

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](#).

San Francisco fault (Class A) No. 2031

Last Review Date: 2016-06-21

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

citation for this record: Kelson, K.I., Jochems, A.P., and Personius, S.F., compilers, 2016, Fault number 2031, San Francisco 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 San Francisco fault has west-down normal displacement and traverses the Santo Domingo basin of the Rio Grande rift, subparallel to the La Bajada fault [2032]. The northern end of the San Francisco fault has a complex intersection with the Pajarito fault [2008] near Cochiti Lake. The southern end intersects or merges with the Rincon fault [2036] and other faults [2043] in a complex transition zone near the town of Placitas. No paleoseismic studies have been completed along the San Francisco fault.
Name comments	The San Francisco fault was named by Stearns (1953 #1127) after springs near the village of San Francisco. The fault extends from

	<p>Cochiti Pueblo south to Placitas. The fault as used herein includes the Placitas fault of Kelley and Northrop (1975 #1308), Menne (1989 #1405), Woodward and Menne (1995 #1428), and Connell and others (1995 #1764) and was termed the San Francisco-Placitas fault by Russell and Snelson (1994 #1186).</p>
County(s) and State(s)	SANDOVAL 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 of Black and others (2000 #7432), Cather and Connell (1998 #7435), Connell and others (1995 #1764), and Smith and Kuhle (1998 #1770, #1771). The San Francisco fault was originally mapped at a scale of 1:63,360 by Stearns (1953 #1127). Other lower scale maps featuring the fault include those of Kelley (1977 #1106) and Wong and others (1995 #1155). In addition, the southern part of the fault, including the Placitas fault, was mapped at 1:8,000 scale by Menne (1989 #1405) and later modified by Woodward and Menne (1995 #1428).</p>
Geologic setting	<p>The San Francisco fault, in conjunction with the La Bajada fault [2032], forms the eastern margin of the Santo Domingo basin of the Rio Grande rift. The Santo Domingo basin links the en echelon Albuquerque and Española basins, and kinematic and paleostress evidence suggests that the basin functions as a relay that began to narrow in Plio-Pleistocene time (Minor and others, 2013 #7437). Woodward and Menne (1995 #1428) indicate stratigraphic separation of 1,800–2,100 m along the San Francisco fault, and Kelley and Northrop (1975 #1308) and Russell and Snelson (1994 #1186) suggested as much as 4,300 m of displacement of the base of the Santa Fe Group. Vertical separation on the fault likely increases to the south from its intersection with the Pajarito fault [2008] near Cochiti Pueblo to its intersection with the Rincon fault [2036] near Placitas. The southern termination of the San Francisco fault occurs in a complex transition zone that marks the right-stepping margin of the Rio Grande rift at the north end of the Sandia uplift (Kelley, 1982 #1306; Woodward and Menne, 1995 #1428; Connell and others, 1995 #1764). Russell and Snelson (1994 #1186) suggest</p>

	that the San Francisco fault is listric at depth, and is a primary structure along the eastern rift margin at this latitude.
Length (km)	26 km.
Average strike	N34°E
Sense of movement	Normal <i>Comments:</i> The San Francisco fault exhibits down-to-the-west normal separation of Miocene rift-fill sediments (Stearns, 1953 #1127; Kelley and Northrop, 1975 #1308; Baltz, 1976 #1431; Russell and Snelson, 1990 #1187; 1994 #1186).
Dip	52–78° W <i>Comments:</i> Picha (1982 #1736) measured a dip of 52°, Menne (1989 #1405) and Woodward and Menne (1995 #1428) measured a dip of 67°, and Connell and others (1995 #1764) measured a dip of 78° on surface fault exposures of the San Francisco fault. Wong and others (1995 #1155) estimated the range in fault dip for seismogenic crust, based on analogy to listric faults interpreted from deep seismic-reflection data in the Albuquerque basin (Russell and Snelson, 1990 #1187; 1994 #1186). However, Russell and Snelson (1994 #1186) suggest that the San Francisco fault may have a shallow dip relative to their more moderately dipping Rio Grande fault to the west.
Paleoseismology studies	
Geomorphic expression	Topographic escarpments are associated with the northern part of the fault (Wong and others, 1995 #1155). There are no published records of scarps on Quaternary deposits, although the fault traverses an area of extensive dissection.
Age of faulted surficial deposits	Hoge (1970 #1104) considered the last movement on the fault to be early Quaternary based on displacement of older Quaternary gravel north of Placitas, although Kelley (1977 #1106) notes a lack of evidence of displacement of the early (?) Pleistocene Ortiz pediment surface. Connell and others (1995 #1764) describe movement on the Placitas fault that is bracketed between offset of their lower Pleistocene to upper Pliocene (?) unit Qtpf1 and burial by their middle to lower (?) Pleistocene unit Qp2. Most significantly, a splay of the fault offsets lower Pleistocene

	<p>Bandelier Tuff (1.61 Ma) about 200 m near its northern end. This splay is buried by a terrace deposit containing 660-ka Lava Creek B ash (Smith and Kuhle, 1998 #1772; Smith and others, 2001 #7438).</p>
Historic earthquake	
Most recent prehistoric deformation	<p>undifferentiated Quaternary (<1.6 Ma)</p> <p><i>Comments:</i> Timing based on displacement of the lower Pleistocene Bandelier Tuff (1.61 Ma) about 200 m near the northern end of the fault (Smith and Kuhle, 1998 #1772; Smith and others, 2001 #7438). Youngest movement along the northern part of the fault is constrained where a splay is buried by a terrace deposit containing 660 ka Lava Creek B ash.</p>
Recurrence interval	
Slip-rate category	<p>Less than 0.2 mm/yr</p> <p><i>Comments:</i> The only published slip rates for this fault are those used for seismic hazard analysis and are based on regional analogy. Wong and others (1995 #1155) conservatively estimated a range of 0.01–0.58 mm/yr for the San Francisco fault, with a preferred value of 0.07 mm/yr, based on similarity to the La Bajada fault [2032] and analysis of regional slip rates in the Rio Grande rift. Kelson and Olig (1995 #1147) used a preferred value of 0.06 mm/yr for the San Francisco fault. Approximately 200 m of offset of the lower Pleistocene Bandelier Tuff (Smith and Kuhle, 1998 #1772) along a splay of the fault near Cochiti Pueblo suggests a higher long-term slip rate than the preferred rates cited above. However, all of the data fall within the slip-rate category assigned here.</p>
Date and Compiler(s)	<p>2016</p> <p>Keith I. Kelson, William Lettis & Associates, Inc. Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources Stephen F. Personius, U.S. Geological Survey</p>
References	<p>#1431 Baltz, E.H., 1976, Seismotectonic analysis of the central Rio Grande rift, New Mexico— A progress report on geologic investigations: U.S. Geological Survey Administrative Report, 93 p., 2 pls.</p>

#7432 Black, B.A., Cather, S.M., and Connell, S.D., 2000, Geologic map of the San Felipe Pueblo NE quadrangle, Sandoval County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Geologic Map 37, scale 1:24,000.

#7435 Cather, S.M., and Connell, S.D., 1998, Geologic map of the San Felipe Pueblo quadrangle, Sandoval County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Geologic Map 19, scale 1:24,000.

#1764 Cather, S.M., Connell, S.D., Karlstrom, K.E., Ilg, B., Menne, B., Bauer, P.W., and Andronicus, C., 1996, Geology of the Placitas SE 7.5-minute quadrangle, Sandoval County, central New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Digital Map OF-DM 2, 26 p. pamphlet, 1 sheet, scale 1:24,000.

#1104 Hoge, H.P., 1970, Neogene stratigraphy of the Santa Ana area, Sandoval County, New Mexico: Albuquerque, University of New Mexico, unpublished Ph.D. dissertation, 140 p.

#1106 Kelley, V.C., 1977, Geology of Albuquerque basin, New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 33, 60 p., 2 pls.

#1306 Kelley, V.C., 1982, The right-relayed Rio Grande rift, Taos to Hatch, New Mexico, *in* Grambling, J.A., and Wells, S.G., eds., Albuquerque Country II: New Mexico Geological Society, 33rd Field Conference, November 4–6, 1982, Guidebook, p. 147–151.

#1308 Kelley, V.C., and Northrop, S.A., 1975, Geology of Sandia Mountains and vicinity, New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 29, 136 p., 4 pls., scale 1:48,000.

#1147 Kelson, K.I., and Olig, S.S., 1995, Estimated rates of Quaternary crustal extension in the Rio Grande rift, northern new Mexico, *in* Bauer, P.W., Kues, B.S., Dunbar, N.W., Karlstrom, K.E., and Harrison, B., eds., Geology of the Santa Fe region, New Mexico: New Mexico Geological Society, 46th Field Conference, September 27–30, 1995, Guidebook, p. 9–12.

#1405 Menne, B., 1989, Structure of the Placitas area, northern Sandia uplift, Sandoval County, New Mexico: Albuquerque,

University of New Mexico, unpublished M.S. thesis, 163 p., 4 pls.

#7437 Minor, S.A., Hudson, M.R., Caine, J.S., and Thompson, R.A., 2013, Oblique transfer of extensional strain between basins of the middle Rio Grande rift, New Mexico—Fault kinematic and paleostress constrains, *in* Hudson, M.R., and Grauch, V.J.S., eds., *New perspectives on Rio Grande rift basins: From Tectonics to Groundwater: Geological Society of America Special Paper 494*, p. 345–382.

#1736 Picha, M.G., 1982, Structure and stratigraphy of the Montezuma salient-Hagan basin area, Sandoval County, New Mexico: Albuquerque, University of New Mexico, unpublished M.S. thesis, 248 p., 3 pls.

#1187 Russell, L.R., and Snelson, S., 1990, Structural style and tectonic evolution of the Albuquerque basin segment of the Rio Grande rift, *in* Pinet, B., and Bois, C., eds., *The potential of deep seismic profiling for hydrocarbon exploration: Paris, France, Editions Technip*, p. 175-207.

#1186 Russell, L.R., and Snelson, S., 1994, Structure and tectonics of the Albuquerque basin segment of the Rio Grande rift —Insights from reflection seismic data, *in* Keller, G.R., and Cather, S.M., eds., *Basins of the Rio Grande rift—Structure, stratigraphy, and tectonic setting: Geological Society of America Special Paper 291*, p. 83–112.

#1770 Smith, G.A., and Kuhle, A.J., 1998, Geologic map of the Santo Domingo Pueblo quadrangle, Sandoval County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Geologic Map OF-DM 15, 1 sheet, scale 1:24,000.

#1771 Smith, G.A., and Kuhle, A.J., 1998, Geologic map of the Santo Domingo Southwest quadrangle, Sandoval County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Geologic Map OF-DM 26, 1 sheet, scale 1:24,000.

#1772 Smith, G.A., and Kuhle, A.J., 1998, Hydrostratigraphic implications of new geological mapping in the Santo Domingo basin, New Mexico: *New Mexico Geology*, v. 20, p. 21-27.

#7438 Smith, G.A., McIntosh, W.C., and Kuhle, A.J., 2001, Sedimentologic and geomorphic evidence for seesaw subsidence

of the Santo Domingo accommodation-zone basin, Rio Grande rift, New Mexico: Geological Society of America Bulletin, v. 113, no. 5, p. 561–574.

#1127 Stearns, C.E., 1953, Tertiary geology of the Galisteo-Tonque area, New Mexico: Geological Society of America Bulletin, v. 64, p. 459–508.

#1155 Wong, I., Kelson, K., Olig, S., Kolbe, T., Hemphill-Haley, M., Bott, J., Green, R., Kanakari, H., Sawyer, J., Silva, W., Stark, C., Haraden, C., Fenton, C., Unruh, J., Gardner, J., Reneau, S., and House, L., 1995, Seismic hazards evaluation of the Los Alamos National Laboratory: Technical report to Los Alamos National Laboratory, Los Alamos, New Mexico, February 24, 1995, 3 volumes, 12 pls., 16 appen.

#1428 Woodward, L.A., and Menne, B., 1995, Down-plunge structural interpretation of the Placitas area, northwestern part of the Sandia uplift, central New Mexico—Implications for tectonic evolution of the Rio Grande rift, *in* Bauer, P.W., Kues, B.S., Dunbar, N.W., Karlstrom, K.E., and Harrison, B., eds., Geology of the Santa Fe region, New Mexico: New Mexico Geological Society, 46th Field Conference, September 27–30, 1995, Guidebook, p. 127–133.

[Questions or comments?](#)

[Facebook](#) [Twitter](#) [Google](#) [Email](#)

[Hazards](#)

[Design](#) [Ground Motions](#) [Seismic Hazard Maps & Site-Specific Data](#) [Faults](#) [Scenarios](#)

[Earthquakes](#) [Hazards](#) [Data](#) [Education](#) [Monitoring](#) [Research](#)

[Home](#) [About Us](#) [Contacts](#) [Legal](#)