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## Mount Rose fault zone (Class A) No. 1647

**Last Review Date: 1999-06-25**

***citation for this record:*** **Sawyer, T.L., compiler, 1999, Fault number 1647, Mount Rose 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 02:35 PM.**

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| **Synopsis** | The relatively long Mount Rose fault zone consists of: (1) a prominent range-front fault bounding the east flank of the northern Carson Range that is generally continuous from near Musgrove Creek northward along west edge of Washoe Valley, across an alluvial embayment near mouth of Galena Creek, and along west side of the Truckee Meadows to north of Thomas Creek; (2) a highly distributed network of echelon and anastomosing north- and northwest-striking faults on piedmont slope of the Carson Range from Washoe City northward into Reno; (3) subparallel to anastomosing intermontane faults in the Carson Range north of about Whites Creek; and (4) a few scattered intra basin faults in Washoe Valley. The Mount Rose fault zone encompasses the Mount Rose segment of the Carson Range fault system of Ramelli and others (1994 #2573) and, in that model, is related to the Little Valley fault [1648] and Kings Canyon fault zone [1654] to the west and south, respectively; |

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| | fault zone may also be related to, or terminate northward against, an unnamed fault zone within the Truckee River canyon [1646]. Two detailed and several site-evaluation trench investigations have been conducted, whereas detailed studies of scarp morphology have not been conducted. |
| **Name comments** | Refers to faults along and within western part of the Truckee Meadows and Washoe Valley, including faults in the Steamboat Hills and eastern Carson Range mapped by Thompson and White (1964 #3617), White and others (1964 #3619), Slemmons (1968, unpublished Reno 1:250,000-scale map), Matthews (1968 #3610), Cordova (1969 #2447), Bonham (1969 #2999), Tablor and others (1978 #2626), Trexler and Bell (1979 #2634), Bonham and Rodgers (1983 #2428), Schilling and Szecsody (1981 #4476);,Szecsody (1983 #2624), Bell (1984 #105), Nitchman and Ramelli (1991 #3611), Greene and others (1991 #3487), Bonham and Bell (1993 #2427), Ramelli and others (1994 #2573), and Ramelli and dePolo (1997 #2579). Includes the two parts of the Mount Rose fault zone of dePolo and others (1997 #1367) and the Washoe Valley fault of Ramelli and others (1994 #2573); Mount Rose is a prominent geographic feature located in the Carson Range between these valleys and bounded by the fault zone, thus, is an appropriate descriptive name for the zone.<br><br>**Fault ID:** Refers to fault numbers R14A and R14B (Mount Rose Fault zone) of dePolo (1998 #2845). |
| **County(s) and State(s)** | CARSON CITY COUNTY, NEVADA<br>WASHOE COUNTY, NEVADA |
| **Physiographic province(s)** | CASCADE-SIERRA MOUNTAINS<br>BASIN AND RANGE |
| **Reliability of location** | Good<br>Compiled at 1:100,000 scale.<br><br>*Comments:* Fault locations are based on 1:24,000-scale maps of Szecsody (1983 #2624), Tablor and others (1978 #2626), Trexler and Bell (1979 #2634) and Bingler (1974 #2425), approximately 1:83,000-scale map of Ramelli (1997 #2578), and 1:250,000-scale map of Greene and others (1991 #3487). Mapping by Ramelli and dePolo (1997 #1367) is a compilation of 1:24,000-scale maps of Tablor and Ellen (1975 #3614), Trexler (1977 #3640), Grose (1986 #3609) and Lewis (1988 #2526) that was modified based on detailed analysis of aerial photographs and field |

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| | reconnaissance. |
| **Geologic setting** | The relatively long Mount Rose fault zone consists of: (1) a prominent range-front fault bounding the east flank of the northern Carson Range that is generally continuous from near Musgrove Creek northward along west edge of Washoe Valley, across an alluvial embayment near mouth of Galena Creek, and along west side of the Truckee Meadows to north of Thomas Creek; (2) a highly distributed network of echelon and anastomosing north- and northwest-striking piedmont faults on piedmont slope of the Carson Range from Washoe City northward into Reno; (3) subparallel to anastomosing intermontane fault in the Carson Range north of about Whites Creek; and (4) a few scattered intra basin faults in Washoe Valley (Thompson and White, 1964 #3617; White and others, 1964 #3619; Matthews, 1968 #3610; Cordova, 1969 #2447; Bonham, 1969 #2999; Tabor and others, 1978 #2626; Trexler and Bell, 1979 #2634; Schilling and Szecsody, 1981 #4476; Bonham and Rogers, 1983 #2428; Szecsody, 1983 #2624; Bell, 1984 #105; Greene and others, 1991 #3487; Ramelli and others, 1994 #2573; Ramelli and dePolo, 1997 #2579). Washoe Valley is an asymmetric west-tilted half graben containing more than a 600-m-thick section of sediment (Petersen and Karlin, 1993 #3612). The Truckee Meadows is a deep structural trough with 1.9 km of basin-fill deposits near the north end of the Mount Rose fault zone and generally less than 500 m of basin-fill deposits elsewhere (Abbott and Louie, 2000 #4475). In addition to deforming by distributed faulting, the northern Carson Range may have deformed by folding and warping (e.g., Thompson and Sandberg, 1958 #3616; Thompson and White, 1964 #3617). The Mount Rose fault zone encompasses the Mount Rose segment of the Carson Range fault system of Ramelli and others (1994 #2573) and, in that model, is related to the Little Valley fault [1648] and Kings Canyon fault zone [1654] to the west and south, respectively; fault zone may also be related to, or terminate northward against, an unnamed fault zone within the Truckee River canyon [1646]. |
| **Length (km)** | 38 km. |
| **Average strike** | N5°E |
| **Sense of movement** | Normal<br><br>*Comments:* Several studies have reported a normal sense of movement along the fault zone (*e.g.*, Thompson and White, 1964 |

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| | #3617; Matthews, 1968 #3610, Bonham, 1969 #2999; Bell, 1981 #2875; Bonham and Rogers, 1983 #2428; Greene and others, 1991 #3487). A subsidiary dextral component was suggested by Ramelli and dePolo (1997 #2579) in the Washoe Valley area based on possible right-lateral offset of a Tertiary river channel, and by VanWormer and Ryall (1980 #3618) based on fault-plane solutions. |
| **Dip Direction** | E; W |
| **Paleoseismology studies** | In addition to several geotechnical trench studies, two detailed paleoseismic investigations have focused on the Mount Rose fault zone; only the study by Ramelli and dePolo (1997 #1367) apparently yielded control on the timing of faulting events. The first investigation, by Schilling and Szecsody (1981 #4476), involved three trench (sites 1647-1, 1647-2, 1647-3, herein) across the range-front fault in the southwestern Truckee Meadows near the mouth of Whites Creek, and the subsequent investigation by Ramelli and dePolo (1997 #1367) involved two trenches in Carson Valley at Davis Creek County Park, one across a splay fault adjacent to the range-front fault (site 1647-4) and the other across the range-front fault (site 1647-5).<br><br>Sites 1647-1, 1647-2, 1647-3 at the Mouth of Whites Creek, southwestern Truckee Meadows. Schilling and Szecsody (1981 #4476) excavated three trenches across the range-front fault at the mouth of Whites Creek; two trenches were excavated north of the creek (site 1647-1 and 1647-2) and one was excavated just south of the creek (site 1647-3). The northern trench (site 1647-1; their trench 3) exposed bouldery alluvial deposits displaced about 0.6 m down-to-the-east along a fault dipping 61° E. The central trench (site 1647-2; their trench 2) exposed bouldery to cobbly alluvial deposits displaced about 1.1 m down-to-the-east along a fault-bounded fissure dipping 77° E. The southern trench (site 1647-3; their trench 1) was excavated in a side channel and crossed a scarp less than 1.5 m high on terrace deposits inset into late Quaternary (*i.e.*, Tahoe) outwash deposits. The trench exposed cobbly to bouldery alluvial deposits displaced about 1.2 m and 0.6 m down-to-the-east along a 82° NE.-dipping fault-bounded fissure and a 71° NE.-dipping fault-bounded fissure to the east, respectively. The A horizon of the surficial soil thickens from west to east across the fault in all three trenches, suggesting that it has been displaced Schilling and Szecsody (1981 #4476). Based on soil-profile development, the most recent event was |

inferred to have occurred in possibly the past 2,000 to 3,000 years; a sample of the youngest A-horizon material infilling a fissure in the southern trench (site 1647-3), was submitted for radiocarbon dating, but the age of this sample was not reported in Schilling and Szecsody (1981 #4476) nor in Szecsody (1983 #2624). Ages for two samples, however, were reported by Bell and others (1984 #106). The two samples, apparently from fissure infilling, was reported to have radiocarbon ages of 620±70 yr B.P. and 910±70 yr B.P.

Site 1647-4 near Winters Creek, Washoe Valley. Ramelli and dePolo (1997 #1367) excavated a trench (DCP-2 in their report) just south of Winters Creek across a 6-m-high piedmont scarp on late Quaternary glacial-outwash deposits. Tabor and others (1983 #3615) interpreted these deposits to be of probably Tahoe age (35–74 ka), but Ramelli and dePolo (1997 #1367) suggested that they are more likely of Tioga age (12–24 ka) based on surface boulder weathering. A scarp profile suggests cumulative normal displacement of 3.8±0.8 m across the scarp. The trench exposed highly weathered granitic bedrock, on both sides of the fault, overlain by poorly stratified fluvial and colluvial granitic sand deposits. A steeply eastward-dipping, relatively narrow, irregular fault zone was also exposed. Stratigraphic and soil offsets were interpreted to represent two faulting events with 1.3–1.5 m of total vertical displacement; offset units also exhibit soft-sediment deformation believed to represent liquefaction in this spring-discharge area (Ramelli and dePolo, 1997 #2579).

Site 1647-5 near Ophir Creek, Washoe Valley. Ramelli and dePolo (1997 #1367) excavated a trench (DCP-1 in their report) across a 4-m-high range-front scarp on a mid to late Holocene alluvial terrace at the mouth of an unnamed drainage, 0.7 km north Ophir Creek. The scarp represents 4.8±1 m of cumulative normal displacement based on scarp-profile data. The trench exposed poorly stratified, bouldery grus (decomposed granite) and, in the hanging wall, colluvial deposits; deposits contain abundant detrital charcoal. Three alluvial deposits are offset across a steep (~70°), east-dipping fault zone and exhibit minor offsets across a distributed zone in the hanging wall. The colluvial deposits, the scarp profile, and several radiocarbon dates suggest two faulting events, possibly with 2 to 2.5 of vertical displacement each, in about the last 1,700 years at this site (Ramelli and dePolo, 1997 #2579).

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| **Geomorphic expression** | The range-front fault is expressed as prominent scarps on alluvial-fan, glacial outwash, colluvial, and landslide deposits and as the abrupt steep escarpment of the Carson Range (Thompson and White, 1964 #3617; White and others, 1964 #3619; Matthews, 1968 #3610; Cordova, 1969 #2447; Bonham, 1969 #2999; Tabor and others, 1978 #2626; Trexler and Bell, 1979 #2634; Schilling and Szecsody, 1981 #4476; Bonham and Rogers, 1983 #2428; Szecsody, 1983 #2624; Bell, 1984 #105; Nitchman and Ramelli, 1991 #3611; Ramelli and others, 1994 #2573; Ramelli and dePolo, 1997 #2579). The range front has basal fault facets that reach a maximum height of 171 m (146–195 m) high (dePolo, 1998 #2845); however, the range front may have been modified in Washoe Valley by late Pleistocene Washoe Lake (Ramelli and dePolo, 1997 #2579). Piedmont faults are marked by eastward- and westward-facing moderately to well-defined scarps on mid to late Quaternary (primarily Donner- and Tahoe-aged, locally Holocene) piedmont-slope deposits and pediment surfaces and by distinct vegetation lineaments. Many scarps have bevels and bound grabens, and most are less than 6 m high. Several scarps on the Callahan Ranch area are marked by 1- to 5-m-high, well-defined scarps on deposits as young as Holocene (Tabor and others, 1978 #2626; Schilling and Szecsody, 1981 #4476). Intermontane faults generally splay into the range from the main range-front fault and are expressed as abrupt intra-range escarpments, broad mountainside benches, small alluvial basin, and at least one closed depression, on Whites Creek-Thomas Creek divide, (Thompson and White, 1964 #3617; White and others, 1964 #3619; Matthews, 1968 #3610; Cordova, 1969 #2447; Bonham, 1969 #2999; Tabor and others, 1978 #2626; Trexler and Bell, 1979 #2634; Schilling and Szecsody, 1981 #4476; Bonham and Rogers, 1983 #2428; Szecsody, 1983 #2624; Bell, 1984 #105; Ramelli and others, 1994 #2573; Ramelli and dePolo, 1997 #2579) suggesting young movement. Intrabasin faults in Washoe Valley are expressed as scarps on late Pleistocene deposits associated with the highstand of late Pleistocene Washoe Lake, that essentially extend to the shore of the contemporary Washoe Lake (Ramelli and dePolo, 1997 #2579). |
| **Age of faulted surficial deposits** | Holocene; late and middle Pleistocene; early to middle Pleistocene; Quaternary; Tertiary. Quaternary deposits, primarily late and middle Pleistocene (Tahoe- and Donner-aged, respectively), are extensively faulted by the piedmont faults and range-front fault, which also juxtaposes these deposits against |

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| | Tertiary volcanic rocks and bedrock (Thompson and White, 1964 #3617; White and others, 1964 #3619; Matthews, 1968 #3610; Cordova, 1969 #2447; Bonham, 1969 #2999; Tabor and others, 1978 #2626; Trexler and Bell, 1979 #2634; Schilling and Szecsody, 1981 #4476; Bonham and Rogers, 1983 #2428; Szecsody, 1983 #2624; Bell, 1984 #105; Bonham and Bell, 1993 #2427; Ramelli and others, 1994 #2573; Ramelli and dePolo, 1997 #2579). Latest Pleistocene (Tioga-aged) and Holocene deposits are faulted within the zone; for example, along piedmont faults near Jones Creek (Tabor and others, 1978 #2626), along the range-front fault in Washoe Valley at Davis Creek County Park (Ramelli and dePolo, 1997 #2579) and in the southwestern Truckee Meadows from about State Highway 431 north to north fork of Dry Creek (e.g., Schilling and Szecsody, 1981 #4476; Bonham and Rogers, 1983 #2428; Szecsody, 1983 #2624). Late Pleistocene basin-fill deposits are displaced along the intra basin faults in Washoe Valley (e.g., Trexler and Bell, 1979 #2634; Ramelli and dePolo, 1997 #2579). The intermontane faults in the Carson Range primarily displace Tertiary volcanic rocks, but locally juxtapose these rocks against early to middle Pleistocene (e.g., Donner-aged) outwash deposits (Schilling and Szecsody, 1981 #4476) and possibly against late Quaternary lake deposits (Bonham and Rogers, 1983 #2428). |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | latest Quaternary (<15 ka)<br><br>*Comments:* A late to latest Holocene time is suggested based on trench studies by Ramelli and dePolo (1997 #2579) and Schilling and Szecsody (1981 #4476), which agrees with mapping by Szecsody (1983 #2624), Thompson and White (1964 #3617), White and others (1964 #3619), Cordova (1969 #2447), Tabor and others (1978 #2626), Trexler and Bell (1979 #2634), Bonham and Rodgers (1983 #2428), Szecsody (1983 #2624), Bell (1984 #105), Nitchman and Ramelli (1991 #3611), Bonham and Bell (1993 #2427), Ramelli and others (1994 #2573), and Slemmons (1968, unpublished Reno 1:250,000-scale map). |
| **Recurrence interval** | <br><br>*Comments:* Trench studies by Ramelli and dePolo (1997 #2579) suggest an interval between the past two events has to be less than about 1.8 k.y. at their southern trench site (site 1647-5). |

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| **Slip-rate category** | Between 1.0 and 5.0 mm/yr<br><br>*Comments:* Ramelli and dePolo (1997 #1367) estimated a range of late Holocene vertical dispacement rate of 1.1–3.8 mm/yr with a tentatively preferred rate of 1.5 mm/yr, based on trench results from near Ophir Creek (site 1647-5). Alternatively, dePolo (1998 #2845) assigned a reconnaissance vertical deformation rate of 0.312 mm/yr based on an empirical relationship between his preferred maximum basal facet height and vertical deformation rate for the range-front fault. 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 slip-rate category assigned here is based on geologically determined Holocene rate presented by Ramelli and dePolo (1997 #1367). |
| **Date and Compiler(s)** | 1999<br>Thomas L. Sawyer, Piedmont Geosciences, Inc. |
| **References** | #4475 Abbott, R.E., and Louie, J.N., 2000, Depth to bedrock using gravimetry in the Reno and Carson City, Nevada, area basins: Geophysics, v. 65, p. 340-350.<br><br>#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.<br><br>#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.<br><br>#106 Bell, J.W., Slemmons, D.B., and Wallace, R.A., 1984, Reno to Dixie Valley-Fairview Peak earthquake areas, *in* Lintz, J., Jr., ed., Western geological excursions: Reno, Nevada, University of Nevada, Mackay School of Mines, 1984 Annual Meetings of the Geological Society of America, Guidebook, v. 4, p. 425-472.<br><br>#2425 Bingler, E.C., 1974, Earthquake hazards map, Reno Folio: Nevada Bureau of Mines and Geology Environmental Series, scale 1:24,000.<br><br>#2999 Bonham, H.F., 1969, Geology and mineral deposits of Washoe and Storey Counties, Nevada: Nevada Bureau of Mines and Geology Bulletin 70, 140 p., 1 pl., scale 1:250,000. |

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