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Quaternary Fault and Fold Database of the United States

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Cimarron fault, Blue Mesa section (Class B) No. 2290c

Last Review Date: 1997-11-17

Compiled in cooperation with the Colorado Geological Survey

citation for this record: **Widmann, B.L., compiler, 1997, Fault number 2290c, Cimarron fault, Blue Mesa section, 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 03:02 PM.**

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 Blue Mesa segment of the Cimarron fault. As discussed previously, fault segments described by Lettis and others (1996 #4453) are herein refered to as sections. The Blue Mesa section extends for about 22 km from Fitzpatrick Mesa to Gateview and includes a 1-km-wide graben formed in middle Tertiary volcanic rocks (Hansen, 1971 #2695; Tweto and others, 1976 #2774; Steven and Hail, 1989 #2747; Lettis and others, 1996 #4453). **Fault ID:** Fault number Q40b of Widman and others (1998 #3441).
County(s) and State(s)	GUNNISON COUNTY, COLORADO
Physiographic province(s)	SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* The Blue 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), 1:250,000 and 1:500,000 by Widmann and others (1998 #3441), 1:500,000 by Kirkham and Rogers (1981 #792), and 1:1,000,000 by Colman (1985 #1953). Part of this section was also mapped at 1:24,000 by Olson and Hedlund (1973 #2728). 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 22 km of a total fault length of 57 km.
Average strike	N63°W
Sense of movement	Normal *Comments:* Lettis and others (1996 #4453) suggested normal movement on the Cimarron fault during the late Cenozoic.
Dip	60° - 75° NE *Comments:* A cross section by Hansen (1971 #2695) showed a dip of 65? to 70? NE for the fault that forms the southern margin of the graben.
Paleoseismology studies	Lettis and others (1996 #4453) excavated three trenches across the Blue Mesa section near Willow Creek Mesa. Two trenches (their WCT-1 and WCT-3) are on prominent northeast-facing scarps, and one trench (their WCT-2) is on a more subtle, southwest-facing scarp and vegetation lineament. These trenches are designated 2290-2 through 2290-4 herein.

	Site 2290-2 (WCT-1): A fault in Oligocene volcanic rocks was exposed in this trench. The fault was overlain by 1.5 m of scarp-derived colluvium that contains two buried argillic Bt soil horizons. No evidence of faulting was noted in the colluvium or buried soils, although the lower buried soil terminated above the fault and could potentially be truncated by the fault. Site 2290-3 (WCT-2): This trench exposed coarse-grained fluvial deposits overlying middle Tertiary volcanic tuff. The tuff extended across the lineament "without apparent vertical separation". The lineament and scarp at this location "coincide with a large channel margin of coarse Quaternary fluvial deposits that are inset into the volcanic bedrock". Lettis and others (1996 #4453) concluded that the lineament and scarp were non-tectonic in origin. Site 2290-4 (WCT-3): A thick sequence of Quaternary colluvial and fluvial deposits overlying middle Tertiary volcanic rocks was exposed in this trench. A prominent shear plane was noted at the contact between the Quaternary deposits and bedrock, and the older Quaternary deposits are warped and back-tilted against the fault. The youngest tilted bed yielded an age of 33,400 14C yr BP. The shear plane dips gently at the base of the trench and steepens near the surface. Striations on the shear plane indicated nearly pure dip slip. Lettis and others (1996 #4453) attributed the Quaternary deformation to landsliding.
Geomorphic expression	The Blue Mesa section of the Cimarron fault includes a 1-km-wide graben with low relief. The drainage system within the graben is poorly integrated into the local, well-integrated drainage system (Lettis and others, 1996 #4453). The most prominent geomorphic evidence of young activity was noted in an area west of the trench sites, but Lettis and others (1996 #4453) were unable to get permission to work on the property.
Age of faulted surficial deposits	Middle Tertiary volcanic rocks are offset by the graben faults. Late Pleistocene sediment is back-tilted against the fault, and a basal slip plane was encountered in trenches. A landslide origin was postulated for these features (Lettis and others, 1996 #4453).
Historic earthquake	
Most recent prehistoric	undifferentiated Quaternary (<1.6 Ma)

deformation	*Comments:* Based on their trenching investigations, Lettis and others (1996 #4453) attributed Quaternary deformation along the Blue Mesa section of the Cimarron fault to landsliding. The poorly integrated drainage within the graben, however, is suggestive of Quaternary activity.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Scarp height on late Plesitocene deposits was not reported by Lettis and others (996 #4453). Based on slip rates calculated for other sections of the Cimaron fault, Widmann and others (1998 #3441) placed the Blue Mesa section within the <0.2 mm/yr slip-rate category.
Date and Compiler(s)	1997 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. #2728 Olson, J.C., and Hedlund, D.C., 1973, Geologic map of the Gateview quadrangle, Gunnison County, Colorado: U.S. Geological Survey Geologic quadrangle Map GQ-1071. #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. #2775 Unruh, J.R., Noller, J.S., Lettis, W.R., Sawyer, T.L., and

	Bott, J.D.J., 1993, Quaternary faults of the central Rocky Mountains, Colorado—A new seismotectonic evaluation: Geological Society of America Abstracts with Programs, v. 25, no. 5, p. 1. #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.