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# Quaternary Fault and Fold Database of the United States

**As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.**

## Clan Alpine fault zone (Class A) No. 1190

**Last Review Date: 2005-09-22**

***citation for this record:*** **Lidke, D.J., compiler, 2005, Fault number 1190, Clan Alpine 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 02:17 PM.**

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| **Synopsis** | This north- to northeast-striking zone of faults is mostly characterized by a relatively continuous, down-to-the-southeast, range-front fault that places bedrock of the Clan Alpine Mountains against Quaternary piedmont-slope deposits of the Edwards Creek Valley. A few sparse east-facing scarps are present along the range front fault and directly east of the range front on proximal piedmont-slope deposits, particularly toward the southern end of the fault. The fault zone is a major, down-to-the-east, range front fault, and the east-facing direction of the associated scarps also implies principally down-to-the-east offset along the fault zone. Along the southern part of the fault zone there is clear evidence for at least one Quaternary faulting event that probably is no older than latest Pleistocene to early Holocene in age. The fault zone has not been studied in detail and little is known with certainty about its nature, character, and movement history. The principal sources of data consist of geologic mapping, reconnaissance photogeologic mapping, morphologic age dating of fault scarps and |

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| | soil age estimates, and reconnaissance geomorphic study of fault scarps and basal fault facets. |
| **Name comments** | Refers to north- to northeast-striking faults mapped by Willden and Speed (1968 #4370; 1974 #3645) and (Dohrenwend and others, 1992 #283) bounding the eastern side of the Clan Alpine Mountains and the western side of the Edwards Creek Valley. Pearthree (1990 #148) referred to these structures as the Clan Alpine fault; later dePolo (1998 #2845) referred to them as the Western Edwards Creek Valley fault zone. A slight modification of the earlier name used by Pearthree (1990 #148) is used herein. The fault zone extends along the eastern flank of the Clan Alpine Mountains from about 4 km southwest of Shoshone Creek southwest to near the south end of the adjacent Edwards Creek Valley.<br><br>**Fault ID:** Refers to fault zone that dePolo (1998 #2845) portrayed and labeled MI3. |
| **County(s) and State(s)** | CHURCHILL COUNTY, NEVADA |
| **Physiographic province(s)** | BASIN AND RANGE |
| **Reliability of location** | Good<br>Compiled at 1:250,000 scale.<br><br>*Comments:* Location is from 1:250,000-scale map of Dohrenwend and others (1992 #283) that shows mapping based on photogeologic analysis of 1:58,000-nominal-scale, color-infrared photography that was transferred directly to 1:100,000-scale topographic maps enlarged to the scale of the photographs. The 1:100,000-scale fault maps were reduced and compiled at 1:250,000-scale for final publication. |
| **Geologic setting** | This north- to northeast-striking, relatively narrow fault zone is principally a major range front fault that bounds the eastern flank of the Clan Alpine Mountains and the western flank of the Edwards Creek Valley. The range front fault shows down-to-the-southeast offset of Quaternary piedmont-slope deposits against Tertiary bedrock (Dohrenwend and others, 1992 #283). Scarps are relatively sparse and poorly preserved but consistently face east (Pearthree, 1990 #148; Dohrenwend and others, 1992 #283). Stratigraphic relations as well as the east-facing direction of the scarps imply mostly down-to-the-east Quaternary offset along the fault zone that probably reflects continued Quaternary uplift of the Clan Alpine Mountains relative to the |

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| | Edwards Creek Valley. However, the fault zone has not been studied in detail and other insights and estimates that concern Quaternary offset amounts and vertical displacement rates have not been reported. |
| **Length (km)** | 33 km. |
| **Average strike** | N27°E |
| **Sense of movement** | Normal<br><br>*Comments:* Not specifically reported, however, the down-to-east character of the range-front faults, east-facing scarps, and a down-to-east offset terrace surface dePolo (1998 #2845) consistently indicates down-to-the-east offsets, which in this extensional regime probably reflects principally normal, dip-slip movement along easterly dipping faults. |
| **Dip Direction** | SE<br><br>*Comments:* Not reported, but probably steep, based on dip measurements of other Quaternary faults in localities nearby and elsewhere in the Basin and Range Province. |
| **Paleoseismology studies** | Florence Canyon Road, sites 1190-1, 1190-2 (Machette and others, 2005 #7771). Two trenches were excavated in September 2001 by the U.S. Geological Survey to determine the timing and rates of slip along the southern end of the Clan Alpine fault. The trenches were mapped and described; a field review was performed by staff from the Nevada Bureau of Mines and Geology (A. Ramelli and C. dePolo), the University of Nevada-Reno (S. Wesnousky), and the Utah Geological Survey (W. Lund). The trenches were sampled for TL and cosmogenic dating, backfilled and graded at the end of September 2001. Interprretation of the exposures include two latest Quaternary surface-faulting earthquakes in the past 30 k.y., and latest Quaternary displacement rates near the southern end of the fault zone are slower than previously suggested for the whole fault zone.<br><br>Site 1190-1. This site is on the southern part of a piedmont strand of the main range bounding Clan Alpine fault. The fault forms a 3–10 m high scarp in alluvial fan deposits about 0.4 km east of bedrock. The scarps north of Florence Canyon Road are smaller (3–4 m high), whereas those to the south are larger, ranging from about 4 m (buried) to about 10 m. A single 35-m-long, up to 4-m-deep trench was excavated across the scarp about 60 m south of the road. Mapping of the south wall of the trench revealed unequivocal evidence for two |

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| | large faulting events and indirect evidence for several others that were subsequently buried by alluviation. Preliminary interpretation indicates two events in the past 130 k.y. which is based on correlation of the younger (buried) deposits with the end of late major pluvial climatic episode (marine isotope stage IV). Cosmogenic dating of these younger alluvial fan deposits and older deposits preserved in the upthrown fault block will provide age control for the two different ages of faulted deposits. TL samples were obtained from the fault scarp colluvium related to both the most recent and penultimate events.<br><br>Site 1190-2. This site is on a short intrabasin fault strand that is antithetic to the main range-bounding Clan Alpine fault. The site is east of Clan Alpine road, near its intersection with Florence Canyon road. The fault forms a 1- to 4-m-high scarp on distal alluvial fan deposits about 1 km east-southeast of site 1190-1. The scarp is buried by young (late Pleistocene and Holocene) alluvium to the south and eroded by a stream channel to the north. It is only preserved for several hundred meters in this area. A single 25-m-long, up to 3.5-m-deep trench was excavated across the scarp about 20 m east of Clan Alpine road. Mapping of the north wall of the trench revealed unequivocal evidence for two large faulting events and less convincing (but compelling) evidence for another event. Preliminary interpretation indicates two events in the past 100 k.y. and a third event between 100 ka and 130 ka, which is based on development of a buried soil and correlation of the oldest (upthrown) deposits with the end of late major pluvial climatic episode (marine isotope stage IV). Cosmogenic dating of the 100 ka alluvial-fan deposits that form a relict surface on the upthrown fault block will provide age control for the faulted deposits. TL samples were obtained from the fault scarp colluvium related to both the most recent and penultimate events. |
| **Geomorphic expression** | Fault zone is expressed mostly by a relatively continuous, down-to-the-east, range front fault on bedrock that has sparse, poorly preserved scarps (Dohrenwend and others, 1992 #283). The fault zone also expressed west-facing scarps that are most common along the southern part of the zone, where these faults step basin ward and offset late Quaternary alluvial surfaces (Pearthree, 1990 #148; dePolo, 1998 #2845). dePolo (1998 #2845) observed single- and multiple-event fault scarps and grabens along the fault zone; at an unspecified locality along the southern part of the fault zone, dePolo (1998 #2845) reported a vertical offset of 19.4 m (17.8-20.4 m) for a faulted late(?) Pleistocene surface. dePolo (1998 #2845) also reported preferred maximum basal fault facets of 207 m. |

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| **Age of faulted surficial deposits** | Based on reconnaissance photogeologic mapping, Dohrenwend and others (1992 #283) assigned a latest Pleistocene to Holocene age to a faulted Quaternary deposit or surface at one locality along the fault zone. dePolo (1998 #2845) assigned a preferred age of 130 ka (74-220 ka) to the 19.4-m offset alluvial surface along the southern part of the fault zone. Pearthree (1990 #148) calculated a mean scarp age of 16.9 ka (11.2-22.6 ka) for the smaller scarps based on morphologic analyses of seven scarp profiles along the southern part of the fault zone; he also estimated aa age of middle Holocene for a soil developed on an unfaulted alluvial surface. |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | late Quaternary (<130 ka)<br><br>*Comments:* The timing of the most recent prehistoric faulting event appears to be relatively well constrained. Reconnaissance photogeologic mapping by Dohrenwend and others (1992 #283) indicates that the most recent prehistoric faulting event probably is no older than latest Pleistocene (<30 ka) in age. Pearthree (1990 #148) reported an 11.2–22.6 ka range of scarp age estimates and a soil-age estimate that implies that the youngest event is older than middle Holocene. |
| **Recurrence interval** | ≥20,000 yrs<br><br>*Comments:* dePolo (1998 #2845) reported that both single- and multiple-event fault scarps are present along the fault zone, which implies that more than one Quaternary faulting event has occurred along the zone. Machette and others (2005 #7771) suggest that recurrence of coseismic surface rupture exceeds 20 k.y. |
| **Slip-rate category** | Less than 0.2 mm/yr<br><br>*Comments:* dePolo (1998 #2845) calculated a preferred vertical displacement rate of 0.15 mm/yr based on a preferred vertical offset of 19.4 m for a faulted alluvial terrace surface. The age of the surface is based on relative position, surface morphology, and soil characteristics that correlate to Donner Lake outwash, therefore, dePolo (1998 #2845) assigned a preferred age of 130 ka. However, paleoseismic investigations by the USGS revealed about 3–4 m of offset along main fault strand (piedmont) in deposits that are considered to be about 130 ka, which indicates a slower vertical displacement rate (0.025–0.08 mm/yr in Machette and others, 2005 #7771). In that context, the |

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| | alluvial terrace deposits that are offset by 19.4 m could be considerably older than assumed by dePolo, perhaps 250 ka (or older). Existing and evolving information suggest that the vertical displacement rate on the southern part of the Clan Alpine fault zone is considerably less than 0.2 mm/yr. |
| **Date and Compiler(s)** | 2005<br>David J. Lidke, U.S. Geological Survey |
| **References** | #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.<br><br>#283 Dohrenwend, J.C., Schell, B.A., and Moring, B.C., 1992, Reconnaissance photogeologic map of young faults in the Millett 1° by 2° quadrangle, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-2176, 1 sheet, scale 1:250,000.<br><br>#7772 Machette, M.N., Haller, K.M., Okumura, K., Ruleman, C.A., Debray, S., and Mahan, S., 2002, Paleoseismology of the Clan Alpine fault, west-central Nevada: Geological Society of America Abstracts with Program, https://gsa.confex.com/gsa/2002RM/finalprogram/abstract_33718.htm.<br><br>#7771 Machette, M.N., Haller, K.M., Ruleman, C.A., Mahan, S., and Okumura, K., 2005, Geologic evidence for late quaternary movement on the Clan Alpine Fault, west-central Nevada : Trench logs, scarp profiles, location maps, and sample and soil descriptions: U.S. Geological Survey Scientific Investigations Map 2891, 1 sheet, https://pubs.er.usgs.gov/publication/sim2891.<br><br>#148 Pearthree, P.A., 1990, Geomorphic analysis of young faulting and fault behavior in central Nevada: Tucson, University of Arizona, unpublished Ph.D. dissertation, 212 p.<br><br>#4370 Willden, R., and Speed, R.C., 1968, Geology and mineral deposits of Churchill County, Nevada: U.S. Geological Survey Open-File Report 68-329, 3 sheets, scale 1:200,000.<br><br>#3645 Willden, R., and Speed, R.C., 1974, Geology and mineral deposits of Churchill County, Nevada: Nevada Bureau of Mines and Geology Bulletin 83, 95 p. |

Questions or comments?