

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](#).

Hackberry fault (Class A) No. 1997

Last Review Date: 2016-07-13

citation for this record: Cikoski, C.T., compiler, 2016, Fault number 1997, Hackberry 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 Hackberry fault is a south-striking, down-to-the-west intrabasinal normal fault in the Engle basin of the Rio Grande rift. It is subparallel to the basin-bounding Walnut Springs fault and may be a splay of the Hot Springs fault. The maximum stratigraphic offset at the surface is 60 m. The fault offsets several late Pliocene volcanic units as well as overlying Plio-Pleistocene Palomas Formation. It is unclear if the fault offsets the depositional top of the Palomas Formation. No post-Palomas units appear to be deformed by the fault, indicating that surface deformations ceased in the early or middle Pleistocene.
Name comments	Named by Cikoski (unpublished on-going mapping, release date 2017) for Hackberry Canyon, in which the fault is exposed. Previously referred to as the Hot Springs fault [2100] by Warren (1978 #1079) and Machette (1987 #960). However, the Hot Springs fault, as mapped and described by Lozinsky (1986

	#1073), juxtaposes Plio-Pleistocene Palomas Formation strata against Mesozoic and older rocks, and additionally shows evidence for Laramide strike-slip ancestry. The Hackberry fault, in contrast, is an intrabasinal structure juxtaposing Palomas Formation against itself, with a maximum stratigraphic offset at the surface of about 60 m (Cikoski, 2016 #7548). The Hot Springs-Hackberry correlation is therefore questionable.
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. <i>Comments:</i> Mapped at 1:24,000 (Cikoski, on-going mapping, release date 2017).
Geologic setting	The Hackberry fault is a generally south-striking, down-to-the-west intrabasinal structure in the Engle basin of the southern Rio Grande rift. The fault lay along the eastern side of the basin, subparallel to the basin-bounding Walnut Springs fault [2102]. At the surface, the fault juxtaposes Plio-Pleistocene Palomas Formation strata against itself, with a maximum stratigraphic offset at the surface of 60 m in the vicinity of Black Mesa (Cikoski, 2016 #7548). The fault shows evidence of syndepositional slip, as slip magnitude appears to decrease with the decreasing age of the unit that is offset. The fault cuts several basaltic flow and pyroclastic units of probable late Pliocene age, given that the nearby basalt of Mitchell Point was K-Ar dated to 3.0 ± 0.3 Ma (Bachman and Mehnert, 1978 #1265, as recalculated by Wilks and Chapin, 1997 #7549). Preliminary cross-section analyses suggests the basalt of Mitchell Point underlies the offset volcanic units (Cikoski, unpublished data). Multiple source vents lie tangential or near to the trace of the Hackberry fault, suggesting a relationship between volcanism and faulting. The fault has a sinuous trend with some apparently sharp bends; downwarping of footwall strata is apparent in the vicinity of these sharp bends. Although the fault cannot be followed into the Hot Springs fault [2100] to the south, the Hackberry fault is possibly a splay of the Hot Springs fault (Lozinsky, 1986 #1073).
Length (km)	10 km.

Average strike	N02°W
Sense of movement	Normal, Left lateral <i>Comments:</i> Mainly normal; lesser component of left-lateral slip. Striations were measured on a subparallel minor fault plane within the damage zone of the fault with rakes of 56° from the south.
Dip	70–85° W
Paleoseismology studies	
Geomorphic expression	The Hackberry fault is commonly associated with a discontinuous, west-facing topographic scarp; however, the scarp is dominantly an erosional feature associated with the uplift of erosion-resistant volcanic rocks in the footwall of the fault.
Age of faulted surficial deposits	Offset volcanic units are interpreted to be late Pliocene in age based on a 3.0 ± 0.3 Ma K-Ar age reported for the nearby basalt of Mitchell Point by Bachman and Mehnert (1978 #1265; as recalculated by Wilks and Chapin, 1997 #7549). Based on preliminary cross-sections, the basalt of Mitchell Point appears to underlie the offset volcanic units (Cikoski, unpublished data). The fault continues upsection into upper Palomas Formation strata, but it is unclear if the fault offsets the depositional top of the Santa Fe Group (700–800 ka; Mack and others, 2006 #7447), due to poor preservation and poor exposure of surface soils. No post-Santa Fe Group inset alluvium appear to be offset by the fault.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) <i>Comments:</i> No post-Santa Fe Group deposits along the trace of the fault show evidence of deformation. Therefore, surface deformations appear to have ceased after the early or middle Pleistocene.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr

Date and Compiler(s)	2016 Colin T. Cikoski, New Mexico Bureau of Geology & Mineral Resources
References	<p>#1265 Bachman, G.O., and Mehnert, H.H., 1978, New K-Ar dates and the late Pliocene to Holocene geomorphic history of the central Rio Grande region, New Mexico: Geological Society of America Bulletin, v. 89, p. 283-292.</p> <p>#7548 Cikoski, C.T., 2016, Preliminary observations of the Plio-Pleistocene development of the southern Engle basin of the Rio Grande rift [abstract]: New Mexico Geological Society, Annual Spring Meeting Abstracts with Programs, p. 15.</p> <p>#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.</p> <p>#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.</p> <p>#7447 Mack, G.H., Seager, W.R., Leeder, M.R., Perez-Arlucea, M., and Salyards, S.L., 2006, Pliocene and Quaternary history of the Rio Grande, the axial river of the southern Rio Grande rift, New Mexico, USA: Earth-Science Reviews 79, p. 141–162.</p> <p>#1079 Warren, R.G., 1978, Characterization of the lower crust-upper mantle of the Engle Basin, Rio Grande rift, from a petrochemical and field geologic study of basalts and their intrusions: Albuquerque, University of New Mexico, unpublished M.S. thesis, 156 p., 1 pl., scale 1:24,000.</p> <p>#7549 Wilks, M., and Chapin, C.E., 1997, The New Mexico geochronological database: New Mexico Bureau of Mines and Mineral Resources Digital Data Series Database DDS-1 [CD-ROM].</p>

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