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Quaternary Fault and Fold Database of the United States

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Antelope Valley fault zone (Class A) No. 1287

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Compiled in cooperation with the California Geological Survey

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Synopsis	The fault zone is comprised of predominately northwest-striking, east-dipping faults that bound the eastern side of the steep escarpment west of Topaz Lake. A northwest-striking fault in Wild Oat Mountain, that only offsets bedrock, is included in this group because of its similar strike and proximity to other northwest striking faults with demonstrated Quaternary offset. The Antelope Valley fault zone is generally located at the piedmont/range front contact, but the continuous geomorphic expression south of Topaz Lake becomes discontinuous to the northwest. Topaz Lake itself occupies a large closed depression that lies adjacent to the fault zone and the base of a 700-m-high escarpment. Reconnaissance photogeologic mapping and bedrock

	mapping of the fault and one trench that exposed evidence of two Holocene surface ruptures are the primary data sources.
Name comments	The fault extends across the state line from California into Nevada. In California, it was first mapped by Curtis (1951 #5643). It includes faults in Little Antelope Valley and faults bordering the eastern side of Antelope Valley that Bryant (1983 #5633; 1984 #2883) considered to be part of the Antelope Valley fault zone. Bryant (1983 #5633) informally named these faults the East Antelope Valley fault zone. These faults are combined with a group of faults in the northwest part of Antelope Valley in Nevada, which were mapped by Moore (1961 #2879), John and others (1981 #2884), Dohrenwend (1981 #2882; 1982 #2481; 1982 #2870) Stewart and others (1982 #2873), and Hayes (1985 #2508). Hayes (1985 #2508) refers to the faults adjacent to and northwest of Topaz Lake as the "northern extension of the Antelope Valley fault zone." dePolo (1998 #2845) refers to the entire group of faults as the Antelope Valley fault zone, which is the name adopted in this compilation. **Fault ID:** Refers to number 130 (Antelope Valley and adjacent faults) of Jennings (1994 #2878) and fault number WL4 (Antelope Valley fault zone) of dePolo (1998 #2845).
County(s) and State(s)	MONO COUNTY, CALIFORNIA DOUGLAS COUNTY, NEVADA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:48,000 and 1:100,000 scale. *Comments:* 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 1:48,000-scale map of by Bryant (1984 #2883). Selected traces of the East Antelope Valley fault zone are from Stewart and others (1989 #2885). Location of fault in Nevada primarily based on 1:62,500 maps of Dohrenwend (1981 #2882) and John and others (1981 #2884). Fault locations checked against 1:250,000-scale maps of Dohrenwend (1982 #2481; 1982 #2870) which were 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	This group of high-angle down-to-east normal faults form the western border of Antelope Valley, a probable down-dropped half graben (Dohrenwend, 1982 #2481; 1982 #2870; Bryant, 1983 #5633). In California, the cumulative vertical displacement across the fault zone is between 600 and 1,200 m (Halsey, 1953 #5637, in Bryant, 1983 #5633). In Nevada, the faults are predominately northwest-striking and east-dipping; they bound the eastern side of the steep escarpment west of Topaz Lake. A northwest-striking fault on Wild Oat Mountain, which only offsets bedrock (John and others, 1981 #2884), is included in this group because of its similar strike and proximity to other northwest striking faults with demonstrated Quaternary offset.
Length (km)	51 km.
Average strike	N26°W
Sense of movement	Normal *Comments:* Predominant sense of movement is normal (Sarmiento and others, 2011 #7178); however, they suggest that oblique displacement is possible.
Dip	50–80° E. *Comments:* Near-surface dip of the fault in the trench (Site #4, Sarmiento and others, 2011 #7178) is about 56° E.
Paleoseismology studies	Trench site 1287-1 is on a young fan-head alluvium at the mouth of a large drainage at along the range front at about lat. 38.6° N. documented as Site #4 by Sarmiento and others (2011 #7178). Exposed stratigraphic relations in the trench indicate two Holocene surface ruptures. Local strike of the fault is about N. 20° E. at the trench site; vertical displacement is reported to be 5.6 m.
Geomorphic expression	The Antelope Valley fault zone in California is characterized by a prominent 670-m-high east-facing escarpment with wine-glass shaped drainage canyons and a well defined break in slope at the base (Bryant, 1983 #5633). Discontinuous scarps on alluvium range from 2 to 7 m high and have scarp slopes as steep as 32° (Bryant, 1984 #2883, Sarmiento and others, 2011 #7178). Topaz Lake occupies a large closed depression that formed on the downdropped hanging wall block of the fault zone and at the base

	of a 700-m-high escarpment. The fault zone appears to be buried by Holocene alluvium from the California border north into Nevada to northwest of Holbrook Junction (John and others, 1981 #2884). However, Bryant (1984 #2883) suggested that evidence for recent faulting adjacent to Topaz Lake may have been obscured by the construction of U.S. Highway 395; Sarmiento and others, 2011 show the fault has continuous surface expression from north of Topaz Lake to southern Antelope Valley. From Holbrook Junction northwest to the southern part of Double Springs Flat, faults bound the southwestern and parts of the northeastern sides of this northwest-trending valley and juxtapose Holocene and upper Pleistocene alluvium against bedrock (Dohrenwend, 1981 #2882; 1982 #2870).
Age of faulted surficial deposits	Holocene, upper Pleistocene alluvium, Pleistocene pediment deposits, and Cretaceous granitic bedrock. In many localities, the faults place Quaternary sediment against bedrock (Dohrenwend, 1981 #2882; John and others, 1981 #2884; Sarmiento and others, 2011 #7178).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Holocene surface rupture at the trench site is confirmed by Sarmiento and others (2011 #7178), which supports earlier interpretations of young surface rupture by Dohrenwend (1981 #2882; 1982 #2870), Bryant (1984 #2883), Hayes (1985 #2508), John and others (1981 #2884), and Jennings (1994 #2878). In California, Bryant (1984 #2883) estimated that the most recent event probably occurred during the past 3 k.y. (late Holocene), based on fault scarp morphology and soil profile development on alluvial-fan surfaces.
Recurrence interval	5 ka (<6250 cal yr BP) *Comments:* Trenching study indicates the most recent surface rupture occurred about 1350 cal yr BP and the prior surface rupture occurred about 6250 cal yr BP.
Slip-rate category	Between 0.2 and 1.0 mm/yr

	Comments: Single-event fault-parallel slip rate calculated from relations exposed by trenching (0.7 mm/yr; Sarmiento and others, 2011 #7178) is slightly higher than previous estimate of 0.4 mm/yr based on a vertical offset of alluvium assumed to be 3 ka based on the degree of soil development (Bryant, 1984 #2883). There have been no detailed studies in Nevada; however, dePolo (1998 #2845) and dePolo and Anderson (2000 #4471) calculated a preferred vertical slip rate of 0.73 mm/yr for the fault based on an data presented by Bryant (1984 #2883).
Date and Compiler(s)	2012 Thomas L. Sawyer, Piedmont Geosciences, Inc. Kenneth Adams, Piedmont Geosciences, Inc. William A. Bryant, California Geological Survey Kathleen M. Haller, U.S. Geological Survey
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