

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](#).

Jemez-San Ysidro fault, Calabacillas section (Class A) No. 2029c

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

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Synopsis

General: The Jemez-San Ysidro fault is a steeply east-dipping normal fault that, in part, forms the active western margin of the Rio Grande rift south of the Valles caldera. The fault is divided into sections on the basis of a 45° change in fault strike at the latitude of Cañones and evidence for young (Holocene) rupture along its southern section. The northern, northeast-striking section of the fault (Jemez section) is aligned with northeast-striking faults within the collapsed center of the Valles caldera and the Embudo fault, and is coincident with the Jemez Lineament. The

central fault (San Ysidro section) merges with the southern fault (Calabacillas section) about 7 km south of the town of San Ysidro.

Sections: This fault has 3 sections. The Jemez-San Ysidro fault consists of a northeast-striking fault (the Jemez fault of Goff and Kron, 1980 #1099), and north-striking faults along the northwestern margin of the Albuquerque basin (the Jemez and San Ysidro faults of Woodward, 1987 #1130). The boundary between the northern (Jemez) and central (San Ysidro) sections is placed at the 45° change in fault strike near Cañones. The boundary between the central and southern (Calabacillas) sections is near Arroyo Piedra Parada, 7 km south of San Ysidro. These sections are distinguished primarily on the basis of younger demonstrated displacement on the Calabacillas section, a prominent down-to-the-east normal fault that offsets the west side of the Llano de Albuquerque along the western margin of the Rio Grande rift.

**Name
comments**

General: The Jemez-San Ysidro fault extends from the latitude of the Albuquerque Volcanoes north to the southern rim of the Valles caldera near Highway 4. As used herein, the Jemez-San Ysidro fault includes the northeast-striking faults referred to as the Jemez fault zone by Goff and Kron (1980 #1099) and Goff and others (1981 #1182), the north-striking Sierrita fault of Woodward and DuChene (1975 #1131), Aldrich (1986 #1084), and Woodward (1987 #1130); the north-striking San Ysidro fault of Woodward and Ruetschilling (1976 #1133), Hawley and Galusha (1978 #1103), and Woodward (1987 #1130); and the north-striking Calabacillas fault of Bryan and McCann (1937 #1288, fig. 4), Wright (1946 #1427) and Cather and others (1997 #1763). All of these faults are grouped together herein because of lateral continuity (Wong and others, 1995 #1155; Koning and others, 1998 #7375).

Section: Part of the Calabacillas fault was originally mapped by Bryan and McCann (1937 #1288, fig. 4), and later described in detail by Wright (1946 #1427) in the Volcano Ranch 7.5 minute quadrangle. The fault was mapped and named in the Sky Village SE (now Arroyo de las Calabacillas) quadrangle by Cather and others (1997 #1763). Wright (1946 #1427, p. 426-428), Kelley and others (1976 #1380), and Kelley (1977 #1106) included the Calabacillas fault with the Sand Hill fault zone [2039], which is located 1–2 km to the west. However, detailed mapping indicates that the Calabacillas fault does not intersect the Sand Hill fault

	<p>zone [2039] at the surface, but rather trends northeastward to the north and southeastward to the south of the exposures described by Wright (1946 #1427). At its northern end, the Calabacillas fault appears to join with the San Ysidro section near Arroyo Piedra Parada (Woodward and Ruetschilling, 1976 #1133; Koning and others, 1998 #7375). Connell (2008 #7454) and Grauch and Connell (2013 #7268) use the name San Ysidro fault for the entire fault zone south of the Rio Jemez, including all of what herein is named the Calabacillas section.</p>
County(s) and State(s)	<p>BERNALILLO COUNTY, NEW MEXICO SANDOVAL COUNTY, NEW MEXICO</p>
Physiographic province(s)	<p>BASIN AND RANGE COLORADO PLATEAUS</p>
Reliability of location	<p>Good Compiled at 1:24,000 scale.</p> <p><i>Comments:</i> The location of the fault is compiled from 1:24,000-scale mapping of the Cerro Conejo (previously Sky Village NE) quadrangle (Koning and others, 1998 #7375), the Arroyo de las Calabacillas (previously Sky Village SE) quadrangle (Cather and others, 1997 #1763), and the Volcanoes (previously Volcano Ranch) quadrangle (Thompson and others, 2009 #7460). The fault location is also evident in high-resolution aeromagnetic data (U.S. Geological Survey and SIAL Geosciences Inc., 1997 #1722; Grauch and Millegan, 1998 #1721)</p>
Geologic setting	<p>The Jemez-San Ysidro fault forms the northwestern margin of the Albuquerque basin, although the amount of Quaternary vertical separation is less than that along other rift-margin faults. Aldrich (1986 #1084) stated that the fault was the western margin of the Rio Grande rift during the Oligocene, and that activity later stepped eastward to the Pajarito fault zone [2008]. Wong and others (1995 #1155) and House and Hartse (1995 #1160) identified seismicity aligned along the northern part of the fault.</p>
Length (km)	<p>This section is 34 km of a total fault length of 92 km.</p>
Average strike	<p>N2°W (for section) versus N14°E (for whole fault)</p>
Sense of movement	<p>Normal</p>
Dip	<p>60° E to near vertical</p>

	<p><i>Comments:</i> Dip measurement from Wright (1946 #1427, plate 8). McCalpin and others (2011 #7183) depict an exposure of the near-vertical main fault in a trench near the southern end of the fault.</p>
<p>Paleoseismology studies</p>	<p>Site 2029-1. Two trenches were excavated 3 km north of the southern end of the fault (McCalpin and others, 2011 #7183). In the eastern trench, across a 5.3-m-high antithetic scarp, details of faulting are overprinted by stage IV soil carbonate that engulfs 4.5 m of exposed section, which bottoms in the Pliocene–Pleistocene (?) Santa Fe Group. McCalpin and others (2011 #7183) could distinguish five major depositional units, but the section was not sampled for dating. The western 60-m-long trench crosses a 27-m-high down-to-the-east fault scarp. The trench exposes Santa Fe Group only in the bottom of the exposed footwall. The interpretation of four prehistorical surface-faulting earthquakes is derived from observed vertical displacement of correlated buried soils and the six infrared-stimulated luminescence (IRSL) dates that are in correct stratigraphic order, substantiated by two fine-silt thermoluminescence (TL) ages, ranging from 14 ka to 219 ka. The IRSL dates were used to constrain the mean rate of secondary-carbonate accumulation in the soils to estimate the timing of the four surface ruptures interpreted at the site.</p>
<p>Geomorphic expression</p>	<p>The Calabacillas fault forms broad, dissected fault scarps across the Llano de Albuquerque and is exposed in upper Santa Fe Group sediments at several locations where it crosses the Ceja del Rio Puerco. The northeast-trending part of the fault zone was mapped by Kelley and others (1976 #1380), Kelley (1977 #1106), Cather and others (1997 #1763), and Koning and others (1998 #7375); this northeast-striking part is marked by scattered displaced pediment remnants across the dissected surface of the Llano de Albuquerque. Wright (1946 #1427) reports 45-m-high scarps on the Llano; McCalpin and others (2011 #7183) describe the broad fault scarps as being 10–30 m high and having surface angles typically less than 5 degrees.</p>
<p>Age of faulted surficial deposits</p>	<p>Kelley (1977 #1106) described minor offsets of pediment remnants on the northeast-trending section of the fault north of the Ceja del Rio Puerco exposures. The ages of these offset deposits are unknown, but they concluded that most are probably early and middle (?) Pleistocene in age. McCalpin and others (2011 #7183) reported displacement of buried soils dated to the</p>

	middle and late Pleistocene.
Historic earthquake	
Most recent prehistoric deformation	<p>latest Quaternary (<15 ka)</p> <p><i>Comments:</i> Based on trenching near the southern end of the fault, the most recent surface rupture occurred 14 k.y. ago (McCalpin and others, 2011 #7183). This age is assigned to the entire length of the fault, which is supported by the nine post-Llano de Albuquerque fault-scarp-derived colluvial and soil deposits adjacent to this structure described by Machette (1978 #1402) and Machette and others (1997 #1403).</p>
Recurrence interval	<p>9–20 k.y. (<55ka)</p> <p><i>Comments:</i> Based on six infrared-stimulated luminescence (IRSL) dates and one soil calcium-carbonate date, the timing of the most recent four surface-faulting events on the southern part of the fault is 14 ka, 23 ka, 35 ka, and 55 ka (McCalpin and others, 2011 #7183). The last four surface-rupturing earthquakes are not evenly spaced in time and individual recurrence intervals are between 9 k.y. and 20 k.y. McCalpin and others (2011 #7183) suggest that activity on the rift-bounding faults alternates and the east-dipping faults have been more active from the middle Pleistocene to present than the west-dipping faults. Soils developed on the colluvial wedges in the Ceja del Rio Puerco exposures also have extensive carbonate development (Machette and others, 1997 #1403), which indicates that a substantial amount of time is recorded in these deposits.</p>
Slip-rate category	<p>Less than 0.2 mm/yr</p> <p><i>Comments:</i> McCalpin and others (2011 #7183) report a long-term vertical-displacement rate of 0.027–0.054 mm/yr based on the 27-m-high scarp on the Llano de Albuquerque surface, assumed to be 0.5–1 Ma. Later work by Connell and others (2013 #7235) indicated that the Llano de Albuquerque surface is 0.8–1.8 Ma, which would decrease these long-term vertical-displacement rates. McCalpin and others (2011 #7183) further report vertical-displacement rates derived from each of the four recent earthquakes, which range from 0.011 to 0.028 mm/yr; although they acknowledge that vertical displacement at this site is likely smaller than that to the north. Displacement on the nearby</p>

	<p>antithetic fault (5.3 m) is not reported or removed from the vertical displacement referenced above; therefore, the reported vertical-displacement rates include maximum displacement for each event at this site. At a different location, Wright (1946 #1427) described about 45 m of accumulated fault-derived colluvial deposits on the downthrown block. All of these data suggest the Calabacillas section deforms at a rate lower than 0.2 mm/yr.</p>
<p>Date and Compiler(s)</p>	<p>2015 Daniel J. Koning, New Mexico Bureau of Geology & Mineral Resources Kathleen M. Haller, U.S. Geological Survey Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources</p>
<p>References</p>	<p>#1084 Aldrich, M.J., Jr., 1986, Tectonics of the Jemez lineament in the Jemez Mountains and Rio Grande rift: <i>Journal of Geophysical Research</i>, v. 91, no. B2, p. 1753–1762.</p> <p>#1288 Bryan, K., and McCann, F.T., 1937, The Ceja del Rio Puerco—A border feature of the Basin and Range province in New Mexico, Part I, Stratigraphy and structure: <i>Journal of Geology</i>, v. 45, p. 801-828.</p> <p>#1763 Cather, S.M., Connell, S.D., Heynekamp, M.R., and Goodwin, L.B., 1997, Geology of the Arroyo de las Calabacillas [Sky Village SE] 7.5-minute quadrangle, Sandoval County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Geologic Map 9, 8 p. pamphlet, 1 sheet, scale 1:24,000.</p> <p>#7239 Connell, S.D., 2001, Stratigraphy of the Albuquerque basin, Rio Grande rift, central New Mexico—A progress report, <i>in</i> Connell, S.D., and 8 others, Stratigraphy and tectonic development of the Albuquerque basin, central Rio Grande rift—Field trip guidebook for the Geological Society of America, Rocky Mountain–South-Central Section Meeting, Albuquerque, New Mexico: New Mexico Bureau of Mines & Mineral Resources Open-File Report 454B, p. A-1–A-26.</p> <p>#7454 Connell, S.D., 2008, Geologic map of the Albuquerque-Rio Rancho metropolitan area and vicinity, Bernalillo and Sandoval Counties, New Mexico: New Mexico Bureau of Geology and Mineral Resources Geologic Map 78, scale</p>

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