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Kings Canyon fault zone (Class A) No. 1654

Last Review Date: 2014-06-10

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Synopsis	This nearly continuous north- to northeast-striking fault zone consists of: (1) generally range- and hill-front faults bounding Carson Range north of U.S. 50 and along southeast front of Sugarloaf; (2) piedmont faults adjacent to the range- and hill-front faults form near mouth of Kings Canyon northeastward to Indian Mountain; and (3) primarily intermontane, bedrock faults extending from Kings Canyon northward to southern margin of Washoe Valley. Fault zone may be structurally related to the Carson Range fault [1285] to the south based on a possibly splaying relationship. The intermontane fault are included in this zone because of similar strike, recency of movement, and proximity to other faults in the zone. Detailed surficial and bedrock mapping are the sources of data. Trench investigations have been accomplished, but detailed studies of scarp morphology have not been conducted.

Name comments	Refers to faults mapped by Matthews (1968 #3610), Slemmons (1968, unpublished Reno 1:250,000-scale map), Bingler (1977 #3639), Trexler (1977 #3640), Pease (1979 #2560; 1980 #2880), Trexler and Bell (1979 #2634), Bell and Trexler (1979 #2420), Bell and Pease (1980 #2418), Bell (1984 #105), Greene and others (1991 #3487), Ramelli and others (1994 #2573; 1999 #3636), and Dohrenwend and others (1996 #2846) extending from Kings Canyon on the west side of Carson City north to the southeast range front of the Virginia Range near Indian Mountain. 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 Kings Canyon fault zone by Ramelli and others (1994 #2573; 1999 #3636). **Fault ID:** Refers to the northeast part of fault R14D (Carson City fault) of dePolo (1998 #2845).
County(s) and State(s)	DOUGLAS COUNTY, NEVADA WASHOE COUNTY, NEVADA CARSON CITY COUNTY, NEVADA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations are primarily based on 1:100,000-scale map of Ramelli and others (1994 #2573) that is, in part, based on 1:24,000-scale maps of Trexler (1977 #3640), Trexler and Bell (1979 #2634), and Pease (1979 #2560; 1980 #2880). Additional fault traces are from 1:24,000-scale maps of Bingler (1977 #3639) and Bell and Trexler (1979 #2420).
Geologic setting	This nearly continuous north- to northeast-striking fault zone consists of: (1) generally range- and hill-front faults bounding Carson Range north of U.S. 50 and along southeast front of Sugarloaf; (2) piedmont faults adjacent to the range- and hill-front faults form near mouth of Kings Canyon northeastward to Indian Mountain (Matthews, 1968 #3610; Trexler, 1977 #3640; Trexler and Bell, 1979 #2634); and (3) primarily intermontane, bedrock faults extending from Kings Canyon northward to southern margin of Washoe Valley (Trexler, 1977 #3640; Pease, 1979 #2566; Trexler and Bell, 1979 #2634; 1980 #2880). Fault zone may be structurally related to the Carson Range fault [1285] to the south based on a possibly splaying relationship (Ramelli and

	others, 1994 #2573; Ramelli and others, 1999 #3636). The intermontane fault are included in this zone because of similar strike, recency of movement, and proximity to other faults in the zone (Trexler and Bell, 1979 #2634).
Length (km)	16 km.
Average strike	N30°E
Sense of movement	Normal *Comments:* (Matthews, 1968 #3610; Bingler, 1977 #3639; Trexler, 1977 #3640; Bell and Trexler, 1979 #2420; Pease, 1979 #2560; Trexler and Bell, 1979 #2634; 1980 #2880).
Dip	65° E. to 90° *Comments:* Trexler (1980 #2633) reported fault traces dipping from 65° E. to vertical from trench exposures across one of the faults near the mouth of Vicee Canyon.
Paleoseismology studies	Trexler and Bell (1979 #3641) excavated four trenches across graben bounding faults west of Carson City near the mouth of Vicee Canyon, all of which provided evidence for young movement. Site 1654-1 was apparently excavated across the northern extension of the fault exposed at site 1654-3 but shows considerably less deformation (Trexler and Bell, 1979 #3641). A single fault striking N. 15 E. offsets the top of the B horizon by about 18 cm. Two other fractures exposed in the trench also offset the B horizon and a disturbed zone east of the fault consisting of a fracture appears to die out downward (Trexler and Bell, 1979 #3641). No numerical ages were derived from offset deposits exposed in the trench. Trench 1654-2 was excavated to the northeast of site 1654-4 and exposes a series of three soft root-filled zones that may represent faults and northwest- to east-northeast- trending open fractures. Displacement of stratified units or stratigraphic contacts, however, could not be made with certainty (Trexler and Bell, 1979 #3641). Trench 1654-3 was excavated across a low (30-cm-high) west-facing antithetic scarp on loose, granitic grus that forms the east side of the graben (Trexler and Bell, 1979 #3641). The fault zone

	consists of four down-to-the-west north- northeast-striking faults. A fissure is filled with dark organic-rich material similar in composition to the A horizon of the surficial soil at the site. Other open fractures with variable trends are present and a 1.7-m-wide fault zone cuts the B soil horizon and has no visible structural or textural continuity across the zone (Trexler and Bell, 1979 #3641). Apparently, no numerical ages were derived from offset deposits exposed in the trench, but the displacement of Holocene soils suggests that the most recent event is young (Trexler and Bell, 1979 #3641). Trench 1654-4 was excavated across an east-facing scarp 1.3 m high and exposed evidence for repeated movement (Trexler, 1980 #3641; Trexler and Bell, 1979 #3641). A broad zone of faulting with consistent down-to-the-east motion was identified with some of the faults displacing alluvial units and overlying Holocene soils (Trexler and Bell, 1979 #3641). Faults predominately strike N 25–40° E. A single bed of clean sand has been displaced a total of 1.7 m by four faults. Apparently, no numerical ages were derived from offset deposits exposed in the trench, but the displacement of Holocene soils suggests that the most recent event is young (Trexler and Bell, 1979 #3641). Site 1654-5 dePolo (2014 #7777) reports on three trenches also located at Vicee Canyon that exposed evidence of four paleoearthquakes occurred 4000–1420 years ago. Average vertical offset is more than 2 m per event.
Geomorphic expression	Piedmont faults are expressed by east- and west-facing scarps some bounding a narrow graben (Trexler and Bell, 1979 #2634; 1979 #3641); a west-facing 30-cm-high scarp on loose granitic grus east of Vicee Canyon indicates that the most recent event was very recent (Trexler and Bell, 1979 #3641). Faults in the bedrock are expressed by a distributed zone of scarps within the Carson Range, on the range-front slope, and at the mountain-valley contact (Ramelli and others, 1994 #2573). Other faults are expressed as east- and southeast-facing scarps on young alluvium and by the juxtaposition of Quaternary alluvium against older bedrock on the southeast side of Sugarloaf hill (Bingler, 1977 #3639; Trexler and Bell, 1979 #2634). dePolo (1998 #2845) reports a maximum preferred basal fault facet height of 244 m (219–268 m).
Age of faulted	Holocene; Pleistocene. Matthews (1968 #3610), Bingler (1977

surficial deposits	#3639), Trexler (1977 #3640), and Pease (1980 #2880) mapped faults displacing alluvial units ranging in age from Holocene through Pleistocene. Studies of faulted soils by Bell and Pease (1980 #2880) support a Holocene age for faulted deposits.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* A latest Quaternary time is indicated from mapping of Pease (1979 #2566) and Trexler and Bell (1979 #2634) who indicated that some of the faults may have ruptured as recently as 3 ka. A young age was confirmed by the trenching studies of Trexler and Bell (1979 #3641), and an even younger age is suggested by dePolo (2014 #7777). Slemmons (1968, unpublished Reno 1:250,000-scale map) originally suggested a recent time for the most recent paleoevent.
Recurrence interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* The assigned slip-rate category is based on dePolo (2014 #7777) who reports a preferred age estimate for the surface of the faulted alluvial fan at Trench 3 of 4420–5260 yr BP; the fan surface is vertically offset 8.4±0.5 m, which results in a vertical displacement rate of 1.5–2.0 mm/yr. In an earlier study, dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.488 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 and maximum average.
Date and Compiler(s)	2014 Kenneth Adams, Piedmont Geosciences, Inc. Thomas L. Sawyer, Piedmont Geosciences, Inc. Kathleen M. Haller, U.S. Geological Survey
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