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Buena Vista Valley fault zone (Class A) No. 1638

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Synopsis	The Buena Vista Valley fault zone is a long, range-front fault at the west margin of the East Range and northern Stillwater Range, separating those ranges from the basin beneath Buena Vista Valley. The East Range is an example of a southeast- or east-tilted range block bounded on the west by active faults. Tilting of about 10? has occurred in the past 10 Ma. By contrast, the northern part of the Stillwater Range is a horst block bounded on the east and west by normal faults along the margins of the Dixie and Buena Vista Valleys respectively. Throughout most of it length, the Buena Vista Valley fault zone generally is comprised of northeast-striking faults marked by west-facing scarps on deposits or erosion surfaces estimated, on the basis of reconnaissance photogeologic study, to be early to middle (130 ka–1.5 Ma) and late Pleistocene (10–130 ka) in age. These scarps are formed on the piedmont directly west of the bedrock escarpment of the

	ranges, although along part of its trace, range-front faults juxtapose Quaternary alluvium against bedrock. The scarps show clear truncation by shoreline scarps of the approximately 13 ka Lake Lahontan high stand (4370 ft asl), therefore the most recent scarp-forming event along both the East and Stillwater Ranges probably occurred prior to 13 ka. However, an intra basin fault forms a southeast-facing scarp on latest Pleistocene lacustrine deposits of pluvial Lake Lahontan. Detailed and regional geologic mapping and reconnaissance photogeologic mapping are the sources of data. Trench investigations and detailed studies of scarp morphology have not been conducted.
Name comments	Name modified from dePolo (1998 #2845) who referred to these faults as the Buena Vista Valley fault system. Wallace (1979 #203) referred to the fault along the East Range as the west flank East Range scarps and those along the Stillwater Range as the west flank Stillwater Range scarps. In the Lovelock 1:250,000-scale map, refers to faults along northwest side of the Stillwater Range near Cornish Peak as mapped by Wallace and others (1969 #3028), Slemmons (1974, unpublished Lovelock 1:250,000-scale map), Johnson (1977 #2569), and Dohrenwend and others (1991 #285). From Cornish Peak, the fault extends northeast to near the mouth of Rockhill Canyon at the west base of the East Range. The southern end of the fault is at lat 40° N.; south of which the range front looses some of its abruptness for several kilometers. Along trend, but further to the southwest, is the Eastern Carson Sink fault zone [1684]. **Fault ID:** Refers to faults WI2A, WI2B, and WI2C of dePolo (1998 #2845).
County(s) and State(s)	PERSHING COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations in the Winnemucca sheet are taken from the 1:125,000-scale mapping of young fault scarps in the region by Wallace (1979 #203). The map was compiled mostly from field and photogeologic study of 1:60,000-scale aerial photos. Dohrenwend and Moring (1991 #282) also mapped

	Quaternary faults across the Winnemucca sheet, but at 1:250,000-scale. The north part of the fault (Dun Glen 15' quadrangle) was also mapped by Whitebread (1994 #4320) and his fault locations agree well with Wallace's (1979 #203) map. As compiled here, the fault does not include the traces northeast of Rockhill Canyon as mapped by Dohrenwend and Moring (1991 #282). The southern end of the fault zone, which lies within the Lovelock sheet, are primarily based on 1:62,500-scale map of Wallace and others (1969 #3028). These fault locations were checked against the 1:250,000-scale map of Johnson (1977 #2569) and the 1:250,000-scale photogeologic maps of Dohrenwend and others (1991 #285) and Slemmons (1974, unpublished Lovelock 1::250,000-scale map).
Geologic setting	The Buena Vista Valley fault zone is a range-front fault at the western margin of the northern Stillwater and East Ranges; it separates those ranges from the basin beneath Buena Vista Valley (Wallace and others, 1969 #3028; Wallace,1979 #203, 1987 #240; Slemmons, 1974, unpublished Lovelock map; Johnson, 1977 #2569; Dohrenwend and others, 1991 #285, 1991 #282). Muller and others, (1951 #4357) did not map faults along the west flank of the East Range, but they suggested such faults may be present. Ferguson and others (1951, #4354) on their 1:125,000-scale geologic map shows only two short (5–8 km long) NNE-striking range-front faults that cut Quaternary alluvium along the west base of the East Range. Wallace (1987 #240) characterized the East Range as an example of a southeast- or east-tilted range block bounded on the west by active faults. Tilting of about 10° has occurred in the past 10 Ma. By contrast, the northern Stillwater Range is a horst block, the steep flanks of which are a direct result of faulting (Muller and others, 1951 #4357).
Length (km)	76 km.
Average strike	N20°E
Sense of movement	Normal *Comments:* Shown as normal faults by Wallace and others (1969 #3028) and Dohrenwend and others (1991 #285).
Dip Direction	W
Paleoseismology	

studies	
Geomorphic expression	The Buena Vista Valley fault zone trends east-northeast where it extends from the Lovelock 1:250,000-scale map into the Winnemucca 1:250,000-scale map (north of the Table Mountain part of the Stillwater Range). In that area, the fault is marked by right-stepping northeast-striking traces. From there northward, it is marked mainly by a conspicuously sinuous, discontinuous single trace. Wallace (1987 #240) commented on the general geomorphic expression of the East Range, and he noted that it is characterized by a 1- to 2-km-wide pediment, a general lack of faceted spurs, an irregular sinuous range front, and that the steepest part of the range is near its crest; all of these features indicate a relatively slow rate of recent displacement. On the basis of geomorphic and geologic considerations, Wallace (1978 #203) concluded that formation of the pediment took millions of years and occurred during the early part of the past 10 Ma (probably in late Miocene time). Along most of its length, the main active trace of the Buena Vista Valley fault is marked by discontinuous west-facing scarps located on the piedmont, west of the piedmont-hillslope transition. Exceptions are at the west base of the East Range where, between Inskip and Reed Canyons and north of Willow Creek, the trace is close to or at the bedrock escarpment. Dohrenwend and Moring (1991 #282) mapped those parts of the fault zone as major range-front faults characterized by juxta positioning of Quaternary alluvium against bedrock. Although some of the transverse canyons in those areas are deeply incised with high gradients and wineglass shapes in their headwater areas, no clear pattern of aligned faceted spurs is apparent. Also, they mapped a 15-km-long major range-front fault that juxtaposes Quaternary alluvium against bedrock along the west base of Fencemaker Ridge in the northern Stillwater Range. That fault is included here with the Buena Vista Valley fault zone. dePolo (1998 #2845) indicates that the northern part of the fault is characterized by a maximum basal facet height of 98 m (73–122 m), the southern part by a height of 49 m (37–61 m), and the rangeward strand in the center of the fault zone by a height of 110 m (85–134 m). An intra basin fault in the Lovelock sheet is expressed as a southeast-facing scarp on latest Pleistocene lacustrine deposits of pluvial Lake Lahontan (Wallace and others, 1969 #3028; Slemmons, 1974, unpublished Lovelock map; Johnson, 1977

	#2569; Dohrenwend and others, 1991 #285).
Age of faulted surficial deposits	Along most of the fault zone in the Winnemucca sheet, scarps are formed on deposits or erosion surfaces estimated to be early to middle (130 ka to 1.5 Ma) Quaternary and late Pleistocene (10–130 ka) on the basis of a reconnaissance photogeologic study (Dohrenwend and Moring, 1991 #282). Latest Pleistocene (<13 ka, Adams, 1997 #3003) lacustrine deposits are offset on the floor of Buena Vista Valley (Wallace and others, 1969 #3028). Quaternary alluvium, possibly as young as late Pleistocene, is offset and juxtaposed against bedrock along the range front (Wallace and others, 1969 #3028; Johnson, 1977 #2569; Dohrenwend and others, 1991 #285).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Wallace (1979 #203) showed a clear truncation of fault scarps by shoreline scarps of the approximately 12 ka Lake Lahontan high stand (4370 ft asl) and estimated that the most recent scarp-forming event along both the East and Stillwater Ranges occurred prior to 12 ka. Pearthree (1990 #148) estimated an age of 7–20 ka for scarps along the fault zone on the basis of limited fault scarp data. Earlier, Hanks and Wallace (1985 #2503) estimated the age of the most-recent event along "beachfront fault scarps" as being 15–18 ka based on diffusion modeling of fault scarps. Although timing of that event is not well constrained, a late Quaternary age (<130 ka) is assigned, on a conservative basis. Wallace (1979 #203) noted that a short (approximately 1-km-long) west-facing scarp in Buena Vista Valley modifies the high beach line of Lake Lahontan, but its relationship to the range front fault is not known.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* dePolo (1998 #2845) reported preferred maximum reconnaissance vertical slip rates of 0.199 and 0.147 mm/yr for the main faults bounding the Sheep and Stillwater Ranges, respectively, and 0.214 mm/yr for the fault along the west base of Fencemaker Ridge (his fault WI2C). dePolo's (1998 #2845)

	assigned slip rates are 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. However, late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) suggest the slip rate during this period is of a lesser magnitude. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
Date and Compiler(s)	2000 Kenneth Adams, Piedmont Geosciences, Inc. Thomas L. Sawyer, Piedmont Geosciences, Inc. R. Ernest Anderson, U.S. Geological Survey, Emeritus
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. #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. #282 Dohrenwend, J.C., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Winnemucca 1° by 2° quadrangle, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-2175, 1 sheet, scale 1:250,000. #285 Dohrenwend, J.C., McKittrick, M.A., and Moring, B.C., 1991, Reconnaissance photogeologic map of young faults in the Lovelock 1° by 2° quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2178, 1 sheet, scale 1:250,000. #4354 Ferguson, H.G., Muller, S.W., and Roberts, R.J., 1951, Geology of the Winnemucca quadrangle, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-0011, 1 sheet, scale 1:125,000. #2503 Hanks, T.C., and Wallace, R.E., 1985, Morphologic analysis of the Lake Lahontan shoreline and beachfront fault scarps, Pershing County, Nevada: Bulletin of the Seismological

Society of America, v. 75, p. 835-846.

#2569 Johnson, M.G., 1977, Geology and mineral deposits of Pershing County, Nevada: Nevada Bureau of Mines and Geology Bulletin 89, 115 p., scale 1:250,000.

#4357 Muller, S.W., Ferguson, H.G., and Roberts, R.J., 1951, Geology of the Mount Tobin quadrangle, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-0007, 1 sheet, scale 1:125,000.

#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.

#203 Wallace, R.E., 1979, Map of young fault scarps related to earthquakes in north-central Nevada: U.S. Geological Survey Open-File Report 79-1554, 2 sheet, scale 1:125,000.

#240 Wallace, R.E., 1987, Grouping and migration of surface faulting and variations in slip rates on faults in the Great Basin province: Bulletin of the Seismological Society of America, v. 77, no. 3, p. 868-876.

#3028 Wallace, R.E., Silberling, N.J., Irwin, W.P., and Tatlock, D.B., 1969, Geologic map of the Buffalo Mountain quadrangle, Pershing and Humboldt Counties, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-821, scale 1:62,500.

#4320 Whitebread, D.H., 1994, Geologic map of the Dun Glen quadrangle, Pershing County, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-2409, 1 sheet, scale 1:48,000.