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Quaternary Fault and Fold Database of the United States

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Northern Sangre de Cristo fault, Blanca section (Class A) No. 2321c

Last Review Date: 2012-01-13

Compiled in cooperation with the Colorado Geological Survey

citation for this record: **Kirkham, R.M., compiler, 2012, Fault number 2321c, Northern Sangre de Cristo fault, Blanca 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 03:00 PM.**

Synopsis	**General:** The Northern Sangre de Cristo fault is a major down-to-west normal fault within the Rio Grande rift in Colorado. This high-angle normal fault dips to the west and forms the structural boundary between the Sangre de Cristo Range/Culebra Range on the east and the San Luis basin. The San Luis basin is the largest of the major north-trending extensional basins of the northern Rio Grande rift. The fault extends from Poncha Pass to near the Colorado-New Mexico state line. **Sections:** This fault has 4 sections. The Northern Sangre de

	Cristo fault is divided into sections based on mountain-front and fault-scarp morphology for the purpose of this compilation. The entire fault shows evidence that suggests multiple late Quaternary surface displacements, including Holocene movement. The following sections from north to south are: the Crestone section, the Zapata section, the Blanca section, and the San Luis section; these three segments are herein called sections. A fourth section (San Luis) extends generally southward from the south side of the Blanca Peak Massif to Jarosa Creek near the Colorado-New Mexico state line.
Name comments	**General:** The Sangre de Cristo fault zone borders the eastern side of San Luis basin from near Poncha Pass, Colorado, to near Taos, New Mexico. This fault zone has been subdivided into two discrete faults for this compilation: the Northern Sangre de Cristo fault, which bounds the west side of the Sangre de Cristo Mountains in Colorado and the Southern Sangre de Cristo fault, which is in New Mexico. Ruleman and Machette (2007 #7165), Ruleman and others (2008 #7286), and Crone and others (2006 #7753) suggest the geomorphology of the Northern Sangre de Cristo fault and the adjacent range front indicate differing amounts of offset and different faulting histories north of Blanca Peak massif in contrast to the San Luis section defined here, which they prefer to call the Central Sangre de Cristo fault zone. **Section:** The name of this section was assigned during this compilation by Widmann and others (1998 #3441). The Blanca section coincides with segment 'C' of McCalpin (1982 #791), which extends from Hobrook Creek eastward around the south flank of the Blanca Peak massif. The Blanca section of the fault is marked by a prominent graben with scarps as much as 28.3 m high. **Fault ID:** Fault number Q69d of Widman and others (1998 #3441); fault 116 in Kirkham and Rogers (1981 #792); fault 131 in Witkind (1976 #2792); fault 3 of Colman (1985 #1953).
County(s) and State(s)	COSTILLA COUNTY, COLORADO
Physiographic province(s)	SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:125,000 scale.

	Comments: The fault was mapped by McCalpin (1982 #791; scale 1:50,000), Colman and others (1985 #1954; scale 1:125,000), and Kirkham and Rogers (1981 #792; scale 1:500,000). The trace used for this compilation is from Colman and others (1985 #1954).
Geologic setting	The Northern Sangre de Cristo fault is a major down-to-west normal fault within the Rio Grande rift. It forms the eastern boundary of the east-tilted half-graben of San Luis basin. The deepest part of San Luis basin lies adjacent to the Northern Sangre de Cristo fault (Gaca and Karig, 1965 #2690). Estimates of the maximum thickness of synorogenic basin fill in that part of San Luis basin have widely ranged. Gaca and Karig (1965 #2690) suggested a maximum thickness of about 9.7 km; Huntley (1976 #2698; 1976 #2699) reported it at about 5 km; Stoughton (1977 #2750) at 6,000 m; and Kluth and Schaftenaar (1994 #1183) at 6.4 km. Estimates of the amount of vertical displacement on the Northern Sangre de Cristo fault also vary widely. Kluth and Schaftenaar (1994 #1183) suggested the Northern Sangre de Cristo fault has approximately 9.2 km of vertical separation; geophysical data suggest that total Neogene throw on the Northern Sangre de Cristo fault is at least 4 km (Brister and Gries, 1994 #1178).
Length (km)	This section is 2 km of a total fault length of 164 km.
Average strike	N58°W (for section) versus N19°W,N35°E (for whole fault)
Sense of movement	Normal
Dip Direction	SW *Comments:* This section of the Northern Sangre de Cristo fault dips to the south, but the amount of dip is unknown.
Paleoseismology studies	
Geomorphic expression	A prominent 2.1-km-long graben with scarps ranging from 3.2-28.3 m high is preserved on glacial and alluvial deposits of five ages along the Blanca section (McCalpin, 1981 #2723; 1982 #791). The graben is within 200 m of the range front. The high, south-facing scarp exaggerates most of the net throw across the graben (McCalpin, 1981 #2723; 1982 #791). McCalpin (1981

	#2723; 1982 #791) measured several scarp profiles on this section, but no trenching investigations were conducted.
Age of faulted surficial deposits	Deposits related to the middle to late Pinedale to Bull Lake glaciations are displaced by the graben-forming faults of the Blanca section.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* McCalpin (1981 #2723; 1982 #791) reported that deposits related to the middle to late Pinedale to Bull Lake glaciations are displaced by the graben-forming faults. This implies that the last movement was post-glacial (<15 ka).
Recurrence interval	25.0 k.y. *Comments:* McCalpin (1981 #2723; 1982 #791) reported a recurrence interval about 25 k.y. for this section, which is roughly twice as long as the recurrence interval for the Crestone and Zapata sections. McCalpin also suggested that the recurrence interval for the Blanca section was significantly longer (47.5 k.y. and 46.0 k.y.) during Pinedale to Bull Lake and pre-Bull Lake times, respectively.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Widmann and others (1998 #3441) placed this section of the fault within the <0.2 mm/yr slip-rate category.
Date and Compiler(s)	2012 Robert M. Kirkham, Colorado Geological Survey
References	#1953 Colman, S.M., 1985, Map showing tectonic features of late Cenozoic origin in Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations I-1566, 1 sheet, scale 1:1,000,000. #1954 Colman, S.M., McCalpin, J.P., Ostenaa, D.A., and Kirkham, R.M., 1985, Map showing upper Cenozoic rocks and deposits and Quaternary faults, Rio Grande Rift, south-central Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations I-1594, 2 sheets.

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#2703 Jack Benjamin & Associates and Geomatrix Consultants, 1996, Probabilistic seismic hazard assessment for the U.S. Army chemical disposal facility, Pueblo Depot Activity, Colorado: Technical report to Science Applications International Corporation, Maryland, under Contract JBA 148-130-PU-002.

#7813 Johnson, B.R., and Bruce, R.M., 1991, Reconnaissance geologic map of parts of the Twin Peaks and Blanca Peak quadrangles, Alamosa, Costilla, and Huerfano Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-2169, scale 1:24,000.

#792 Kirkham, R.M., and Rogers, W.P., 1981, Earthquake potential in Colorado: Colorado Geological Survey Bulletin 43, 171 p., 3 pls.

#1183 Kluth, C.F., and Schaftenaar, C.H., 1994, Depth and geometry of the northern Rio Grande rift in the San Luis Basin, south-central Colorado, *in* Keller, G.R., and Cather, S.M., eds., Basins of the Rio Grande rift—Structure, stratigraphy, and tectonic setting: Geological Society of America Special Paper 291, p. 27-37.

#2723 McCalpin, J., 1981, Quaternary geology and neotectonics of the west flank of the northern Sangre de Cristo Mountains, south-central Colorado: Golden, Colorado School of Mines,

	unpublished Ph.D. dissertation, 287 p. #791 McCalpin, J.P., 1982, Quaternary geology and neotectonics of the west flank of the northern Sangre de Cristo Mountains, south-central Colorado: Colorado School of Mines Quarterly, v. 77, no. 3, p. 1-97. #7252 Ruleman, C., and Machette, M., 2007, An overview of the Sangre de Cristo fault system and new insights to interactions between Quaternary faults in the northern Rio Grande rift, in Machette, M.N., Coates, M.M., and Johnson, M.L., eds., 2007 Rocky Mountain Section Friends of the Pleistocene field trip—Quaternary geology of the San Luis Basin of Colorado and New Mexico, September 7–9, 2007: U.S. Geological Survey Open-File Report 2007-1193, p. 187–197. #2750 Stoughton, D., 1977, Interpretation of seismic reflection data from the San Luis Valley, south-central Colorado: Golden, Colorado School of Mines, M.S. thesis T-1960, 100 p. #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. #2792 Witkind, I.J., 1976, Preliminary map showing known and suspected active faults in Colorado: U.S. Geological Survey Open-File Report 76-154.