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Quaternary Fault and Fold Database of the United States

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La Bajada fault (Class A) No. 2032

Last Review Date: 2016-07-25

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

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Synopsis	The La Bajada fault forms the margin between the Santo Domingo basin, the Española basin, and the eastern edge of the Rio Grande rift, and truncates the western edge of the Cerros del Rio volcanic field. A several-hundred-meter-high, west-facing escarpment marks the trace of the La Bajada fault along the northern part of the fault. Much of the footwall is capped by the resistant flows of the Plio-Pleistocene Cerros del Rio volcanic field, which help maintain the steep escarpment. The fault has been active in the Quaternary because it cuts upper Pliocene and lower Pleistocene volcanic rocks northeast of Cochiti Dam. However, the fault trace is commonly covered by extensive toreva block landslides; no fault scarps on surficial deposits have been

	found. These relations indicate an active period of faulting during the latest Pliocene and early Pleistocene, perhaps associated in part with volcanic activity in the Jemez and Cerros del Rio volcanic fields. The fault appears to have been quiescent for the last several hundred thousand years.
Name comments	The La Bajada fault extends from just beyond its intersection with the Rio Grande to at least 15 km south of Galisteo Creek; some workers suggest that the La Bajada fault extends in the subsurface to the Tijeras-Cañoncito fault system further south (e.g., Maynard, 2002 #7521). The southern part of the fault, from Tetilla Peak southward to beyond Galisteo Creek, was originally named the Rosario fault (Stearns, 1953 #1127), but most compilations since that time have included at least the northern part of the Rosario fault in the La Bajada fault (Kelley, 1954 #1222; Baltz, 1976 #1431; Kelley, 1977 #1106; Kelley, 1978 #1107; Wong and others, 1995 #1155; Hawley and Whitworth, 1996 #1303; Sawyer and Minor, 2006 #7584; Koning and Read, 2010 #7582). Herein we use the name "La Bajada fault" for the entire structure, because of confusion about where to divide the Rosario and La Bajada faults. Displacement on the La Bajada fault decreases south of Rosario, and may decrease to zero about 10 km north of its apparent intersection with the Tijeras-Cañoncito fault system [2033] near Golden (Bachman, 1975 #1283; Baltz, 1976 #1431). At its northern end, the La Bajada fault intersects with (Smith and others, 1970 #1125; Dethier and others, 2011 #7436) and may be truncated by (Wong and others, 1995 #1155) the Pajarito fault [2008] north of the Rio Grande.
County(s) and State(s)	SANDOVAL COUNTY, NEW MEXICO SANTA FE COUNTY, NEW MEXICO
Physiographic province(s)	BASIN AND RANGE SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Fault trace from 1:24,000-scale maps of Smith and Kuhle (1998 #1770), Maynard and others (2002 #7585), and Sawyer and others (2002 #7586) as compiled by Koning and Read (2010 #7582), as well as 1:24,000-scale maps of Maynard (2002 #7521) and Dethier and others (2011 #7436). Parts of the fault were also mapped by Smith and others (1970 #1125), Bachman (1975 #1283), Thompson and others (1997 #1420) and

	Sawyer and others (1998 #1780). Parts of the fault trace are covered by extensive toreva block landslides, so fault locations in these areas are imprecise.
Geologic setting	The La Bajada fault forms the eastern edge of the Rio Grande rift as well as the boundary between the Española and Santo Domingo basins. This boundary area, termed the La Bajada constriction, is marked by a narrowing of the Rio Grande rift where more than 200 m of basin-fill sediments are preserved (Kelley, 1952 #7564; Minor and others, 2006 ##7583; Sawyer and Minor, 2006 #7584). Narrowing of the Rio Grande rift in this area has occurred in part via a northwestward shift in fault activity along the La Bajada fault since about 2.7 Ma (Minor and others, 2013 #7437). At least some movement along the fault during this interval may relate to volcanic activity in the adjacent Cerros del Rio volcanic field.
Length (km)	48 km.
Average strike	N9°W
Sense of movement	Normal *Comments:* The La Bajada fault exhibits predominantly normal slip (Minor and others, 2006 #7583), but some bedrock exposures indicate a component of localized strike-slip movement in the intersection zone with the Pajarito fault [2008], and in local areas where slip is transferred across smaller scale relay or accommodation zones (S.M. Minor, written commun., 1996–1997).
Dip	55° W to vertical *Comments:* Measurements of fault planes in bedrock exposures along the surface traces of the main and subsidiary strands of the La Bajada fault mostly range from 55° to 90° (Sawyer and others, 2002 #7586; Minor and others, 2006 #7583)
Paleoseismology studies	
Geomorphic expression	A well-developed, several-hundred-meter-high, west-facing escarpment marks the trace of the La Bajada fault along most of its length. Much of the footwall is capped by the resistant flows of the Pliocene Cerros del Rio volcanic field, which help maintain

	the steep escarpment. The fault trace is commonly covered by extensive toreva-block landslides. Wong and others (1995 #1155, p. 2-14, 7–11) briefly describe lineaments and topographic scarps, presumably in surficial deposits, but field investigations by the primary compiler (S.F. Personius, unpublished data, 1996) found no evidence of fault offsets in surficial deposits of Quaternary age along the trace of the La Bajada fault.
Age of faulted surficial deposits	Parts of the La Bajada fault are covered by extensive toreva-block landslides, but the fault clearly cuts upper Pliocene and lower Pleistocene volcanic rocks at its northern end (Smith and others, 1970 #1125; Aubele, 1978 #1282; Sawyer and others, 2002 #7586; Dethier and others, 2011 #7436). These rocks include basalts of Cerros del Rio (1.1–2.7 Ma; Bachman and Mehnert, 1978 #1265; WoldeGabriel and others, 1996 #1426; Thompson and others, 2006 #7587), which are overlain by the 1.6 Ma Guaje pumice (the base of the Otowi Member of the Bandelier Tuff; Smith and others, 1970 #1125; Izett and Obradovich, 1994 #1305). The basaltic andesite of Cochiti Cone (also mapped as the "basaltic andesite of Tank Nineteen" by Smith and others, 1970 #1125, and "upper unit lava flows of the andesite of Cochiti volcano" by Dethier and others, 2011 #7436) is the youngest bedrock unit offset along the La Bajada fault zone, and has been dated at approximately 1.14 Ma (Thompson and others, 2006 #7587). This age is consistent with stratigraphic relations, because the unit overlies and thus post-dates the Otowi and probably the Tshirege members of the Bandelier Tuff (Thompson and others, 1997 #1420).
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Wong and others (1995 #1155, p. 2-14, 7–11) briefly describe lineaments and topographic scarps, presumably in surficial deposits, but field investigations by the primary compiler (S.F. Personius, unpublished data, 1996) found no evidence of fault offsets in surficial deposits of Quaternary age along the trace of the La Bajada fault. Surficial deposits that lie undeformed across the fault trace include extensive toreva-block landslides, some with well developed (stage IV) calcium carbonate soil horizons, piedmont surfaces with well developed (stage III) calcium carbonate soil horizons, a 15-m-high terrace along the Santa Fe River, a 20-m-high terrace along Galisteo Creek, and a

	30-m-high terrace along the Rio Grande (S.F. Personius, unpublished data, 1996). The ages of these deposits are unknown, but regional correlations suggest that the unfaulted Rio Grande terrace is probably several hundred thousand years old (Dethier, 1997 #1091; D.P. Dethier, written commun., 1996). In addition, the fault is buried by the Pliocene to Pleistocene Tuerto Gravel of Stearns (1953 #1127) south of Galisteo Creek (Bachman, 1975 #1283; Koning and Read, 2010 #7582). Thus, the most recent data point to an active period of faulting in late Pliocene and early Pleistocene time, perhaps associated with the volcanic activity in the Jemez and Cerros del Rio volcanic fields. The fault appears to have been quiescent for the last several hundred thousand years.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Wong and others (1995 #1155, table 7-1) calculated a post-Cerros del Rio (late Pliocene) rate of 0.06 mm/yr. However, slightly higher long-term (Plio-Pleistocene) slip rates across the La Bajada fault are indicated by the offsets of the basalt of Cerros del Rio and the basaltic andesite of Cochiti Cone (Smith and others, 1970 #1125; Thompson and others, 2006 #7587) northeast of Cochiti Dam near the northern end of the fault. Offsets of these units are about 250 m and 90 m, respectively (S.F. Personius, unpublished data, 1996). The basalt of Cerros del Rio was mostly deposited about 2.2–2.7 Ma and the basaltic andesite of Cochiti Cone was deposited about 1.14 Ma (Thompson and others, 2006 #7587). Further south, correlation of basalts in a Bureau of Indian Affairs water well with Cerros del Rio basalts in the footwall of the La Bajada fault indicate offset of about 375 m (Smith and Kuhle, 1998 #1772; Sawyer and others, 1998 #1780).
Date and Compiler(s)	2016 Stephen F. Personius, U.S. Geological Survey Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources
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