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Quaternary Fault and Fold Database of the United States

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Mud Springs fault (Class A) No. 2101

Last Review Date: 2016-02-09

Compiled in cooperation with the New Mexico Bureau of Geology & Mineral Resources

citation for this record: **Machette, M.N., and Jochems, A.P., compilers, 2016, Fault number 2101, Mud Springs 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 02:21 PM.**

Synopsis	Very little work has been done on the Mud Springs fault. It is a concave-to-the-east, down-to-the-west normal fault that uplifts the Mud Springs Mountains to the east and downdrops the Palomas Basin to the west. To the north, the fault forms conspicuous scarps on the nearly featureless Cuchillo surface, but the fault is concealed along the west margin of the Mud Springs Mountains. The most recent movement along most of the fault is poorly documented, but it has been active in the middle or late Quaternary where it crosses the Cuchillo surface.
Name comments	Kelley and Silver (1952 #1072) suggested the presence of the Mud Springs fault and showed it as a concealed structure on their

	map of the Caballo Mountains and surrounding area. They named it for the Mud Springs Mountains, which are due west of Truth or Consequences, New Mexico. The fault extends from the Rio Grande on the south, northwest and north around the west margin of the Mud Springs Mountains and north across the Cuchillo surface and Cañada Alamosa (Cikoski and Koning, 2013 #7354), northwest of Truth or Consequences. Recent mapping by Jochems and Koning (2015 #735448) suggests that the fault continues southeast toward the Rio Grande and merges with the Williamsburg section of the Caballo fault [2088a] (Machette, 1987 #960). **Fault ID:** Referred to as fault 5 on fig. 1 in Machette (1987 #960)
County(s) and State(s)	SIERRA COUNTY, NEW MEXICO
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Location of fault is from unpublished 1:24,000-scale mapping used to compile fig. 1 in Machette (1987 #960) in addition to recent mapping by Cikoski and Koning (2013 #7354) and Jochems and Koning (2015 #7348). The fault has also been shown (somewhat differently) on the 1:24,000-scale geologic map of the Cuchillo 7.5-minute quadrangle (Maxwell and Oakman, 1990 #1145). Where concealed on the west side of the Mud Springs Mountains, the digitized trace reflects the original compilation at 1:100,000 scale on a topographic base map.
Geologic setting	The Mud Springs fault bounds the Mud Springs Mountains, a northeast-tilted block comprised mainly of Precambrian and Paleozoic rocks. It was considered to be the east-bounding fault of the Cuchillo Negro fault zone [2104] by Machette (1987 #960). Kelley and Silver (1952 #1072) were the first to speculate on the existence of this fault, and it was later mapped by Maxwell and Oakman (1990 #1145) and Machette (1987 #960). The southern half of the fault forms discontinuous scarps north of Mud Springs Canyon and west of the Mud Spring Mountains (Koning and Jochems, unpub. mapping), but the northern part of the fault forms obvious scarps that oppose the regional east gradient of the Cuchillo surface (Cikoski and Koning, 2013 #7354). Although

	somewhat conjectural, Lozinsky (1986 #1073) showed about 2,000 m of Tertiary down-to-the-west throw on the Mud Springs fault.
Length (km)	20 km.
Average strike	N1°W
Sense of movement	Normal
Dip Direction	W *Comments:* Shown as a high-angle normal fault on schematic cross sections of Lozinsky (1987 #1268).
Paleoseismology studies	
Geomorphic expression	The fault trace is marked by 2- to 10-m-high scarps that extend from Cuchillo Negro Creek north to U.S. Interstate Highway 25, northwest of Truth or Consequences. These scarps mainly face west and have ponded or deflected local ephemeral streams. These scarps appear degraded (they have gentle slope angles), which led Machette (1987 #960) to infer a late middle Pleistocene age. However, no trenching of the fault scarps or detailed studies of the age of Quaternary deposits on the Cuchillo surface have been conducted. Along the west side of the Mud Springs Mountains, the fault does not have a noticeable surface trace, but may control a prominent north-south alignment of small ephemeral streams (Machette, 1987 #960). South of Mud Mountain, the trace of the fault turns southeast (as shown by Kelley and Silver, 1952 #1072) and forms highly discontinuous scarps, some of which offset remnants of the Cuchillo surface.
Age of faulted surficial deposits	No detailed studies of the age of Quaternary deposits along the fault have been conducted. The Cuchillo surface was considered to be middle Pleistocene by Lozinsky (1986 #1073) and Machette (1987 #960), but more recent studies by Mack and others (1993 #1020) suggested that this constructional surface may be as old as 700–900 ka, thereby providing an older maximum limit on the deformation. Hawley and Seager (p. 87 in 1978 #1272) and Machette (1987 #960) mentioned the fault cutting sediment of the upper Santa Fe Group (Camp Rice Formation) in the lower part of Mud Springs Canyon, as evidenced by gently tilted beds exposed

	in roadcuts along U.S. Interstate Highway 25. Unpublished mapping in the southern Cuchillo 7.5-minute quadrangle by Koning and Jochems confirms that the fault forms gentle, discontinuous scarps on the Cuchillo surface along the southwest flank of the Mud Springs Mountains.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* Machette (1987 #960) suggested a late middle Pleistocene age for the fault scarps based on their subdued morphology.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Low slip-rate category assigned based on 2- to 10-m-high scarps on a surface that stabilized 700–900 ka (Mack and others, 1993 #1020).
Date and Compiler(s)	2016 Michael N. Machette, U.S. Geological Survey, Retired Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources
References	#7354 Cikoski, C.T., and Koning, D.J., 2013, Geologic map of the Huerfano Hill quadrangle, Sierra County, New Mexico: New Mexico Bureau of Geology and Mineral Resources Open-File Geologic Map 243, scale 1:24,000. #1272 Hawley, J.W., compiler, 1978, Guidebook to Rio Grande rift in New Mexico and Colorado: New Mexico Bureau of Mines and Mineral Resources Circular 163, 241 p., 1 pl., scale 1:1,000,000. #7348 Jochems, A.P., and Koning, D.J., 2015, Geologic map of the Williamsburg 7.5-minute quadrangle, Sierra County, New Mexico: New Mexico Bureau of Geology and Mineral Resources Open-File Geologic Map 250, scale 1:24,000. #1072 Kelley, V.C., and Silver, C., 1952, Geology of the Caballo Mountains: University of New Mexico Publications in Geology 4, 286 p., 9 pls.

#1268 Lozinsky, R.P., 1987, Cross section across the Jornada del Muerto, Engle, and northern Palomas Basins, south-central New Mexico: New Mexico Geology, v. 9, p. 55-57 and 63.

#1073 Lozinsky, R.R., 1986, Geology and late Cenozoic history of the Elephant Butte area, Sierra County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 187, 40 p., 2 pls.

#960 Machette, M.N., 1987, Preliminary assessment of Quaternary faulting near Truth or Consequences, New Mexico: U.S. Geological Survey Open-File Report 87-652, 40 p.

#1020 Mack, G.H., Salyards, S.L., and James, W.C., 1993, Magnetostratigraphy of the Plio-Pleistocene Camp Rice and Palomas formations in the Rio Grande rift of southern New Mexico: American Journal of Science, v. 293, p. 49–77.

#1145 Maxwell, C.H., and Oakman, M.R., 1990, Geologic map of the Cuchillo quadrangle, Sierra County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ-1686, 1 sheet, scale 1:24,000.