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Quaternary Fault and Fold Database of the United States

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Indian Hill fault (Class A) No. 1652

Last Review Date: 1999-06-10

citation for this record: **Adams, K., compiler, 1999, Fault number 1652, Indian Hill 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 02:35 PM.**

Synopsis	This nearly continuous, but relatively short zone consists of: (1) a short, northeast-striking fault at Hobo Hot Springs; (2) range-front normal faults on the south and east sides of Indian Hill that form a distinctive 90° bend around Indian Hill and splay northward into multiple northeast-striking short faults; and (3) a northeast-striking zone that bifurcates from the main zone on the east side of Indian Hill and bounds the southeast side of low hills above the flood plain of the Carson River. Southern end of fault zone appears to splay northeastward from the Genoa fault [1285] at the base of Genoa Peak, suggesting that the two faults may be related. The short fault at Hobo Hot Springs is expressed as a northeast-trending lineament on Quaternary alluvium. Two trenches excavated across the northeast splay just north of the 90° bend provide evidence for two events in the past 3 k.y. Detailed surficial and bedrock mapping are the sources of data.
Name	Refers to faults mapped by Slemmons (1968, unpublished Reno

comments	1:250,000-scale map), Pease (1979 #2560; 1980 #2880), Bell (1981 #2875; 1984 #105), Greene and others (1991 #3487), Ramelli and others (1994 #2573; 1999 #3636), and Dohrenwend and others (1996 #2846) on the south and east sides of Indian Hill south of Carson City. These faults are part of the Carson City segment of the Carson Range fault system of Ramelli and others (1994 #2573), but are collectively referred to as the Indian Hill fault by Ramelli and others (1994 #2573; 1999 #3636). dePolo (1998 #2845) referred to these faults as part of the Carson City fault; the Indian Hill name is descriptive. **Fault ID:** Refers to fault R14F (Carson City fault) of dePolo (1998 #2845).
County(s) and State(s)	DOUGLAS COUNTY, NEVADA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations are primarily based on 1:100,000-scale fault compilation map of Ramelli and others (1994 #2573) that was, in part, based on 1:24,000-scale maps of Pease (1979 #2560; 1980 #2880).
Geologic setting	This nearly continuous, but relatively short zone consists of: (1) a short, northeast striking fault at Hobo Hot Springs; (2) range-front normal faults on the south and east sides of Indian Hill that form a distinctive 90° bend around Indian Hill and then splay to the north into multiple northeast-striking short faults; and (3) a northeast-striking zone that bifurcates from the main zone on the east side of Indian Hill and bounds the southeast side of low hills above the flood plain of the Carson River (Pease, 1979 #2560; Trexler and Bell, 1979 #3641; 1980 #2880; Bell, 1984 #105; Ramelli and others, 1994 #2573; 1999 #3636).
Length (km)	8 km.
Average strike	N41°E
Sense of movement	Normal *Comments:* (Pease, 1979 #2560; 1980 #2880)

Dip	70° E. *Comments:* Trexler and Bell (1979 #3641)
Paleoseismology studies	Trexler and Bell (1979 #3641) excavated two trenches across a northeast-striking splay of the Indian Hill fault just north of the distinctive 90° bend in the fault zone; both of which provided evidence for young movement. These sites were chosen because the scarps appeared youthful. Site 1652-1: Trexler and Bell (1979 #3641) found evidence for two events in the past 3 k.y. by interpreting offset soil and alluvial units. The main fault trace exposed in the trench strikes N. 45° E. and dips 70° E. Secondary faults also displace soil units exposed in the trench. Site 1652-2: Trench 5 of Trexler and Bell (1979 #3641). Although this trench was in close proximity to site 1652-1, evidence for only a single event in the last 3 k.y. was documented. Alluvial deposits of probable Holocene age have been vertically displaced about 1 m. However, interpretation in Bell and Pease (1980 #2418) differs in that two events have occurred in the past 12 k.y.
Geomorphic expression	The short fault at Hobo Hot Springs is expressed as a northeast-trending lineament on Quaternary alluvium (Pease, 1980 #2880). Single event scarps are about 1 m high and composite scarps are up to 5.1 m high (Pease, 1979 #2560). Each of the two main strands of the fault zone on the east side of Indian Hill is expressed by about 45-60 m of topographic relief and multiple-event, east- and southeast-facing scarps on and at the base of relatively steep hillslopes (Ramelli and others, 1994 #2573). Indian Hill has a maximum preferred basal fault facet of 122 m (dePolo, 1998 #2845). Scarps on the two main strands are on Quaternary-Tertiary gravel or juxtapose this unit and older bedrock units against relatively young alluvium (Pease, 1980 #2880).
Age of faulted surficial deposits	Holocene; Pleistocene; Tertiary. Pease (1980 #2880) mapped faults displacing alluvial units ranging in age from Holocene through Pleistocene to Tertiary.
Historic earthquake	

Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* A latest Quaternary time is indicated by the detailed studies of Trexler and Bell (1979 #3641) who documented two events in the past 3 k.y for faults included in this group. A young age for the most recent paleoevent was originally suggested by Slemmons (1968, unpublished Reno 1:250,000-scale map).
Recurrence interval	 *Comments:* The recurrence interval should be short based on two ground rupturing events having occurred in the past 3 k.y. (Trexler and Bell, 1979 #3641).
Slip-rate category	Less than 0.2 mm/yr *Comments:* Aside from the apparent short recurrence of events on this fault, there is no other specific data to constrain a slip rate on this fault. dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.231 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. The late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) indicate young movement, however, there exists no data to constrain the magnitude of that movement in the latest Quaternary. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
Date and Compiler(s)	1999 Kenneth Adams, Piedmont Geosciences, Inc.
References	#2875 Bell, J.W., 1981, Quaternary fault map of the Reno 1° by 2° quadrangle, Nevada-California: U.S. Geological Survey Open-File Report 81-982, 62 p., http://pubs.er.usgs.gov/publication/ofr81982. #105 Bell, J.W., 1984, Quaternary fault map of Nevada—Reno sheet: Nevada Bureau of Mines and Geology Map 79, 1 sheet, scale 1:250,000. #2418 Bell, J.W., and Pease, R.C., 1980, Soil stratigraphy as a technique for fault activity assessment in the Carson City area, Nevada, *in* Evernden, J.F., ed., Earthquake hazards along the

Wasatch and Sierra-Nevada frontal fault zones: U.S. Geological Survey Open-File Report 80-801, p. 577-600.

#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.

#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.

#3487 Greene, R.C., Stewart, J.H., John, D.A., Hardyman, R.F., Silberling, N.J., and Sorensen, M.L., 1991, Geologic map of the Reno 1° by 2° quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2154-A, scale 1:250,000.

#2560 Pease, R.C., 1979, Genoa quadrangle—Earthquake hazards map: Nevada Bureau of Mines and Geology Map 1Ci, 1 sheet, scale 1:24,000.

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#3636 Ramelli, A.R., Bell, J.W., dePolo, C.M., and Yount, J.C., 1999, Large-magnitude, late Holocene earthquakes on the Genoa fault, west-central Nevada and eastern California: Bulletin of the Seismological Society of America, v. 89, p. 1458-1472.

#2573 Ramelli, A.R., dePolo, C.M., and Bell, J.W., 1994, Synthesis of data and exploratory trenching along the northern Sierra Nevada fault zone: National Earthquake Hazards Reduction Program, Final Technical Report, 65 p., scale 1:100,000.

#3641 Trexler, D.T., and Bell, J.W., 1979, Earthquake hazard maps of Carson City, New Empire, and South Lake Tahoe quadrangles: Technical report to U.S. Geological Survey, Reston, Virginia, under Contract 14-08-001-G-494.