Jump to Navigation

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.

West Paradise fault zone (Class A) No. 2042

Last Review Date: 2016-06-27

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

citation for this record: **Personius, S.F., and Jochems, A.P., compilers, 2016, Fault number 2042, West Paradise fault zone, 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 02:22 PM.**

Synopsis	The West Paradise fault is one of several north-trending normal faults that form a wide graben that confines the Albuquerque Volcanoes volcanic field. An excellent exposure of the West Paradise fault zone is present on the north rim of Arroyo de las Calabacillas, at a sharp bend in the arroyo channel. At this site, one or more fault strands offset Santa Fe Group sands and pebble gravels by an unknown amount. The fault can be traced about 4 km north of Arroyo de las Calabacillas as aligned drainages and several west-facing escarpments in upper Santa Fe Group sediments. The northern extent of the West Paradise fault may be limited by remnants of the Llano de Albuquerque, which extend undisturbed across the projected trace of the fault about 300 m

	south of Southern Boulevard in the City of Rio Rancho. However, the sharp anomaly in the aeromagnetic data that marks the approximate trace of the fault zone extends 2–3 km north of this location, so displacement on the West Paradise fault may have extended further north before the development of the Llano de Albuquerque. To the south, the fault projects into but does not offset the basalt flows present on the south rim of Arroyo de las Calabacillas. The fault can be mapped several kilometers south of Arroyo de las Calabacillas under the basalts with aeromagnetic data and geomorphic indicators such as rubble zones and intermittent linear breaks in slope. These features were caused by preexisting fault scarps along the trace of the West Paradise fault that disrupted the basalt flows during emplacement.
Name comments	An exposure of this fault zone was originally recognized and mapped by Bjorklund and Maxwell (plate 1a, 1961 #1285) in Arroyo de las Calabacillas; they mapped a down-to-the-west normal fault from Arroyo de las Calabacillas northward about 2.5 km. This fault was not included on subsequent maps, such as Kelley (1977 #1106) and Hawley and Haase (1992 #1304), until more recent compilations (Hawley and others, 1995 #1301; Hawley and Whitworth, 1996 #1303). Hawley and Whitworth (1996 #1303) mapped both this fault and a parallel down-to the-west fault located approximately 2.5 km east as the Paradise fault zone. Herein we use "West Paradise fault" and "East Paradise fault zone" [2040] for the western and eastern strands of the Paradise fault zone of Hawley and Whitworth (1996 #1303).
County(s) and State(s)	SANDOVAL COUNTY, NEW MEXICO BERNALILLO COUNTY, NEW MEXICO
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* The trace of the West Paradise fault is from the 1:24,000-scale map of Personius and others (2000 #1413). The trace of the fault beneath the basalts of the Albuquerque Volcanoes volcanic field is based on geomorphic indicators such as rubble zones and intermittent linear breaks in slope and on recently acquired high resolution aeromagnetic data (U.S. Geological Survey and SIAL Geosciences, Inc., 1997 #1722; Grauch and Millegan, 1998 #1721).

Geologic setting	The West Paradise fault is one of several north-trending intrabasin faults in the northern part of the Albuquerque-Belen basin, and is one of several faults that form a wide graben confining the Albuquerque Volcanoes volcanic field. The spatial association of the fault with the volcanic field suggests that it may be associated with magmatic activity.
Length (km)	10 km.
Average strike	N3°E
Sense of movement	Normal *Comments:* Slickensides on fault planes in Santa Fe Group sediment in an exposure on the north flank of Arroyo de las Calabacillas have rakes of about 90°, indicating nearly pure dip-slip normal faulting (S.F. Personius, unpublished data, 1996–1997).
Dip	70°–75° W *Comments:* Surface dips were measured in a fault zone in upper Santa Fe Group sand and pebble gravel exposed on the north side of Arroyo de las Calabacillas (S.F. Personius, unpublished data, 1996–1997).
Paleoseismology studies	
Geomorphic expression	The West Paradise fault is weakly expressed as aligned drainages and several west-facing escarpments in upper Santa Fe Group sediments from Arroyo de las Calabacillas northward about 4 km. To the south, the fault does not offset the basalt that forms the southern rim of Arroyo de las Calabacillas. However, in the basalts the fault zone is marked by rubble zones and intermittent linear breaks in slope which indicate the presence of preexisting fault scarps that disrupted the flows during emplacement.
Age of faulted surficial deposits	The West Paradise fault clearly offsets early Pleistocene upper Santa Fe Group sands and gravels, and early Pleistocene, strongly developed calcic soil remnants of the Llano de Albuquerque. Late Pleistocene eolian sand and alluvial deposits are not offset across the fault north of Arroyo de las Calabacillas. South of Arroyo de las Calabacillas, faulting along the West Paradise fault predates

	the approximately 155- to 218-ka (Geissman and others, 1990 #1297; Peate and others, 1996 #1411; Singer and others, 2008 #7492) basalts of the Albuquerque Volcanoes volcanic field.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* The West Paradise fault does not offset basalt flows of the Albuquerque Volcanoes volcanic field that are dated at about 155–218 ka (Geissman and others, 1990 #1297; Peate and others, 1996 #1411; Singer and others, 2008 #7492), so the latest event predates the age of these deposits. No evidence of fault scarps on surficial deposits are visible, but the fault offsets strongly developed calcic soils of the Llano de Albuquerque, remnants of which appear to be offset about 10 m across the fault zone north of Arroyo de las Calabacillas (S.F. Personius, unpublished data, 1996–1997). These relations indicate a recurrent history of faulting that probably extended into the middle Pleistocene.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Low slip rate inferred based on offset about 10 m of the Llano de Albuquerque (formed about 1 Ma).
Date and Compiler(s)	2016 Stephen F. Personius, U.S. Geological Survey Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources
References	#1285 Bjorklund, L.J., and Maxwell, B.W., 1961, Availability of ground water in the Albuquerque area, Bernalillo and Sandoval Counties, New Mexico: New Mexico State Engineer Technical Report 21, 117 p. #1297 Geissman, J.W., Brown, L., Turrin, B.D., McFadden, L.D., and Harlan, S.S., 1990, Brunhes chron excursion/polarity episode recorded during the late Pleistocene, Albuquerque Volcanoes, New Mexico, USA: Geophysical Journal International, v. 102, p. 73-88. #1721 Grauch, V.J.S., and Millegan, P.S., 1998, Mapping intrabasinal faults from high-resolution aeromagnetic data: The

Leading Edge, v. 17, p. 53-55.

#1304 Hawley, J.W., and Haase, C.S., compilers, 1992, Hydrogeologic framework of the northern Albuquerque basin: New Mexico Bureau of Mines and Mineral Resources Open-File Report 387, 1 pl., scale 1:100,000.

#1303 Hawley, J.W., and Whitworth, T.M., compilers, 1996, Hydrogeology of potential recharge areas for the basin- and valley-fill aquifer systems, and hydrogeochemical modeling of proposed artificial recharge of the upper Santa Fe aquifer, northern Albuquerque basin, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Report 402-D, 575 p.

#1301 Hawley, J.W., Haase, C.S., and Lozinsky, R.P., 1995, An underground view of the Albuquerque basin, *in* Ortega-Klett, C.T., ed., The water future of Albuquerque and Middle Rio Grande basin: New Mexico Water Resources Research Institute Technical Report, p. 37–77.

#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.

#1411 Peate, D.W., Chen, J.H., Wasserburg, G.J., Papanastassiou, D.A., and Geissman, J.W., 1996, 238U-230Th dating of a geomagnetic excursion in Quaternary basalts of the Albuquerque Volcanoes Field, New Mexico (USA): Geophysical Research Letters, v. 23, p. 2271-2274.

#1413 Personius, S.F., Machette, M.N., and Stone, B.D., 2000, Preliminary geologic map of the Loma Machete quadrangle, Sandoval County, New Mexico: U.S. Geological Survey Miscellaneous Field Studies Map MF-2334, scale 1:24,000.

#7492 Singer, B.S., Jicha, B.R., Kirby, B.T., Geissman, J.W., Herrero-Bervera, E., 2008, $^{40}Ar/^{39}Ar$ dating links Albuquerque Volcanoes to the Pringle Falls excursion and the Geomagnetic Instability Time Scale: Earth and Planetary Science Letters, v. 267, p. 584–595.

#1722 U.S. Geological Survey, and SIAL Geosciences, Inc., 1997, Description of digital aeromagnetic data collected north and west of Albuquerque, New Mexico: U.S. Geological Survey

	Open-File Report 97-286, 40 p.