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Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

Mesita fault (Class A) No. 2015

Last Review Date: 2016-06-23

Compiled in cooperation with the New Mexico Bureau of Geology & Mineral Resources and the Colorado Geological Survey

citation for this record: **Kelson, K.I., Personius, S.F., and Jochems, A.P., compilers, 2016, Fault number 2015, Mesita fault, 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 02:23 PM.**

Synopsis	The Mesita fault is a north-striking, down-to-the-west normal fault within the southern San Luis basin 7–14 km west of the Southern Sangre de Cristo fault [2017]. In southern Colorado, the fault forms prominent topographic scarps less than 1.5 m high on latest Pleistocene alluvium, 8 m high on middle Pleistocene alluvium, and 8–10 m high on Pliocene (?) basalt. In New Mexico, the fault is marked by 2- to 5-m-high scarps on middle to late (?) Pleistocene alluvium.
Name	The north-trending Mesita fault was mapped by Colton (1976

comments	#1136) and Thompson and Machette (1989 #1382) in southern Colorado and by Machette and Personius (1984 #1113) and Thompson and others (2014 #7542) in northern New Mexico. The fault name was first used by Kirkham and Rogers (1981 #792) and is derived from Mesita Hill, a prominent early Pleistocene cinder cone offset by the fault in southern Colorado (Appelt, 1998 #7540; Thompson and others, 2007 #7541). The fault extends from the eastern flank of Ute Mountain in New Mexico north to about 5 km north of Mesita cone in southern Colorado. The southern end of the fault is about 4 km east of Ute Mountain, and the fault crosses the New Mexico-Colorado border about 7 km north-northeast of Ute Mountain. **Fault ID:** The Mesita fault is fault number 108 of Kirkham and Rogers (1981 #792), fault number 189 of Witkind. (1976 #2792), and fault number Q72 of Widman and others (1998 #3441).
County(s) and State(s)	COSTILLA COUNTY, COLORADO TAOS COUNTY, NEW MEXICO
Physiographic province(s)	SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:24,000 and 1:250,000 scale. *Comments:* The fault trace in Colorado was compiled from 1:50,000-scale mapping of Thompson and Machette (1989 #1382) and 1:24,000-scale mapping of Thompson and others (2014 #7542) in New Mexico, including several lineations near the southern end of the fault determined from aeromagnetic data. Parts of the fault have also been mapped at scales of 1:125,000 by Colman and others (1985 #1954), 1:250,000 by Colton (1976 #1136), 1:500,000 by Witkind (1976 #2792), 1:500,000 by Kirkham and Rogers (1981 #792), 1:1,000,000 by Colman (1985 #1953), and 1:5,000,000 by Howard and others (1978 #312).
Geologic setting	The west-down Mesita fault lies within the southern San Luis Basin, and is parallel to the rift-margin Southern Sangre de Cristo fault [2017] to the east.
Length (km)	29 km.
Average strike	N1°E
Sense of	Normal

movement	Normal
Dip Direction	W *Comments:* No structural data have been published for the Mesita fault, so down-dip fault geometry is unknown.
Paleoseismology studies	
Geomorphic expression	The Mesita fault has prominent geomorphic expression along most of its mapped length. The fault displaces the early Pleistocene Mesita volcanic cone in southern Colorado, and crosses Pleistocene alluvium on the floor of the San Luis basin in Colorado and northern New Mexico. There have been no detailed investigations along the Mesita fault, although Machette and Personius (1984 #1113), Personius and Machette (1984 #1124), and Thompson and Machette (1989 #1382) measured fault scarp profiles and reported morphometric data for the fault.
Age of faulted surficial deposits	In Colorado, total displacements across the Mesita fault are 15–30 m in Pliocene Servilleta Basalt (Burroughs, 1978 #1381), 8–13 m in early Pleistocene Andesite of Mesita Hill (Kirkham and Rogers, 1981 #792; Thompson and Machette, 1989 #1382), 8 m in middle Pleistocene (200–600 ka) alluvium, 2–3 m in middle and late Pleistocene (125–150 ka) alluvium, and about 1.5 m in younger Pleistocene (15–25 ka) alluvium (Thompson and Machette, 1989 #1382). The Andesite of Mesita Hill yielded an $^{40}Ar/^{39}Ar$ age of 1.03 ± 0.01 Ma (Appelt, 1998 #7540; Thompson and others, 2007 #7541). In New Mexico, the fault is marked by 2- to 5-m-high scarps on middle to late (?) Pleistocene alluvium (Machette and Personius, 1984 #1113; Personius and Machette, 1984 #1124; Thompson and others, 2014 #7542). The fault is buried by Holocene alluvium at Costilla Creek in southern Colorado (Thompson and Machette, 1989 #1382).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* The most recent event post-dates middle to late (?) Pleistocene alluvium in New Mexico (Machette and Personius, 1984 #1113; Personius and Machette, 1984 #1124). The fault is buried by Holocene (<10 ka) alluvium in Colorado (Thompson and Machette, 1989 #1382).

Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Personius and Machette (1984 #1124) noted that the Mesita fault has displaced late Pleistocene (>25 to 130 ka) alluvium approximately 2–5 m in New Mexico. In southern Colorado, the fault offsets latest Pleistocene (15–25 ka) deposits about 1.5 m and middle Pleistocene (200–600 ka) deposits about 8 m (Thompson and Machette, 1989 #1382). These data suggest the slip rate is less than 0.2 mm/yr.
Date and Compiler(s)	2016 Keith I. Kelson, William Lettis & Associates, Inc. Stephen F. Personius, U.S. Geological Survey Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources
References	#7540 Appelt, R.M., 1998, $^{40}Ar/^{39}Ar$ geochronology and volcanic evolution of the Taos Plateau volcanic field, northern New Mexico and southern Colorado: Socorro, New Mexico Institute of Mining and Technology, unpublished M.S. thesis, 58 p. #1381 Burroughs, R.L., 1978, Northern rift guide 2, Alamosa, Colorado-Santa Fe, New Mexico—Alamosa to Antonito, Colorado, *in* Hawley, J.W., ed., Guidebook to Rio Grande rift in New Mexico and Colorado: New Mexico Bureau of Mines and Mineral Resources Circular 163, p. 33-36. #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. #1136 Colton, R.B., 1976, Map showing landslide deposits and late Tertiary and Quaternary faulting in the Fort Garland-San Luis

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	M.L., eds., 2007 Rocky Mountain Section of the Friends of the Pleistocene field trip—Quaternary geology of the San Luis Basin of Colorado and New Mexico: U.S. Geological Survey Open-File Report 2007-1193, p. 169–179, http://pubs.usgs.gov/of/2007/1193/. #2792 Witkind, I.J., 1976, Preliminary map showing known and suspected active faults in Colorado: U.S. Geological Survey Open-File Report 76-154.