

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](#).

Bosque del Apache fault (Class A) No. 2132

Last Review Date: 2016-07-14

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

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Fault number 2132, Bosque del Apache 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

The Bosque del Apache fault trends northwest across the southern Socorro basin from the Rio Grande floodplain to the Chupadera Mountains. The fault dips northeast, has normal displacement, and juxtaposes Plio-Pleistocene Sierra Ladrones Formation sediments in the hanging wall against Miocene Popotosa Formation strata in the footwall. The fault offsets post-Sierra Ladrones alluvial gravels and underlies a topographic scarp in a geomorphic surface interpreted to be late Pleistocene in age based on soil development and correlation to a ^{36}Cl -dated surface in Socorro Canyon, 14 miles to the north. A trench was dug across this fault scarp, and fault scarp sediments and soils indicate at least 2 to 3 surface-rupturing events since the abandonment of the surface.

Name comments	Named by Cikoski (2010 #7445) for the Bosque del Apache National Wildlife Refuge, where the fault is located. Likely correlates to the Mike Well fault of Cikoski (2012 #7446), described separately.
County(s) and State(s)	SOCORRO COUNTY, NEW MEXICO
Physiographic province(s)	BASIN AND RANGE
Reliability of location	<p>Good Compiled at 1:24,000 scale.</p> <p><i>Comments:</i> Fault trace from 1:24,000-scale mapping by Cikoski (2010 #7445), Chamberlin and Cikoski (2010 #7443), and unpublished mapping by the compiler. The Bosque del Apache fault projects along the southwest flank of an embayment in the Chupadera Mountains. Chamberlin and Cikoski (2010 #7443) locally mapped this embayment as fault-controlled, and it is inferred that the fault along the embayment is the continuation of the Bosque del Apache fault.</p>
Geologic setting	<p>The Bosque del Apache fault is a north-northwest-striking, down-to-the-northeast intrabasinal structure lying within the Rio Grande rift in the southern part of the topographically defined Plio-Pleistocene Socorro basin. The fault juxtaposes hanging wall Plio-Pleistocene Sierra Ladrones Formation (SLF) sediments against footwall Miocene Potosa Formation (PF) sediments, and Plio-Pleistocene sediments are entirely absent from the immediate footwall of the fault (Chamberlin and Cikoski, 2010 #7443; Cikoski, 2010 #7445). The age of the base of the Sierra Ladrones Formation in the Socorro basin is constrained by the 6.88 ± 0.02 Ma basaltic trachyandesite of Sedillo Hill (Chamberlin and Osburn, 2006 #7442) and the 3.7 ± 0.1 Ma basalt of Socorro Canyon (age from R. M. Chamberlin, unpublished, cited in Chapin and others, 2004 #7444), and the thickness is suggested to be at least 340 m, based on cuttings from a water well drilled in the vicinity of the town of Socorro (R.M. Chamberlin, pers. comm., cited in Cikoski, 2010 #7445). Therefore, the Bosque del Apache fault is inferred to have accommodated at least 340 m of stratigraphic offset since the late Miocene or early Pliocene. Sierra Ladrones Formation strata occur in the footwall of the fault further to the southwest away from the Bosque del Apache fault trace. Cikoski (2010 #7445) mapped the extent of these sediments, and, based on cross-section analysis and comparison to modern stream dips, estimated that the footwall of the Bosque del Apache fault is tilted about 0.5° to the southwest; Cikoski</p>

	(2010 #7445) attributed this tilt to flexural uplift along the Bosque del Apache structure.
Length (km)	4 km.
Average strike	N53°E
Sense of movement	Normal
Dip	52–74° W. <i>Comments:</i> Two natural fault exposures revealed dips of 52° and 74°; an average dip of 60° was measured in a shallow trench across the fault.
Paleoseismology studies	
Geomorphic expression	The Bosque del Apache fault is both a basin-bounding and intrabasinal feature. Its northwestern extent juxtaposes Precambrian through Oligocene bedrock against Plio-Pleistocene Sierra Ladrones Formation sediments. Here, faulting is expressed as a prominent fault-line scarp formed by differential erosion. Further southeast, the fault is intrabasinal, juxtaposing Plio-Pleistocene rift basin fill against Miocene rift basin fill. Through this stretch, the fault trace is commonly eroded and not apparent at the surface. The fault underlies well-defined topographic scarps in two locations, one scarp approximately 2–3 m high about 1.2–1.8 km northwest of the Bosque del Apache National Wildlife Refuge visitor's center and a second section approximately 6–8 m high about 3.6–4.0 km northwest of the visitor's center. To the southeast of the visitor's center, the Bosque del Apache fault projects into the modern floodplain of the Rio Grande, where it has no apparent surface expression.
Age of faulted surficial deposits	No deformed surface deposits have been directly dated in the vicinity of the Bosque del Apache fault. However, Cikoski (2010 #7445) proposed that one prominently-offset geomorphic surface (the surface in which the trench was dug) correlates to a better-studied geomorphic surface in Socorro Canyon 14 miles to the north that is offset by the Socorro Canyon fault and was dated by the ³⁶ Cl cosmogenic method to be about 122±18 ka (Phillips and others, 2003 #6915). This correlation is supported by 1:24,000-scale mapping between the two locations (Chamberlin, 1999 #7310; Chamberlin and others, 2002 #1224; Chamberlin and Cikoski, 2010 #7443) and by the similarity in

	<p>soil development in footwall sediments exposed at both trench locations. A soil profile logged in the footwall of the Bosque del Apache fault included a Stage III carbonate horizon marked by local thin laminations at the top of the horizon, and a similar carbonate horizon is observed in the footwall of the Socorro Canyon fault. This level of soil development is consistent with a middle to late Pleistocene age for the surface (cf. Machette, 1985 #1267).</p>
Historic earthquake	
Most recent prehistoric deformation	<p>late Quaternary (<130 ka)</p> <p><i>Comments:</i> Ages of individual events are poorly constrained. However, the uppermost soil in the fault scarp sediments exhibits a carbonate horizon with Stage II to III morphology, suggesting a late Pleistocene age for the most recent surface deformation event (cf. Machette, 1985 #1267).</p>
Recurrence interval	<p>~40–60 k.y.</p> <p><i>Comments:</i> As mentioned above, Cikoski (2010 #7445 and unpublished) determined that at least 2 to 3 surface rupturing events deformed the geomorphic surface. Given the proposed correlation of the deformed geomorphic surface to that trenched and dated in Socorro Canyon (see above), these 2 to 3 events occurred since 122 ka, suggesting a 40–60 k.y. recurrence interval.</p>
Slip-rate category	<p>Less than 0.2 mm/yr</p> <p><i>Comments:</i> Estimated rates of vertical displacement are low based on 3-m-high scarp on 122-ka surface and 340 m of stratigraphic offset since 3.7 Ma. Estimates are simplistic and do not account for fault block rotation.</p>
Date and Compiler(s)	<p>2016 Colin T. Cikoski, New Mexico Bureau of Geology & Mineral Resources</p>
References	<p>#1224 Chamberlin, R., Eggleston, T., and McIntosh, W.C., 2002, Geologic map of the Luis Lopez quadrangle, Socorro County, New Mexico: New Mexico Bureau of Geology and Mineral Resources Open-File Geologic Map 53, scale 1:24,000, https://geoinfo.nmt.edu/publications/maps/geologic/ofgm/details.cfm?Volume=53.</p> <p>#7310 Chamberlin, R.M., 1999, Geologic map of the Socorro 7.5-</p>

minute quadrangle, Socorro County: New Mexico Bureau of Mines and Mineral Resources Open-File Geologic Map 34, scale 1:24,000, <https://geoinfo.nmt.edu/publications/maps/geologic/ofgm/details.cfm?Volume=34>.

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