Jump to Navigation

Quaternary Fault and Fold Database of the United States

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Milligan Gulch fault zone (Class A) No. 2107

Last Review Date: 2016-02-12

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

citation for this record: **Machette, M.N., and Jochems, A.P., compilers, 2016, Fault number 2107, Milligan Gulch 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 02:21 PM.**

Synopsis	The Milligan Gulch fault zone is comprised of a 22-km-long group of diffuse north-trending intrabasin fault scarps preserved on high-level surfaces related to filling of the San Marcial Basin. The most recent movement on most faults in the zone is considered to be of late middle to early late Pleistocene age (100–200 ka). However, no detailed study has been made of fault scarp morphology or the age of Quaternary deposits within and adjacent to the fault zoneThe Milligan Gulch fault zone is comprised of a 27-km-long group of diffuse north-trending intrabasin fault scarps preserved on high-level surfaces related to filling of the San Marcial Basin. The most recent movement on most faults in the zone is considered to be of late middle to early late Pleistocene

	age (100–200 ka). However, no detailed study has been made of fault scarp morphology or the age of Quaternary deposits within and adjacent to the fault zone.
Name comments	Mapped and named by Machette (1987 #960) for Milligan Gulch, a prominent southeast-flowing ephemeral stream that enters the Rio Grande at the north end of Elephant Butte Reservoir. The fault zone extends from about 4 km north of Milligan Gulch south to Nogal Canyon, which also flows east from the southern San Mateo Mountains. **Fault ID:** Fault (zone) 2 in Machette (1987 #960).
County(s) and State(s)	SOCORRO COUNTY, NEW MEXICO
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:24,000 and 1:100,000 scale. *Comments:* Most traces digitized at 1:24,000 scale from 1:100,000 compilation of unpublished 1:24,000-scale mapping used by Machette (1987 #960) combined with accurate placement using photogrammetric methods. Six mostly east-facing faults are from original 1:100,000-scale compilation.
Geologic setting	The Milligan Gulch fault zone is comprised of a 27-km-long group of diffuse north-trending intrabasin fault scarps in the west-central part of the San Marcial Basin, northwest of the northern end of the Fra Cristobal Mountains and east of the southern part of the San Mateo Mountains. The southern and central parts of the zone are comprised mainly of down-to-the-east faults, whereas the northern part is comprised mainly of down-to-the-west faults. All of the faults have relatively minor displacement where they deform the highest (middle or early Pleistocene) surface related to Cenozoic filling of the San Marcial Basin.
Length (km)	21 km.
Average strike	N2°W
Sense of movement	Normal

Dip Direction	E; W
Paleoseismology studies	
Geomorphic expression	These faults form small, fairly continuous east- and west-facing scarps that are 1–11 km in length. They were divided into two sets by Machette (1987 #960) on the basis of aspect: the scarps north of Milligan Gulch generally face west and the faults farther south generally face east. The west-facing scarps oppose the gradient of the piedmont slope on which they are formed, and thus are more apparent on aerial photographs. Scarps from both sets are commonly less than 5 m high, and are generally degraded; no systematic study of their morphology has been conducted. Near the southern end of the zone, there are several fresher-appearing scarps formed on lower-level (possibly late Pleistocene) surfaces. The most prominent of these "younger" scarps was named the Black Hill fault scarp by Machette (1987 #960), and thus it is discussed herein as a separate fault [2130].
Age of faulted surficial deposits	Most of the scarps in this fault zone are on high-level surfaces related to filling of the San Marcial Basin. To the south, these surfaces are generally correlative to the Cuchillo surface, which is underlain by gravel of the Palomas Formation (upper part of the Santa Fe Group). This surface was considered to be middle Pleistocene (400–500 ka) by Lozinsky (1986 #1073) and Machette (1987 #960), but Mack and others (1993 #1020) suggested that the Cuchillo surface may be as old as 700–900 ka, thereby providing an older maximum limit on the deformation. The fresher appearing scarps at the southern end of the fault zone may be formed on alluvium of late (?) Pleistocene age. However, no detailed mapping of Quaternary deposits along this fault zone or in the Milligan Gulch area have been conducted to help resolve the minimum age of faulted deposits.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* Timing based on degraded nature of fault scarps (Machette, 1987 #960). Collectively, the most recent movement on faults of the zone is considered to be late middle to early late Pleistocene age (100–200 ka). However, Machette (1987 #960) suggested that there may be late Pleistocene (30–130 ka) movement at the south end of the zone and on the Black Hill fault

	[2130], which forms the southwest margin of the Milligan Gulch fault zone.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Low slip-rate category assigned based on small scarps (<5 m high) on a surface that stabilized 700–900 ka.
Date and Compiler(s)	2016 Michael N. Machette, U.S. Geological Survey, Retired Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources
References	#1073 Lozinsky, R.R., 1986, Geology and late Cenozoic history of the Elephant Butte area, Sierra County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 187, 40 p., 2 pls. #960 Machette, M.N., 1987, Preliminary assessment of Quaternary faulting near Truth or Consequences, New Mexico: U.S. Geological Survey Open-File Report 87-652, 40 p. #1020 Mack, G.H., Salyards, S.L., and James, W.C., 1993, Magnetostratigraphy of the Plio-Pleistocene Camp Rice and Palomas formations in the Rio Grande rift of southern New Mexico: American Journal of Science, v. 293, p. 49–77.