted surficial deposits	Quaternary deposits along the Pahrump fault are largely unstudied (although mapping is in progress), so there is little quantitative data on which to base stratigraphic assignments or age estimates. Hoffard (1991 #1543) suggested that the youngest deposits in Stewart Valley that are displaced by the Pahrump fault are probably late Pleistocene to early Holocene because (1) the deposits are in the same area as modern playa deposits, (2) the deposits are only weakly dissected by modern drainages, (3) the deposits are only a few meters higher than the modern playa deposits, and (4) the soils on the deposits are weakly developed. Scarps on the surfaces of these deposits have a geomorphically youthful appearance, are linear, and are distinct on aerial photographs (Hoffard, 1991 #1543).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Quaternary deposits along the Pahrump fault are

	largely unstudied, so there is little quantitative data on which to base age estimates. An early to middle(?) Holocene age was estimated for the single-event (?) scarp southeast of Stewart playa on the basis scarp morphology (Anderson and others, 1995 #897). That estimate is based on the easily eroded nature of the playa deposits and not on Quaternary stratigraphy. Also, the length of the Pahrump fault activated during that event is unconstrained. However, the scarcity of documented deformation suggests limited or distributed faulting. Based on multi-component detailed geophysics, including a 3-D seismic survey, Louie and others (1998 #3869) interpreted Holocene displacement along the full length of the Pahrump fault. In southern Stewart Valley, they interpreted the images as indicating a Holocene dextral-slip displacement of 18 m and suggested a slip rate of >0.1 mm/yr.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* The weak geomorphic expression of faulting along the Pahrump fault is suggestive of a low slip rate, but if the displacement is lateral, this criterion may be invalid. On the basis of interpretations of geophysical images acquired in southern Stewart Valley, Louie and others (1998 #3869) suggest a slip rate of > 0.1 mm/yr.
Date and Compiler(s)	1998 R. Ernest Anderson, U.S. Geological Survey, Emeritus William A. Bryant, California Geological Survey
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Questions or comments?