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.**

## Gillespie Mountain fault (Class A) No. 2096

**Last Review Date: 2016-02-12**

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

## *citation for this record:* Vincent, K.R., Jochems, A.P., and Machette, M.N., compilers, 2016, Fault number 2096, Gillespie Mountain 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 Gillespie Mountain fault is marked by continuous west-facing, south-trending scarps along the western flank of the Animas Mountains. The larger scarps record evidence of multiple faulting events during or before the middle Pleistocene. Scarp morphology has been used to estimate the most recent faulting event as about 10 ka, although detailed geomorphic-surface mapping by Vincent and Krider (1997 #1193) suggests it might have last ruptured prior to the latest glacial maximum (i.e., >15 ka). No trenching has been done along the fault. |
| **Name comments** | This fault was first mapped by Zeller (1962 #1060), and later by Zeller and Alper (1965 #1253), Erb (1979 #1254), and Vincent |

| | |
|---|---|
| | and Krider (1997 #1193), but was named by Machette and others (1986 #1033) for Gillespie Mountain, a prominent peak in the Animas Mountains. The fault zone may extend from Animas Peak northward about 25 km. The mid-point of the fault is about 30 km south-southeast of Animas, New Mexico.<br><br>**Fault ID:** Fault number 21 of Machette and others (1986 #1033). |
| **County(s) and State(s)** | HIDALGO COUNTY, NEW MEXICO |
| **Physiographic province(s)** | BASIN AND RANGE |
| **Reliability of location** | Good<br>Compiled at 1:24,000 scale.<br><br>*Comments:* Originally compiled at 1:100,000 scale. Updated using 1:24,000-scale maps of Vincent and Krider (1997 #1193) combined with accurate placement using photogrammetric methods. |
| **Geologic setting** | The fault forms the western margin of the northern half of the Animas Mountains and the eastern margin of the Animas Valley. Over much of its length, the valley consists of a full-graben, but in the southern part of the valley, the bounding structures (i.e., the west-dipping Gillespie Mountain fault [2096] and the east-dipping Gray Ranch fault zone [2095]) form a half-graben with a single, west-dipping fault (Lang Canyon fault [2025]). The transition from full-graben to half-graben is located near the confluence of Animas and Indian Creeks, and is coincident with both a 6-km right step in the Animas range-front and a bedrock promontory that extends east into the valley from the Peloncillo Mountains. The southern end of Quaternary scarps on the Gillespie Mountain fault (and on the Gray Ranch fault zone) terminates at or near this transition zone. Uplift and dissection of the narrow pediment between the fault and the mountains implies that recurrent Quaternary movement occurred after an extensive period of tectonic quiescence during which the pediment was formed, perhaps in early Pleistocene time. |
| **Length (km)** | 22 km. |
| **Average strike** | N15°E |
| **Sense of** | Normal |

| | |
|---|---|
| **movement** | *Comments:* Vincent and Krider (1997 #1193) report near pure dip slip from their observed slickensides at Cottonwood Creek, which trend N. 58° W. and plunge 59° W. (7 measurements) on exposed bedrock fault surfaces that strike about N. 40° E. and dip 60°–66° W. |
| **Dip Direction** | W |
| **Paleoseismology studies** | |
| **Geomorphic expression** | A series of west-facing scarps mark the surficial trace of the fault zone. Along the northern part of the fault zone, Machette and others (1986 #1033) observed distinct 8- to 13-m-high scarps formed on piedmont-slope deposits of probable early middle Pleistocene age (i.e., 500-750 ka). In the central part of the fault, smaller (1- to 3-m-high) scarps are formed on alluvium thought to be on the order of 100 ka (Vincent and Krider, 1997), in addition to older and higher scarps that truncate narrow pediments. They could not find evidence of displacement of latest Pleistocene (i.e., 20–50 ka) deposits, and Holocene terraces (<7 ka) (Krider, 1997 #1255) cover the fault. The southern part of the fault (south of Cottonwood Creek), which is inferred mostly from topography, splays into bedrock near Double Adobe Creek. It truncates a middle Pleistocene terrace (with about 13 m of throw) at the southern end of the trace near Indian Creek (Vincent and Krider, 1997 #1193). At that site neither late Pleistocene (100 ka) nor younger terraces are disrupted by faulting. South of Indian Creek the trace is lost in bedrock. Machette and others (1986 #1033) profiled the smaller (1- to 3-m-high) scarps found along the central portion of the trace. Their morphology is probably early Holocene (Machette and others, 1986 #1033). |
| **Age of faulted surficial deposits** | Machette and others (1986 #1033) suggested that the large scarps are formed on piedmont-slope deposits of probable lower middle Pleistocene age (i.e., 500–750 ka), whereas the small scarps are formed on upper Pleistocene deposits. Detailed mapping of Vincent and Krider (1997 #1193) showed that the late Pleistocene terraces (approximately 100 ka, based on soil development), although faulted along the central and northern parts of the Gillespie Mountain fault, are not disrupted at the southern end of the trace. They also reported that middle to late Holocene deposits cover the fault and are everywhere undisturbed. |

| | |
|---|---|
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | late Quaternary (<130 ka)<br><br>*Comments:* Morphometric data from the 1- to 3-m-high scarps indicate that they may have formed about 10 ka and are clearly younger than about 15 ka on the basis of comparison with the Bonneville shoreline in Utah. However, Vincent and Krider (1997 #1193) indicate that middle to late Holocene deposits cover the fault and are everywhere undisturbed, and deposits considered to be 20-50 ka are not demonstrably offset in the area where Machette and others (1986 #1033) profiled. As a result of this apparent conflict, we use a conservative estimate that the northern two-thirds of the fault has ruptured in late Pleistocene time. The timing of movement along the southern part of the fault has not been documented other than to be middle Pleistocene (i.e., 500–750 ka). |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr<br><br>*Comments:* A low slip-rate category is assigned based on 8- to 13-m-high scarps, which relate to 6–10 m of vertical offset of deposits that are about 500–750 ka. |
| **Date and Compiler(s)** | 2016<br>Kirk R. Vincent, U.S. Geological Survey<br>Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources<br>Michael N. Machette, U.S. Geological Survey, Retired |
| **References** | #1254 Erb, E.E., Jr., 1979, Petrologic and structural evolution of ash-flow tuff cauldrons and noncauldron-related volcanic rocks in the Animas and southern Peloncillo Mountains, Hidalgo County, New Mexico: Albuquerque, University of New Mexico, unpublished Ph.D. dissertation, 286 p.<br><br>#1255 Krider, P.R., 1997, Paleoclimate significance of late Quaternary lacustrine and alluvial stratigraphy, Animas Valley, New Mexico: Tucson, University of Arizona, M.S. thesis.<br><br>#1033 Machette, M.N., Personius, S.F., Menges, C.M., and Pearthree, P.A., 1986, Map showing Quaternary and Pliocene |

faults in the Silver City 1° x 2° quadrangle and the Douglas 1° x 2° quadrangle, southeastern Arizona and southwestern New Mexico: U.S. Geological Survey Miscellaneous Field Studies Map MF-1465-C, 12 p. pamphlet, 1 sheet, scale 1:250,000.

#1193 Vincent, K.R., and Krider, P.R., 1997, Geomorphic surface maps of the southern Animas Valley, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Report OF-429, 12 sheets, scale 1:24,000.

#1060 Zeller, R.A., Jr., 1962, Reconnaissance geologic map of southern Animas Mountains: New Mexico Bureau of Mines and Mineral Resources Geologic Map 17, 1 sheet, scale 1:62,500.

#1253 Zeller, R.A., Jr., and Alper, A.M., 1965, Geology of the Walnut Wells quadrangle, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 84, 105 p.