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Quaternary Fault and Fold Database of the United States

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Cortez Mountains fault zone, northeast section (Class A) No. 1157a

Last Review Date: 2000-06-15

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Synopsis	**General:** The Cortez Mountains are one of many southeast- to east-tilted ranges in north-central Nevada with precipitous west-facing bedrock escarpments that may have resulted from long-term (>1–2 m.y.) accelerated displacement during the latter part of the past 10–14 Ma. The Cortez Mountains fault zone is a major generally northeast trending basin-range fault that separates the basin beneath Crescent Valley on the northwest from the Cortez Mountains on the southeast. The northeastern part of the fault trend northerly, and has a singular fault trace that probably has not been active in the past 15 k.y. The middle part of the fault trends more westerly, and also has a singular fault trace but it clearly displaces middle Holocene sediment. A paleoseismic investigation at Fourmile Canyon suggests that the most recent faulting event along this medial part of the fault occurred at about 2.7–2.6 ka. On the basis of scarp profiling along the entire fault

	zone, the last surface-faulting event was estimated to have produced a mean normal-sense offset of 2.7 m about 3 k.y. ago, which compares well with the preliminary paleoseismic data. The southwestern part of the fault is less conspicuous, but its multiple traces are estimated to have been active in the past 130 k.y. (late Quaternary). **Sections:** This fault has 3 sections. The Cortez Mountains fault zone is herein divided into sections based on abrupt changes in trend and/or shape of the fault trace as well as estimated age of the last surface faulting event (Wallace, 1979 #203). Preliminary results from an ongoing paleoseismic investigation appear to substantiate this partitioning of the fault zone.
Name comments	**General:** Name from dePolo (1998 #2845) who applied it to the main range-bounding fault at the northwestern base of the Cortez Mountains. The fault separates the uplifted Cortez Mountains from the basin beneath Crescent Valley and extends southwest to the northernmost flank of the Toiyabe Range and northeast to the narrow north-northeast-trending, northernmost part of the Cortez Mountains. The feature was referred to as the "northwest flank Cortez Mountains scarps" by Wallace (1979 #203). **Section:** This section extends from less than 2 km south of Interstate Highway 80 (I-80) near the mouth of Safford Canyon in the northern Cortez Mountains south-southwest to about 1 km beyond Cave Canyon, terminating at a sharp concave-west bend in the range directly east of Frenchie Flat. Dohrenwend and Moring (1991 #282) extend a major range-bounding fault further north from McCormack Spring along the western base of Iron Blossom Mountain. They show the fault as a discontinuous trace that is not marked by scarps on Quaternary deposits or erosion surfaces. Also, Wallace (1979 #203) did not map young scarps along that trace, so it is not shown herein as part of the Cortez Mountains fault zone. **Fault ID:** Fault referred to as WI22 by dePolo (1998 #2845).
County(s) and State(s)	EUREKA COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale.

	Comments: Fault trace taken from 1:125,000-scale map of young fault scarps by Wallace (1979 #203). That map is based mostly on photogeologic and field mapping on 1:60,000-scale aerial photos transferred to 1:62,500-scale topographic maps.
Geologic setting	The Cortez Mountains are one of many southeast- to east-tilted ranges in central Nevada (Wallace, 1979 #203). The Cortez Mountains fault zone is a major basin-range fault that separates the basin beneath Crescent Valley on the northwest from the Cortez Mountains on the southeast. Wallace (1978 #2648) concluded that formation of the precipitous high bedrock escarpment along the range resulted from long-term (>1–2 m.y.) accelerated displacement during the latter part of the past 10–14 Ma. The northeast section [1604a] strikes north-northeast along the sharply defined western base of the narrow northernmost part of the Cortez Mountains. It apparently forms the eastern structural margin of a narrow eastern arm of the basin beneath Crescent Valley, which is between the Cortez Mountains and the Dry Hills. The middle section [1157b] strikes northeast and separates the main, strongly uplifted part of the Cortez Mountains from the main (broad) part of Crescent Valley. The southwest section [1157c] is marked by a convex-northwest fault along the base of the northern extreme of the very long Toiyabe Range block. It separates that block from the southern part of the basin beneath Crescent Valley and includes a group of short northeast-striking piedmont faults that are distributed west toward Red Mountain.
Length (km)	This section is 12 km of a total fault length of 63 km.
Average strike	N°15E (for section) versus N48°E (for whole fault)
Sense of movement	Normal *Comments:* Normal sense is inferred from location in an extensional tectonic province and evidence of normal faulting at one site to the south (Friedrich and others, 2004 #7770).
Dip Direction	W
Paleoseismology studies	
Geomorphic expression	The fault was mapped by Wallace (1979 #203) as having a continuous west-facing scarp at the abrupt break in slope between

	the precipitous west-facing bedrock escarpment and the piedmont slope. Dohrenwend and Moring (1991 #282) mapped the northern and southern parts of the fault as defined by scarps on Quaternary surficial deposits or erosion surfaces, and they show the main central part as a major range-front structure that typically juxtaposes Quaternary alluvium against bedrock, but which generally lacks scarps on Quaternary surficial deposits or erosion surfaces. Pearthree (1989 #238) measured 18 scarp profiles across the Cortez Mountains fault and reports a mean offset of 2.7 m. Apparently 3 of those profiles were measured across the northeast section [1157a], but the data are not analyzed separately, so it is unclear whether or not Pearthree's (1989 #238) morphometric age estimates apply to the section. dePolo (1998 #2845) reported preferred maximum basal facet heights of 134 m (110-207 m) for the Cortez Mountains fault. It is unknown along which section that measurement was made.
Age of faulted surficial deposits	On the basis of photogeologic reconnaissance of 1:58,000-nominal-scale aerial photos, Dohrenwend and Moring (1991 #282) show that most of the scarp along this section are on deposits or erosion surfaces of middle to early Pleistocene (0.13-1.6 Ma) age; at the southern end scarps are on late Pleistocene (10-130 ka) deposits or erosion surfaces.
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* On the basis of a reconnaissance investigation of field-observed scarp morphology, Wallace (1979 #203), estimated the scarps along this section to have formed in the past 2 ka. This estimate is significantly younger than estimates he made for the other two sections. Unpublished field reconnaissance by the USGS suggests that the scarps are relatively old, which contrasts with Wallace's young timing estimate. Pending further work, or publication of the USGS scarp profiles, we conservatively estimate that the most recent event is less than 130 ka.
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 0.214 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. However, the 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 R. Ernest Anderson, U.S. Geological Survey, Emeritus
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. #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. #7770 Friedrich, A.M., Lee, J., Wernicke, B.P., and Sieh, K., 2004, Geologic context of geodetic data across a Basin and Range normal fault, Crescent Valley, Nevada: Tectonics, v. 23, TC2015, doi:10.1029/2003TC001528. #238 Pearthree, P.A., Demsey, K.A., Bull, W.B., and Slaff, S., 1989, Detailed geomorphic studies of late Quaternary faulting in central Nevada: Technical report to U.S. Geological Survey, Earthquake Hazards Reduction Program, under Contract 14-0001-08-G1360, December 1989, 17 p. #2648 Wallace, R.E., 1978, Geometry and rates of change of fault-generated range fronts, north-central Nevada: Journal of Research of the U.S. Geological Survey, v. 6, no. 5, p. 637-649. #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.

Questions or comments?