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Quaternary Fault and Fold Database of the United States

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Red Rocks fault (Class B) No. 2291

Last Review Date: 1998-01-06

Compiled in cooperation with the Colorado Geological Survey

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Synopsis	The Red Rocks fault is north of and subparallel to the closely linked Cimarron fault [2290]. Both faults are part of the Laramide Red Rocks-Cimarron fault system that originated as an oblique reverse or tear fault, but had renewed late Cenozoic movement in a normal sense (Lettis and others, 1996 #4453). Geomorphic features along the fault, such as scarps, lineaments, and linear drainages, are suggestive of Quaternary movement. Lettis and others (1996 #4453) described offset of Oligocene rocks at Morrow Point, but mapping by Hansen (1971 #2695) and Steven and Hail (1989 #2747) indicated the fault does not cut the Oligocene faults in this area. Lettis and others (1996 #4453) recognized several subtle scarps on late Pleistocene deposits, but

	the origin of these scarps is not well understood. Lettis and others (1996 #4453) reported that the scarps might be of tectonic or landslide origin. A single trench was excavated across the Red Rocks fault by Lettis and others (1996 #4453) near Jones Summit. The trench exposure revealed that middle Pleistocene to Holocene deposits (200 to 9 ka) were not deformed by the Red Rocks fault. The Red Rocks fault is herein considered to be a Class B structure, because features along the fault could be interpreted as having a non-tectonic origin.
Name comments	The Red Rocks fault is a west-northwest-trending fault north of and parallel to the Cimarron fault [2290]. The fault begins in the Black Canyon of the Gunnison National Monument near the northeast end of the Bostwick Park section of the Cimarron fault [2290a]. The Red Rocks Fault trends southeastward, crossing the Black Canyon of the Gunnison twice, and ending at Fitzpatrick Mesa, near the northwestern end of the Blue Mesa section of the Cimarron fault [2290b]. **Fault ID:** Fault number Q41 of Widman and others (1998 #3441).
County(s) and State(s)	MONTROSE COUNTY, COLORADO GUNNISON COUNTY, COLORADO
Physiographic province(s)	COLORADO PLATEAUS SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* The Red Rocks fault was mapped at a scale of 1:31,680 by Hansen (1971 #2695), at 1:250,000 by Tweto and others (1976 #2774) and Lettis and others (1996 #4453), and 1:250,000 and 1:500,000 by Widmann and others (1998 #3441). Part of the fault was mapped by Steven and Hail (1989 #2747) at a scale of 1:100,000. The fault trace used herein is primarily from Lettis and others (1996 #4453).
Geologic setting	The Laramide-age Red Rocks-Cimarron fault system originated as an oblique-reverse fault or tear fault and was reactivated during the late Cenozoic as a normal fault system (Lettis and others, 1996 #4453). The Red Rocks fault is north of and parallel to the Cimarron fault [2990]. The Red Rocks fault is a high-angle fault near the surface and in exposures within the Black Canyon of the

	Gunnison. Stratigraphic offset across the fault indicates Laramide reverse movement on a possible tear fault downthrown to the southwest (Hansen, 1971 #2695). Hansen (1971#2695) reported as much as 200 m of reverse displacement and as much as 5.5 km of left-lateral slip. Possible reactivation of the fault during the late Cenozoic is down to the northeast in a normal sense (Lettis and others, 1996 #4453). The Red Rocks fault is closely linked to the Cimarron fault. Lettis and others (1996 #4453) showed both faults as flattening at depth and merging in a blind thrust fault. The Red Rocks fault is subparallel to the Bostwick Park [2290a] and Poverty Mesa [2290b] sections of the Cimarron fault, both of which are suspected Quaternary (Class B) faults.
Length (km)	38 km.
Average strike	N59°W
Sense of movement	Normal *Comments:* Although the fault originated as a Laramide reverse or tear fault, late Cenozoic movement on the fault has been normal (Lettis and others, 1996 #4453).
Dip	75°-90° NE *Comments:* Hansen (1971 #2695) showed this fault as northeast dipping and steepening with depth. Lettis and others (996 #4453) also indicated the fault is northeast-dipping, but believed it flattens at depth and merges with a lateral ramp in a blind thrust fault.
Paleoseismology studies	Jones Draw (JDT1) site 2291-1. Lettis and others (1996 #4453) conducted a trenching investigation across the Red Rocks fault in Jones Draw, near Jones Summit at the northwest end of the fault. Trench revealed a 5-m-wide fault zone in Precambrian rocks that dipped steeply to the northeast. Holocene alluvial and colluvial deposits, latest Pleistocene alluvial and colluvial deposits, and scarp-derived deposits of latest Pleistocene to Holocene age were undeformed by the fault. Charcoal in undeformed beds was dated at 9-11 ka, indicating that no faulting has occurred during the Holocene.
Geomorphic expression	The fault lies in the linear stream valley of Jones Draw. A prominent 300-m-high, southwest-facing bedrock escarpment,

	subtle scarps, and vegetation lineaments are present along parts of the fault (Lettis and others, 1996 #4453).
Age of faulted surficial deposits	Mapping by Hansen (1971 #2695), Tweto and others (1976 #2774), and Steven and Hail (1989 #2747) indicated the middle Tertiary volcanic rocks at Morrow Point conceal the fault.
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Quaternary deposits exposed in a trench excavated by Lettis and others (1996 #4453) are not offset by the Red Rocks fault. However, geomorphic features such as scarps, lineaments, and linear drainages suggest possible Quaternary movement (Lettis and others, 1996 #4453). Scarps are present on late Pleistocene to Holocene (?) deposits along the fault, but they may be the result from either tectonism or landsliding. On the basis of field and trenching investigations, Lettis and others (1996 #4453) concluded that the scarps were due to mass movement, but did not rule out the possibility of tectonic movement. The Red Rocks fault is herein considered a Class B structure.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Widmann and others (1998 #3441) placed the Red Rocks fault within the <0.2 mm/yr slip-rate category.
Date and Compiler(s)	1998 Beth L. Widmann, Colorado Geological Survey
References	#2695 Hansen, W.R., 1971, Geologic map of the Black Canyon of the Gunnison River and vicinity, western Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations I-584. #4453 Lettis, W., Noller, J., Wong, I., Ake, J., Vetter, U., and LaForge, R., 1996, Draft report, Seismotectonic evaluation of Colorado River storage project-Crystal, Morrow Point, Blue Mesa dams, Smith Fork project-Crawford dam, west-central Colorado: Technical report to U.S. Bureau of Reclamation, Denver, Colorado, 177 p.

	#2747 Steven, T.A., and Hail, W.J., Jr., 1989, Geologic map of the Montrose 30' x 60' quadrangle, southwestern Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations I-1939. #2774 Tweto, O., Steven, T.A., Hail, W.J., Jr., and Moench, R.H., 1976, Preliminary geologic map of the Montrose 1° x 2° quadrangle, southwestern Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-761. #3441 Widmann, B.L., Kirkham, R.M., and Rogers, W.P., 1998, Preliminary Quaternary fault and fold map and database of Colorado: Colorado Geological Survey Open-File Report 98-8, 331 p., 1 pl., scale 1:500,000.