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Quaternary Fault and Fold Database of the United States

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Cimarron fault, Poverty Mesa section (Class B) No. 2290b

Last Review Date: 1997-11-17

Compiled in cooperation with the Colorado Geological Survey

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Synopsis	**General:** The west-northwest trending Cimarron fault and adjacent Red Rocks fault [2291] are on the southwest side of the Laramide Gunnison Uplift. The following is summarized from Lettis and others (1996 #4453). The Cimarron fault consists of four fault sections: from west to east they are the Bostwick Park, Poverty Mesa, Blue Mesa, and Powderhorn sections. The Poverty Mesa section [2290b] probably moved during the late Quaternary. The Bostwick Park [2290a] and Blue Mesa sections [2290c] are suspected of Quaternary movement. The Powderhorn section is suspected only of late Cenozoic movement, and is not discussed

	further in this database. The Bostwick Park section [2290a] is marked by a series of scarps of unknown origin. **Sections:** This fault has 3 sections. The fault was described as segmented by Lettis and others (1996 #4453), but their studies were not extensive. The Cimarron fault is divided into four sections, three of which show evidence of Quaternary movement. They include from west to east the Bostwick Park section [2290a], the Poverty Mesa section [2290b], and the Blue Mesa section [2290c]. The fourth section, the Powderhorn section, may have moved during the late Tertiary movement, but lacks evidence for Quaternary movement. Therefore is not discussed herein.
Name comments	**General:** The Cimarron fault is a west-northwest-striking fault between Montrose and Blue Mesa Reservoir. The western end of the fault is parallel to State Highway 50 and the Gunnison River. The fault extends from the Black Canyon of the Gunnison National Monument, continues southeast past Powderhorn and Iron Hill, and terminates south of the southeastern end of Huntsman Mesa. **Section:** Lettis and others (1996 #4453) referred to this section as the Poverty Mesa segment of the Cimarron Fault. The Poverty Mesa section extends for about 23 km from the west end of Poverty Mesa to Stump Creek. **Fault ID:** Fault number Q40b 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 Poverty Mesa section was mapped at a scale of 1:31,680 by Hansen (1971 #2695), 1:24,000 and 1:250,000 by Lettis and others (1996 #4453), 1:100,000 by Steven and Hail (1989 #2747), 1:250,000 by Tweto and others (1976 2774), and 1:250,000 and 1:500,000 by Widmann and others (1998 #3441). The trace used herein is from Lettis and others (1996 #4453).

Geologic setting	The Cimarron fault [2290] and associated Red Rocks fault [2291] are on the southwest margin of the Laramide-age Gunnison Uplift. The Cimarron fault is a high-angle, northeast-dipping reverse fault that was reactivated during the late Cenozoic as a down-to-the-northeast normal or oblique-slip structure (Hansen, 1971 #2695; Lettis and others, 1996 #4453). Based on geologic relationships exposed at the surface, Lettis and others (1996 #4453) suggested the Cimarron fault may merge with the Red Rocks fault at a depth of 5–9 km and then flatten to merge with a blind thrust or detachment at a depth of 8–10 km. Hansen (1971#2695) reported 5.5 km of left-lateral Laramide-age displacement across the fault. Bostwick Park is underlain by as much as 50 m of Quaternary deposits that include the Lava Creek B ash, dated at 620 ka (Hansen, 1971 #2695; Lettis and others, 1996 #4453).
Length (km)	This section is 23 km of a total fault length of 57 km.
Average strike	N58°W
Sense of movement	Normal *Comments:* The Poverty Mesa section of the Cimarron Fault is a northeast-dipping fault with reverse movement during the Laramide (Hansen, 1971 #2695) and normal movement during the late Cenozoic (Lettis and others, 1996 #4453).
Dip	65–70° NE *Comments:* The fault trace is fairly linear as it crosses valleys and ridges, suggesting the fault plane is steep. A cross section by Hansen (1971#2695) showed a dip of about 70° to the north-northeast for the Poverty Mesa section.
Paleoseismology studies	Lettis and others (1996 #4453) conducted paleoseismic investigations in four trenches that they labeled CST-1 through CST-4, located at the Curecanti site (their site 12) southeast of the town of Cimarron. The location of these trenches is generalized and represented by a single site labeled 2290-1 on the accompanying map for this database. Curecanti site (2290-1). The trenches cross an approximately 200-m-long northeast-facing scarp that is about 8 m high, and a linear trough between the uphill-facing scarp and the southwest-facing escarpment or mountain front. Trench logs are included in Lettis

and others (1996 #4453), but the trenches were not described individually. They presented a geologic summary based on the combined findings in the four trenches:

1. Deposition of late Pleistocene colluvium on a hillslope.

2. Formation of an argillic (Bt) soil horizon

3. Development of the scarp and back-tilting of Pleistocene deposits toward the axis of the trough.

4. Deposition of undeformed Holocene colluvial and fluvial sediments in the trough.

Lettis and others (1996 #4453) concluded that the uphill-facing scarp at their site 12 is 50–100 ka, but is probably not tectonic in origin. Formation of the scarp was attributed to slope failure based on the following:

1. Most scarps in this area were discontinuous, were within or adjacent to landslides, and varied in height.

2. Uphill-facing scarps were concentrated in a 10-km-long reach that was coincident with the steepest part of the range-front escarpment in an area of extensive slope failure in the Mancos Shale.

3. There was no evidence for brittle faulting or shearing in Pleistocene or Holocene deposits, only of warping of late Pleistocene deposits.

4. The scarp formed during a discrete time period (between 100–400 ka and 8 ka), which suggested a single-event landslide origin rather than a multiple-event tectonic origin.

5. A single-event tectonic origin would require about a magnitude 8 earthquake to produce the 8-m-high scarp. Such a large earthquake is unlikely for a relatively short, 23-km-long section of fault. If the scarps resulted from multiple events, they would have clustered during the late Pleistocene with no evidence of prior or subsequent earthquakes.

6. No evidence of fault offset was observed in Pleistocene terraces along Stumpy Creek at the southern end of the Poverty Mesa section.

	7. The landslide-prone Mancos Shale is in fault contact with Precambrian crystalline rocks. The scarps may represent extensional pull-away zones that create linear troughs in the Mancos Shale along the contact. Factors favorable to a tectonic interpretation included: 1. The scarps are linear, not arcuate, in plan view. 2. The scarps lie along the range front and generally coincide with the bedrock trace of the Cimarron fault [2290]. 3. The absence of well-preserved landslide morphology that is as prominent as the scarps. 4. Scarps extend well beyond the boundaries of observed landslides.
Geomorphic expression	A prominent south-facing, 300-m-high escarpment, numerous north- or uphill-facing, 5- to 20-m-high scarps on Quaternary deposits, vegetation lineaments, and ponded sediments are present along the Poverty Mesa section of the fault (Lettis and others, 1996 #4453). The high south-facing escarpment is either a fault-line scarp or the headscarp of a landslide. The small uphill-facing scarps are of tectonic or slope failure origin (Lettis and others, 1996 #4453).
Age of faulted surficial deposits	Quaternary landslide deposits and middle to late Pleistocene colluvium (50–100 ka) are broken by or warped across the fault, although this deformation may not be tectonic in origin. Holocene deposits are not offset (1996 #4453).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* The scarp at Lettis and others (1996) site 11 was considered to be a possible tectonic feature based on offset of the toe of a landslide, ponded sediment, and extension of the scarp and lineaments beyond the margins of the landslide. The most recent movement on the fault at site 11 occurred during the middle or late Pleistocene, at least 50,000–100,000 yr BP. Trench investigations at the Curecanti site (site 12) supported a non-tectonic landslide origin for the scarp in that area, although a

	tectonic origin could not be discounted. The most recent movement on the faults in the Curecanti trench site folded late Pleistocene deposits; early Holocene deposits were apparently unaffected by the feature.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Widmann and others (1998 #3441) placed this section of the Cimarron fault within the <0.2 mm/yr slip-rate category based on a maxium scarp height of 35 m and an average scarp age of 150 ka (Lettis and others, 1996 #4453).
Date and Compiler(s)	1997 Beth L. Widmann, Colorado Geological Survey
References	#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.

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