Jump to Navigation

Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

Lake Range fault zone (Class A) No. 1607

Last Review Date: 2016-03-03

citation for this record: **Sawyer, T.L., Haller, K.M., and Adams, K., compilers, 2016, Fault number 1607, Lake Range fault zone, 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 02:29 PM.**

Synopsis	This discontinuous zone of normal faults bounds the west front of the Fox Range and Lake Range from Buckbrush Spring southward along and apparently beneath Pyramid Lake to east of Anaho Island, and locally traverses piedmont slope along the east side of the Pyramid Lake basin. Both the Lake Range and Fox Range are east-tilted blocks that border sedimentary basins on their west sides. The range-front faults are expressed as abrupt west-facing range fronts and juxtapose late Quaternary piedmont-slope deposits against bedrock. Short piedmont faults are marked by scarps on late Quaternary piedmont-slope deposits east of Sheep Pass in the Lake Range and at mouth of Hell's Kitchen Canyon, where the fault projects southward beneath Pyramid Lake. Regional geologic mapping and reconnaissance photogeologic mapping are the sources of data. Trench investigations and detailed studies of scarp morphology have not been conducted.

Name comments	Refers to faults mapped by Bonham (1969 #2999), Slemmons (1968, unpublished Reno 1:250,000-scale quadrangle; 1974, unpublished Lovelock 1:250,000-scale quadrangle), and Dohrenwend and others (1991 #285) along the east side of the Pyramid Lake basin from near Buck Brush Springs southward along and apparently beneath Pyramid Lake, to east of Anaho Island; Bonham (1969 #2999) and dePolo (1998 #2845) inf#er that the fault continues beneath the eastern part of Pyramid Lake. dePolo (1998 #2845) referred to it as the Eastern Pyramid Lake fault. Drakos (2007 #7695) referred to this fault as the Lake Range fault zone to avoid confusion with the right-lateral Pyramid Lake fault; we adopt this nomenclature following Drakos (2007 #7695), Eisses and others (2015 #7366), and Angster and others (2016 #7362). **Fault ID:** Refers to fault LL7 of dePolo (1998 #2845).
County(s) and State(s)	WASHOE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations are primarily based on 1:250,000-scale map of Dohrenwend and others (1991 #285) 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. Locations were checked against photogeologic map of Slemmons (1974, unpublished Lovelock 1:250,000-scale quadrangle). The location of the southern part of the fault where it is thought to extend beneath Pyramid Lake is based on over 500-line km of compressed high-intensity radar pulse (CHIRP) seismic system images; fault locations were refined in the marine setting and then correlated to mapped faults on land (Eisses and others, 2015 #7366).
Geologic setting	This discontinuous zone of down-to-the-west normal faults bounds the western front of the Fox Range and Lake Range from Buckbrush Spring southward along and apparently beneath Pyramid Lake to east of Anaho Island, and locally traverses the

	piedmont slope along the east side of the Pyramid Lake basin (Slemmons, 1968, unpublished Reno 1:250,000-scale quadrangle; 1974, unpublished Lovelock 1:250,000-scale quadrangle; Bonham, 1969 #2999; Dohrenwend and others, 1991 #285). The Lake Range and Fox Range are east-tilted blocks that border sedimentary basins on their west sides (Stewart, 1978 #2866). High-resolution digital bathymetry reveals that the greatest relief in Pyramid Lake is along the eastern edge of the lake (Eisses and others, 2015 #7366).
Length (km)	42 km.
Average strike	N4°W
Sense of movement	Normal *Comments:* Shown as a normal fault by Dohrenwend and others, (1991 #285) based largely on topographic expression.
Dip Direction	W *Comments:* The apparent dip of the fault is steep (measured at ~60° in CHIRP images) in the near surface (Eisses and others, 2015 #7366).
Paleoseismology studies	
Geomorphic expression	The range-front fault in this section is expressed as the abrupt west-facing front of the Lake Range and piedmont faults are expressed as short scarps on late Quaternary piedmont-slope deposits (Dohrenwend and others, 1991 #285). dePolo (1998 #2845) reports a maximum preferred basal fault facet height of 280 m (256-341 m).
Age of faulted surficial deposits	Late Quaternary (Dohrenwend and others, 1991 #285), possibly latest Quaternary, and undifferentiated Quaternary alluvium is faulted along the piedmont faults and is juxtaposed against Tertiary bedrock along the range-front faults (Slemmons, 1968, unpublished Reno 1:250,000-scale quadrangle; 1974, unpublished Lovelock 1:250,000-scale quadrangle; Bonham, 1969 #2999; Dohrenwend and others, 1991 #285).
Historic earthquake	

Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* The timing of most recent event is not well constrained and the map sources differ. Slemmons (1974, unpublished Lovelock 1:250,000-scale quadrangle) suggests faulting could be as young as latest Quaternary. Dohrenwend and others (1991 #285; 1996 #2846) indicate late Quaternary. The assigned age category is based on the sole published source. Slemmons (1968, unpublished Reno 1:250,000-scale quadrangle) indicates that the southern part of the fault might be older.
Recurrence interval	*Comments:* Eisses and others (2015#7366) reports numerous apparent vertical displacement rates across each of the significant faults in the basin by correlating the stratigraphy interpreted from the high-resolution CHIRP data with core data from Mensing and others (2004 #7696, Benson and others (2002 #7693), and Benson and others (2013 #7694); rates range from 0.07 to 1.5 mm/yr.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Eisses and others (2015#7366) reports numerous apparent vertical displacement rates across each of the significant faults in the basin by correlating the stratigraphy interpreted from the high-resolution CHIRP data with core data from Mensing and others (2004 #7696, Benson and others (2002 #7693), and Benson and others (2013 #7694); rates range from 0.07 to 1.5 mm/yr. dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.609 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 late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) suggest the slip rate during this period is of a lesser magnitude. Thus, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
Date and Compiler(s)	2016 Thomas L. Sawyer, Piedmont Geosciences, Inc. Kathleen M. Haller, U.S. Geological Survey Kenneth Adams, Piedmont Geosciences, Inc.
References	#7362 Angster, S., Wesnousky, S., Huang, W-l., Kent, G., Nakata,

T., and Goto, H., 2016, Application of UAV photography to refining the slip rate on the Pyramid Lake fault zone, Nevada: Bulletin of the Seismological Society of America, vol. 106, p. 785–798, doi:10.1785/0120150144.

#7693 Benson, L.V., Kashgarian, M., Rye, R., Lund, S., Paillet, F., Smoot, J., Kester, C., Mensing, S., Meko, D., and Lindstrom, S., 2002, Holocene multidecadal and multicentennial droughts affecting northern California and Nevada: Quaternary Science Reviews, v. 21, p. 659–682, doi:10.1016 /S0277-3791(01)00048-8.

#7694 Benson, L.V., Smoot, J.P., Lund, S.P., Mensing, S.A., Foit, F.F., Jr., and Rye, R.O., 2013, Insights from a synthesis of old and new climate-proxy data from the Pyramid and Winnemucca Lake basins for the period 48 to 11.5 cal ka: Quaternary International, v. 310, p. 62–82, doi:10.1016/j.quaint.2012.02.040.

#2999 Bonham, H.F., 1969, Geology and mineral deposits of Washoe and Storey Counties, Nevada: Nevada Bureau of Mines and Geology Bulletin 70, 140 p., 1 pl., scale 1:250,000.

#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.

#285 Dohrenwend, J.C., McKittrick, M.A., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Lovelock 1° by 2° quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2178, 1 sheet, scale 1:250,000.

#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.

#7695 Drakos, P.S., 2007, Tertiary stratigraphy and structure of the southern Lake Range northwest Nevada—Assessment of kinematic links between strike-slip and normal faults in the northern Walker Lane: Reno, University of Nevada, unpublished

	M.S. thesis, 179 p. #7366 Eisses, A.K., Kell, A., Kent, G.M., Driscoll, N.W., Baskin, R.L., Smith, K.D., Karlin, R.E., Louie, J.N., and Pullammanappallil, S.K., 2015, New constraints on fault architecture, slip rates, and strain partitioning beneath Pyramid Lake, Nevada: Geosphere, v. 11, no. 3, p. 683–704, doi:10.1130/GES00821.1. #7696 Mensing, S.A., Benson, L.V., Kashgarian, M., Lund, S., 2004, A Holocene pollen record of persistent droughts from Pyramid Lake, Nevada, USA: Quaternary Research, v. 62, p. 29–38, doi:10.1016/j.yqres.2004.04.002. #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.