Jump to Navigation

Quaternary Fault and Fold Database of the United States

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Bettles Well-Petrified Springs fault (Class A) No. 1326

Last Review Date: 1998-08-28

citation for this record: **Sawyer, T.L., and Adams, K., compilers, 1998, Fault number 1326, Bettles Well-Petrified Springs fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:15 PM.**

Synopsis	This relatively long, northwest-striking right-lateral fault zone bounds northeast fronts of the Pilot Mountains and Gabbs Valley Range; this fault is one of four or five northwest-striking dextral faults in Monte Cristo Valley, Stewart Valley, and Gabbs Valley Range area of the "Walker Lane" belt. Movement began on the Bettles Well fault zone as early as the Mesozoic, but most of the dextral movement has occurred on the fault zone during the late Cenozoic. The northern part of the fault (Petrified Springs) has subparallel faults that join to form a single linear fault north of Mt. Ferguson, which bifurcates near Ramsey Spring. The southern part of the fault (Bettles Well) has subparallel range-bounding faults in right-stepping groupings from the south end of the Pilot Mountains to about 5 km northwest of Muller Mountain. Reconnaissance and locally detailed photogeologic mapping of the fault zone and studies of late Cenozoic faulting are the sources

	of data. Trench investigations and detailed studies of scarp morphology have not been completed.
Name comments	Refers to faults mapped by Nielsen (1965 #2544), Hardyman and others (1975 #2918), Dohrenwend (1982 #2481), Molinari (1984 #1584), Ekren and Byers (1985 #2905; 1986 #2907), Bell and others (1999 #4768), Bell (unpublished map of Quaternary faults and lineaments, Monte Cristo Valley), Oldow and Meinwald (1992 #2920), Dohrenwend and others (1996 #2846). The southern part has been called the Bettles Well fault and the northern part the Petrified Springs fault. dePolo (1998 #2845) referred to the entire fault zone as the Bettles Well fault system and Hamel (1983 #2923) referred to the entire zone as the Battle's (sic) Well fault. To avoid confusion and because of their continuity, parallel strike, dextral slip, and apparent similar recency of activity, we combine the Bettles Well and Petrified Springs names to describe this entire fault zone. This fault zone extends from southern end of the Pilot Mountains, along its northeast and north fronts and the northeast fronts of Table and Muller Mountains, across Petrified Summit, and along east flank of southern Gabbs Valley Range. **Fault ID:** Refers to fault WL29 (Bettles Well fault system) of dePolo (1998 #2845).
County(s) and State(s)	ESMERALDA COUNTY, NEVADA MINERAL COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location chiefly based on 1:62,500-scale map of Dohrenwend (1982 #2909) and 1:250,000-scale map of Dohrenwend (1982 #2481) 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. Additional faults were located based on 1:62,500-scale maps of Molinari (1984 #1584), and 1:48,000-scale geologic maps of Ekren and Byers (1985 #2905; 1986 #2907) with late Cenozoic emphasis, and Bell (unpublished map of Quaternary faults and lineaments, Monte Cristo Valley) by photogeologic analysis of 1:12,000 low-sun-angle photography

	along the east flank of the Pilot Mountains, and 1:24,000-scale geologic maps of Oldow and Meinwald (1992 #2920) with late Cenozoic emphasis.
Geologic setting	This relatively long, northwest-striking right-lateral fault zone bounds the northeast fronts of the Pilot Mountains, Table Mountain, Muller Mountain and east flank of the southern Gabbs Valley Range. Movement began on the Bettles Well fault zone as early as the Mesozoic. However, most of the 32 km of dextral movement occurred during the late Cenozoic (Albers, 1967 #2922; Hardyman and others, 1975 #2918; Stewart, 1980 #162). The fault zone has a right-stepping range-bounding southern part and intermontane-valley-bounding and range-bounding northern part that is remarkably linear.
Length (km)	67 km.
Average strike	N32°W
Sense of movement	Right lateral *Comments:* (Nielsen, 1965 #2544; Molinari, 1984 #1584; Ekren and Byers, 1985 #2905; 1986 #2907; Stewart, 1988 #1654)
Dip Direction	NE; SW
Paleoseismology studies	
Geomorphic expression	The northern part of the fault is characterized as an intermontane-valley-bounding and range-bounding fault that is remarkably linear. At its north end, the fault appears to bifurcate and splay around Mystery Ridge in a horsetail pattern, extending a few kilometers into southern Gabbs Valley. Further southeast the fault is simply expressed a single northwest-striking, northeast-facing scarp on Quaternary erosional surfaces and alluvium. Near petrified summit, the fault is expressed as a series of subparallel, generally right-stepping, northwest-striking faults that both cut and bound Tertiary bedrock, Quaternary erosional surfaces, and Quaternary deposits. The southern part of the fault generally bounds the eastern range-front of the arcuate Pilot Mountains, and consists of several parallel piedmont faults including two between Graham Spring and Bettles Well, that are marked by scarps juxtaposing Quaternary deposits against bedrock and scarps and lineaments on late Quaternary piedmont slope deposits. The

	northwest-striking piedmont faults appear to step right from Bettles Well to parallel fault scarps along base of Table Mountain at Mud Spring faults (Molinari, 1984 #1584; Dohrenwend and others, 1996 #2846). A north-striking fault that displaces Quaternary talus passes directly west of Tim Hilt Summit and connects the echelon northwest-striking faults through the stepover area (Oldow and Meinwald, 1992 #2920). The short scarps at Mud Springs and two scarps at Poleline Spring are parallel and form another right stepover in the section.
Age of faulted surficial deposits	Late Quaternary; Quaternary; and Tertiary. Scarps mapped by Dohrenwend (1982 #2481; 1982 #2909) and Dohrenwend and others (1996 #2846) are on or involve late Quaternary piedmont-slope deposits. Dohrenwend (1982 #2909) mapped one short fault that offsets latest Quaternary alluvial-fan deposits southwest of Gabbs Mountain. Other faults involve or cut early Quaternary erosional or alluvial surfaces and bedrock (Dohrenwend, 1982 #2909; Dohrenwend and others, 1996 #2846). Several faults have been mapped displacing Tertiary volcanic rocks and older bedrock units (Hardyman and others, 1975 #2918; Molinari, 1984 #1584; Ekren and Byers, 1985 #2905; 1986 #2907; Oldow and Meinwald, 1992 #2920).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Although timing of the most recent event is not well constrained, there is general agreement on a late Quaternary time among topical studies of the fault zone (Dohrenwend, 1982 #2909; Molinari, 1984 #1584; Oldow and Meinwald, 1992 #2920; Dohrenwend and others, 1996 #2846). However, one fault may offset latest Quaternary deposits (Dohrenwend, 1982 #2909).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* A low slip rate is inferred from a lack of prominent scarps and general knowledge of regional slip rates. However, 32 km of late-Cenozoic right-lateral displacement (Hardyman and others, 1975 #2918) suggests a moderate long-term slip rate.
Date and	1998

Compiler(s)	Thomas L. Sawyer, Piedmont Geosciences, Inc. Kenneth Adams, Piedmont Geosciences, Inc.
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