

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](#).

Bright Angel fault zone (Class A) No. 991

Last Review Date: 1997-02-07

Compiled in cooperation with the Arizona Geological Survey

citation for this record: Pearthree, P.A., compiler, 1997, Fault number 991, Bright Angel 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 03:13 PM.

Synopsis

The northeast-trending normal faults of the Bright Angel zone cut an erosion surface formed on Paleozoic rocks between the Mogollon Rim and the Grand Canyon. The faults are northwest of the Pliocene-Quaternary San Francisco volcanic field, and Quaternary deposits are very sparse in the area. Faults have vertically displaced Paleozoic strata by as much as 60 m, forming southeast-facing escarpments and narrow grabens. The fault zone continues into the Grand Canyon, where it evidently has controlled the development of Bright Angel Canyon, a deep tributary canyon north of the Colorado River. Away from the Grand Canyon, escarpments formed on Paleozoic bedrock vary from quite gentle to fairly steep in slope. Based on their strong

	geomorphic expression, Quaternary activity is possible on some of these faults, but such movement has not been conclusively demonstrated. Moderate historical seismic activity has occurred in this general area.
Name comments	The regionally extensive Bright Angel fault zone was mapped by Shoemaker and others (1974 #2166; 1978 #2155). In the Grand Canyon area, the Bright Angel fault has been mapped in detail (Huntoon and Sears, 1975 #2175; Huntoon and others, 1976 #2174).
County(s) and State(s)	COCONINO COUNTY, ARIZONA
Physiographic province(s)	COLORADO PLATEAUS
Reliability of location	Good Compiled at 1:250,000 scale. <i>Comments:</i> Traces based on aerial photo interpretation at 1:130,000 scale; traces transferred to 1:250,000-scale topographic base map.
Geologic setting	These faults are located on the erosion surface cut on Paleozoic rocks between the Mogollon Rim and the Grand Canyon and continue into the Grand Canyon. A detailed geologic map exists for the Grand Canyon area (Huntoon and others, 1976 #2174), but not for areas south of the Grand Canyon. Faults of the Bright Angel zone cut Paleozoic bedrock; displacement of Paleozoic rocks near the Grand Canyon is about 60 m. Quaternary alluvium is sparse in this area, and no displacement of Quaternary alluvium has been documented.
Length (km)	74 km.
Average strike	N36°E
Sense of movement	Normal <i>Comments:</i> Predominantly normal movement inferred from topography and exposed stratigraphic relations.
Dip	76°-87° and 45°-80° <i>Comments:</i> Steeper dips were measured in Paleozoic strata;

	shallower dips were measured in Precambrian rocks lower in section within the Grand Canyon (Huntoon and Sears, 1975 #2175).
Paleoseismology studies	
Geomorphic expression	Fault scarps formed on bedrock are low to moderately high and their slopes range from fairly gentle to quite steep.
Age of faulted surficial deposits	Paleozoic
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) <i>Comments:</i> This timing estimate is very poorly constrained, but the strong geomorphic expression of some fault scarps suggests that there has been some Quaternary activity on this fault system.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr <i>Comments:</i> Low slip-rate category assigned based on the lack of demonstrable evidence for Quaternary movement.
Date and Compiler(s)	1997 Philip A. Pearthree, Arizona Geological Survey
References	#2175 Huntoon, P.W., and Sears, J.W., 1975, Bright Angel and Eminence faults, eastern Grand Canyon, Arizona: Geological Society of America Bulletin, v. 86, p. 465-472. #2174 Huntoon, P.W., Billingsley, G.H., Breed, W.J., Sears, J.W., Ford, T.D., Clark, M.D., Babcock, R.S., and Brown, E.H., 1976, Geologic map of the Grand Canyon National Park, Arizona: Grand Canyon Natural History Association (Grand Canyon, Arizona) and Museum of Northern Arizona (Flagstaff), 1 sheet, scale 1:62,500. #2166 Shoemaker, E.M., Squires, R.L., and Abrams, M.J., 1974, The Bright Angel and Mesa Butte fault systems of northern

Arizona, *in* Karlstrom, T.N.V., Swann, G.A., and Eastwood, R.L., eds., *Geology of northern Arizona, Part I, Regional studies: Geological Society of America, Rocky Mountain Section Meeting, Guidebook*, p. 355-391.

#2155 Shoemaker, E.M., Squires, R.L., and Abrams, M.J., 1978, Bright Angel and Mesa Butte fault systems in northern Arizona, *in* Smith, R.B., and Eaton, G.P., eds., *Cenozoic tectonics and regional geophysics of the Western Cordillera: Geological Society of America Memoir 152*, p. 341-367.

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