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Eastern Carson Sink fault zone (Class A) No. 1684

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Synopsis	This fault zone, which generally separates the extremely broad and deep Carson Sink from prominent west front of Stillwater Range, consists of short faults near and at the linear range front from about the mouth of West Lee Canyon discontinuously north-northeast to mouth of Copper Kettle Canyon, and a few intra basin faults or secondary deformation structures in northeastern part of the sink west of Grimes Canyon. The Stillwater Range has been uplifted several kilometers relative to Carson Sink since basin-and-range faulting began (<13 Ma). In addition, the southern part of range was tilted 40? to 90? east during early Miocene extensional faulting. Fault may be related to an unnamed fault in southwestern Stillwater Range [1683] and to the Rainbow Mountain fault zone [1679] to west and southwest; one short fault near Desert Well may have ruptured during the 1954 Rainbow Mountain-Stillwater earthquakes. Reconnaissance and locally

	detailed photogeologic mapping of the fault zone are sources of data. Trench investigations and detailed studies of scarp morphology have not been conducted.
Name comments	Refers to faults mapped by Russell (1885 #3549), Tocher (1956 #307), Slemmons (1968, unpublished Reno 1? X 2? sheet), Bell (1984 #105), Greene and others (1991 #3487), Caskey (1996 #2439), and Caskey and others (1996 #2439) along the west side of the Stillwater Range and near eastern margin of the Carson Sink. Russell (1885 #3549) originally named it the Pahute Mountain fault, but the same geographic feature is now called the Stillwater Range. dePolo (1998 #2845) originated the name of Eastern Carson Sink fault zone. **Fault ID:** Refers to fault R28A, R28B, and R28C (Eastern Carson Sink fault zone) of dePolo (1998 #2845).
County(s) and State(s)	CHURCHILL COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations are generally based on 1:250,000-scale maps of Bell (1984 #105) and Slemmons (1968, unpublished Reno 1? X 2? sheet). Location of faults between Shanghai Canyon and Grimes Canyon, are based on 1:48,000-scale map of Caskey (1996 #2437; reproduced in Caskey and others, 1996 #2439). Mapping by Bell (1984 #105) is based on photogeologic analysis of 1:40,000-scale low sun-angle aerial photography, supplemented with 1:12,000-scale aerial photography of selected areas, several low-altitude aerial reconnaissance flights, and field reconnaissance of major structural and stratigraphic relationships. Mapping by Slemmons (1968, unpublished Reno 1? X 2? sheet) is from analysis of 1:60,000-scale AMS photography transferred to mylar overlaid onto a 1:250,000-scale topographic map using proportional dividers. Mapping by Caskey (1996 #2437) and Caskey and others (1996 #2439) is based on detailed photogeologic analysis of 1:10,000- to 1:12,000-scale vertical, low-sun-angle aerial photography, transferred by inspection to 1:24,000-scale mylar orthophotos and directly to 1:24,000-scale topographic maps, that were then reduced to 1:48,000-scale.

Geologic setting	This fault zone, which generally separates the extremely broad and deep Carson Sink from prominent west front of Stillwater Range, consists of short faults near and at linear range front from about mouth of West Lee Canyon discontinuously north-northeast to mouth of Copper Kettle Canyon and a few intra basin faults or secondary deformation structures in northeastern part of the sink west of Grimes Canyon (Tocher, 1956 #307; Bonham and Slemmons, 1968 #2430; Bell, 1984 #105; Greene and others, 1991 #3487; Caskey, 1996 #2437; Caskey and others, 1996 #2439). The Stillwater Range has been uplifted several kilometers relative to the Carson Sink since basin-and-range faulting began (<13 Ma). In addition, the southern part of range was tilted 40? to 90? to the east during early Miocene extensional faulting (John, 1995 #3713). Several kilometers of late Cenozoic vertical movement is indicated by more than one kilometer of steep range-front relief and from borehole data and seismic reflection profiles that show a 2- to 3-km-thick section of basin-fill sediment (Hastings, 1979 #3707). Fault may be related to an unnamed fault [1683] in southwestern Stillwater Range (dePolo, 1998 #2845) and to the Rainbow Mountain fault zone [1679] to the west and southwest; one short fault near Desert Well may have ruptured during the 1954 Rainbow Mountain-Stillwater earthquakes.
Length (km)	41 km.
Average strike	N4°E
Sense of movement	Normal *Comments:* Normal sense of movement from Caskey (1996 #2437), Caskey and others (1996 #2439), Slemmons (1968, unpublished Reno 1? X 2? sheet), John (1995 #3713) and Greene and others (1991 #3487). Slemmons (1968, unpublished Reno 1? X 2? sheet) reports that sinistral movement is evident on one short north-striking fault on east edge of the Carson Sink north of Grimes Canyon.
Dip Direction	W
Paleoseismology studies	
Geomorphic expression	Although a fault has been inferred along entire west front of Stillwater Range, only scattered geomorphic evidence of late Quaternary faulting is apparent (e.g., Bell, 1981 #2875). The

	range front is steep, linear, has wineglass canyons (Adams and Wesnousky, 1996 #3705). However, faulting is not the only process that has influenced the western front of the Stillwater Range. Pluvial Lake Lahontan, which had a very long fetch in the Carson sink area, produced many shoreline scarps and eroded the range front. Faults are expressed as scarps on deposits of latest Pleistocene Lake Lahontan, between Cox and Shanghi Canyons, that locally cannot be traced along trend because they are parallel to latest Pleistocene shoreline scarps. Moderately, well defined scarps on pre-Lake Lahontan piedmont-slope deposits south of White Cloud Canyon extend discontinuously northward across Lake Lahontan deposits (Bell, 1981 #2875; Adams and Wesnousky, 1996 #3705) and merge with a possibly wave-modified compound scarp on piedmont slope north of Grimes Canyon. North of Kent Canyon, a piedmont fault is expressed by a prominent scarp that crosses a post-highstand spit (~13 ka Adams, 1997 #3003) and represents 3.0+0.2 m of vertical separation (Adams and others, 1996 #3706). A few linear, generally west-facing scarps have been mapped on floor of the eastern Carson Sink generally east of Lone Rock (Slemmons, 1968, unpublished Reno 1?x2? sheet) and are included in this zone because of their proximity and subparallel orientation.
Age of faulted surficial deposits	Holocene; latest Quaternary; Quaternary. Latest Quaternary lacustrine sediment (~13 ka, Adams, 1997 #3003), and Holocene and undifferentiated Quaternary piedmont-slope deposits are displaced by faults in this zone (Tocher, 1956 #307, Slemmons, 1968, unpublished Reno 1? X 2? sheet, Bell, 1984 #105; Greene and others, 1991 #3487; Caskey, 1996 #2437; Caskey and others, 1996 #2439; Adams and Wesnousky, 1996 #3705; Adams and others, 1996 #3706).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Although timing of most recent event is not well constrained, offset of a post-Lake Lahontan highstand (~13 ka , Adams, 1997 #3003) deposits is suggested based on photogeologic mapping and field studies by Bell (1984 #105), Adams and Wesnousky (1996 #3705), and Caskey (1996 #2437). Slemmons (1968, unpublished Reno 1? X 2? sheet) assigned a latest Quaternary time to northern faults on floor of the Carson Sink and a late Quaternary time to faults at front of Stillwater

	Range.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No detailed data exists to determine slip rates for this fault. dePolo (1998 #2845) assigned a reconnaissance vertical slip rate of 0.300 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 less than 0.2 mm/yr slip-rate category has been assigned to this fault; in support of this assignment Adams (1997 #3003) reported 3.0 + 0.2 m vertical separation on deposits 13 k.y. old North of Kent Canyon. These data can only constrain the maximum possible value for a slip rate, which is only slightly higher that the slip-rate category permits.
Date and Compiler(s)	1999 Thomas L. Sawyer, Piedmont Geosciences, Inc.
References	#3003 Adams, K.D., 1997, Late Quaternary pluvial history, isostatic rebound, and active faulting in the Lake Lahontan basin, Nevada and California: Reno, University of Nevada, unpublished Ph.D. dissertation, 169 p. #3705 Adams, K.D., and Wesnousky, S.G., 1996, Stop 1-2, Grimes Canyon, *in* 1996 Quaternary history, isostatic rebound and active faulting in the Lake Lahontan Basin, Nevada and California: Friends of the Pleistocene Pacific Cell Field Trip guidebook, p. 20-21. #3706 Adams, K.D., Wesnousky, S.G., and Bills, B., 1996, Stop 2-4B, isostatic rebound and active faulting, *in* 1996, Quaternary history, isostatic rebound and active faulting in the Lake Lahontan Basin, Nevada and California: Friends of the Pleistocene Cell Field Trip guidebook, p. 28-30. #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.

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	Survey Monograph 11, 288 p. #307 Tocher, D., 1956, Movement on the Rainbow Mountain fault: Bulletin of the Seismological Society of America, v. 46, no. 1, p. 10-14.