Jump to Navigation

Quaternary Fault and Fold Database of the United States

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Rainbow Mountain fault zone (Class A) No. 1679

Last Review Date: 1999-04-08

citation for this record: **Sawyer, T.L., compiler, 1999, Fault number 1679, Rainbow Mountain 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 02:25 PM.**

Synopsis	This long, widely distributed fault zone has numerous subparallel, oblique to left-stepping intra basin faults that occur throughout much of the Carson Sink and along eastern margin of Salt Wells Basin, and has very short range-front faults bounding both sides of Stillwater Point; fault zone bounds a buried horst beneath young basin-fill deposits north of Rainbow Mountain based on seismic reflection data. The 1954 rupture pattern of the Rainbow Mountain-Stillwater earthquakes suggests that these faults form a discrete fault zone, that may be related to the Eastern Carson Sink fault zone [1684] and to unnamed faults in Salt Wells Basin [1680]. Reconnaissance photogeologic and detailed mapping of the fault zone are the sources of data.
Name	Refers to faults mapped by Tocher (1956 #307), Slemmons (1956

comments	#306, 1968, unpublished Reno 1:250,000-scale map), Bell (1984 #105), Greene and others (1991 #3487). Faults are widely distributed throughout much of the Carson Sink and along east side of Salt Wells Basin; although it was originally named the Rainbow Mountain fault by Tocher (1956 #307) and includes Morrison's (1964 #3486) Stillwater Lakes fault zone, most current investigators refer to it as the Rainbow Mountain fault zone. **Fault ID:** Refers to fault R36 (Rainbow Mountain 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 1:50,000-scale map of Caskey (1999, written commun.). Mapping based on detailed photogeologic analysis of 1:10,000- to 1:12,000-scale vertical, low-sun-angle aerial photography, reducing photo overlays and directly transferring photo-center information to 1:24,000-scale topographic maps, and then reducing maps to 1:50,000-scale; mapping also based on detailed field mapping and numerous measurements of fault offset south of Carson Sink. Additional fault traces are from 1:250,000-scale maps of Bell (1984 #105) and Slemmons (1968, unpublished Reno 1:250,000-scale map). Mapping of 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 1:250,000-scale map) 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.
Geologic setting	This long, extremely distributed fault zone has numerous subparallel, oblique to left-stepping intra basin faults throughout much of the Carson Sink and along eastern margin of Salt Wells Basin, and has very short range-front faults bounding both sides

	of Stillwater Point (Slemmons, 1956 #306; 1968, unpublished Reno 1:250,000-scale map; Tocher, 1956 #307; Bell, 1981 #2875; Greene and others, 1991 #3487); fault zone bounds a buried horst beneath young basin-fill deposits north of Rainbow Mountain based on seismic reflection data (Hastings, 1979 #3707). The 1954 rupture pattern of the Rainbow Mountain-Stillwater earthquakes suggests that these faults form a discrete fault zone, that may be related to the Eastern Carson Sink fault zone [1684] and to unnamed faults in Salt Wells Basin [1680].
Length (km)	72 km.
Average strike	N13°E
Sense of movement	Right lateral *Comments:* Several investigators reported that movement in 1954 was of a normal sense (*e.g.*, Tocher, 1956 #307). However, Caskey (1999, written commun.) made several measurements of 1954 offsets and has found many sites in Rainbow Mountain area that exhibit convincing evidence for a dominant component of right-lateral displacement.
Dip	50° E *Comments:* Caskey (1999, written commun.) reported a pre-1954 fault juxtaposing alluvium against bedrock in a diatomite quarry north of Rainbow Mountain dipping 50° E.
Paleoseismology studies	One backhoe trench has been excavated across Rainbow Mountain fault zone. Fourmile Flat area. Site 1679-1 was recently excavated at north end of Fourmile Flat directly west of U.S. Highway 50 (Bell and others, 2004 #7763).
Geomorphic expression	Many of minor 1954 breaks on floor of the Carson Sink and in eolian deposits along east side of Salt Wells Basin reported by Tocher (1956 #307) and Slemmons (1968, unpublished Reno 1:250,000-scale map) are poorly preserved as subdued lineaments and possible cracks or are no longer visible (Bell, 1981 #2875). Although many 1954 breaks in floor of the sink did not occur along pre-existing fault scarps, their continuity, linearity, preferential northerly strike and continuity with demonstrable Quaternary faults to the south, suggest that these surficial features closely reflect movement on an underlying fault zone (Tocher,

	1956 #307). Numerous fresh-looking 1954 scarps, some with free faces, are preserved on coarse gravely deposits and discontinuously extend south from Stillwater Point Reservoir, along front of Rainbow Mountain, to Salt Wells and a few scarps also border north side of Fourmile Flat (Tocher, 1956 #307; Slemmons, 1956 #306, 1968, unpublished Reno 1:250,000-scale map, Bell, 1981 #2875). The 1954 scarps on several places bound graben and represent up to 0.7 m of vertical separation, at a point 2–3 km north of Rainbow Mountain, as much as 1.15 m of right-lateral offset of stream channels occurred in 1954. Additional 1954 breaks are expressed as a distinct mole track transecting a playa east of Stillwater Point Reservoir, as gently folded deposits and lurch features on east margin of Eightmile Flat and on northeast margin of Fourmile Flat. Locally, a few faults in the zone are expressed by compound fault scarps, up to 2 m high, that were re-ruptured in 1954, some of which have been modified by shoreline processes (Caskey, 1999, written commun.).
Age of faulted surficial deposits	Holocene; latest Quaternary; Quaternary; Tertiary. Latest Quaternary lacustrine sediment (<13 ka) and Holocene basin-fill and piedmont-slope deposits are displaced by faults in this zone (Tocher, 1956 #307; Slemmons, 1968, unpublished Reno 1:250,000-scale map, Bell, 1981 #2875; 1984 #105; Greene and others, 1991 #3487). North of Rainbow Mountain, Caskey (1999, written commun.) reported offset lacustrine deposits containing a layer of Wilson Creek tephra (~27.6 ka). Locally faults bounding Rainbow Mountain displace probably Tertiary sedimentary rocks or juxtapose undifferentiated Quaternary deposits against Tertiary volcanic rocks (Greene and others, 1991 #3487; Tocher, 1956 #307).
Historic earthquake	Rainbow Mountain earthquake 1954 Stillwater earthquake 1954
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Although timing of most recent paleoevent is not well constrained, a late to latest Quaternary time is suggested based on detailed field mapping by Caskey (1999, written commun.), which provides evidence that the most recent paleoevent postdates deposition of the Wilson Creek tephra (~27.6 ka) and probably predates formation of approximately 10 ka "dendritic terrace" of Morrison (1964 #3486). Photogeologic mapping by Bell (1981 #2875; 1984 #105), Slemmons (1968, unpublished Reno 1:250,000-scale map), and Dohrenwend and others (1996

	#2846) support a latest Quaternary time.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr
Date and Compiler(s)	1999 Thomas L. Sawyer, 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. #7208 Bell, J.W., Caskey, S.J., Ramelli, A.R., and Guerrieri, L., 2004, Pattern and rates of faulting in the central Nevada seismic belt, and paleoseismic evidence for prior beltlike behavior: Bulletin of the Seismological Society of America, v. 94, p. 1229-1254. #7760 Caskey, J.S., Bell, J.W., Ramelli, A.R., and Wesnousky, S.G., 2004, Historic surface faulting and paleoseismicity in the area of the 1954 Rainbow Mountain–Stillwater earthquake sequence, central Nevada: Bulletin of the Seismological Society of America, v. 94, p. 1255–1275, doi: 10.1785/012003012 #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. #3707 Hastings, D.D., 1979, Results of exploratory drilling, north Fallon Basin, western Nevada, *in* Newman, G.W., and Good, H.D., eds., Basin and Range symposium: Denver, Colorado, Rocky Mountain Association of Geologists-Utah Geological Association, p. 515-522. #3486 Morrison, R.B., 1964, Lake Lahontan—Geology of the southern Carson Desert, Nevada: U.S. Geological Survey Professional Paper 401, 156 p. #306 Slemmons, D.B., 1956, Geologic setting for the Fallon-Stillwater earthquakes of 1954: Bulletin of the Seismological Society of America, v. 46, p. 4-9. #307 Tocher, D., 1956, Movement on the Rainbow Mountain fault: Bulletin of the Seismological Society of America, v. 46, no. 1, p. 10-14.