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Quaternary Fault and Fold Database of the United States

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Hurricane fault zone, southern section (Class A) No. 998f

Last Review Date: 1998-01-27

Compiled in cooperation with the Arizona Geological Survey

citation for this record: **Pearthree, P.A., compiler, 1998, Fault number 998f, Hurricane fault zone, southern section, 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 03:11 PM.**

Synopsis	**General:** The Hurricane fault is a long, generally north-trending fault zone with substantial Quaternary normal displacement near the western margin of the Colorado Plateaus province in Arizona and Utah. The Hurricane Cliffs are a fault-generated steep, curvilinear, west-facing bedrock escarpment several hundred meters high. Displacement decreases southward; there has been 200–400 m of Cenozoic normal displacement across the fault zone along most of its length in Arizona. Near the Utah border, displacement increases to at least 450 m and probably continues to increase into Utah.

	Sections: This fault has 6 sections. The Hurricane fault is divided into sections based on gross geomorphic expression, structural characteristics, and what is known about the recent rupture history of the fault. Although parts of the Hurricane escarpment south of the Colorado River is fairly linear and steep, no definitive evidence of Quaternary activity on this southern section [998f] of the fault has been reported. The Whitmore Canyon section [998e], between the Colorado River and the Mt. Trumbull area, last ruptured in the latest Pleistocene to early Holocene and has had recurrent late Quaternary activity. The escarpment associated with the fault in this section is steep, but is sinuous and erosionally embayed. The Mt. Trumbull area is probably a section boundary, because there is very little topographic relief across the Hurricane fault and Pliocene volcanic rocks have only been displaced a moderate amount. Northward along the Shivwitz section [998d], the curvilinear fault escarpment (the Hurricane Cliffs) increases to several hundred meters in height. Low fault scarps on colluvium, alluvium, and bedrock are common along the base of the Cliffs in this section, and record late Quaternary fault activity. The northern end of the Shivwitz section is defined by a major convex bend in the fault zone, across which total fault displacement increases by at least 50 percent. The Anderson Junction section [998c] begins at this convex bend and continues north into Utah. The fault escarpment is very steep and curvilinear, and scarps along the base of the Cliffs record at least 20 m of late Quaternary displacement. The youngest rupture on this section was probably in the early Holocene, but the northern extent of this rupture is uncertain. The next section to the north, the Ash Creek section [998b] is exhibits more complex fault geometry along the steep base of the Hurricane Cliffs. The northernmost section, Cedar City section [998a] is defined based on the timing of the most recent event. The major section boundaries are at zones of structural complexity.
Name comments	**General:** Early work by Gardner (1941 #2190) refers to the "Hurricane fault." The fault extends from about 2 km east of Cedar City, Utah, to about 5 km west of Peach Springs, Arizona, on U.S. Highway 66. **Section:** This informal name applies to the most southern part of the Hurricane fault, which extends from the Colorado River to the southern end of the fault near Peach Springs. This section corresponds with the "southern segment" of Menges and Pearthree (1983 #2073). It is separated from the Whitmore

	Canyon section of the fault, which is north of the Colorado River, because of the lack of definitive evidence of late Quaternary faulting on the southern section.
County(s) and State(s)	COCONINO COUNTY, ARIZONA MOHAVE COUNTY, ARIZONA
Physiographic province(s)	COLORADO PLATEAUS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Most of this section was mapped at 1:48,000 scale (Billingsley and others, 1986 #2179; Wenrich and others, 1986 #2194; Billingsley and others, 1990 #2189); the trace was transferred to 1:250,000-scale topographic map for digitization.
Geologic setting	The Hurricane fault zone is one of several long, down-to-the-west, normal faults located in what is effectively a 150-km-wide transition zone between the Colorado Plateaus and Basin and Range. Substantial late Cenozoic displacement on the Grand Wash [1005], Washington [1004], Hurricane, and Sevier/Toroweap [997] faults has resulted in the formation of a series of broad plateaus and escarpments that step down to the west. Along most of its length, the Hurricane fault is marked by a high, steep bedrock escarpment with relatively thin Quaternary deposits along its base. Paleozoic strata have been vertically displaced by hundreds of meters across the Hurricane fault. Pliocene and Quaternary basalt flows have been displaced by substantial amounts, and upper Quaternary alluvium and colluvium have been faulted as well. Stewart and Taylor (1996 #3473) document 450 m of stratigraphic separation in Quaternary basalt displaced by the fault, and a total separation of 2,520 m across a portion of the Hurricane fault near Anderson Junction. Cenozoic displacement is only 200–400 m across the fault zone along most of its length in Arizona. Several swarms of historical seismicity have occurred adjacent to, but cannot be correlated directly with, the north end of the Hurricane fault. The earliest of these swarms (1942) included two approximately magnitude 5 earthquakes (Arabasz and Smith, 1979 #4438; Richins and others, 1981 #4443). The 1992 M5.8 St. George earthquake was likely on the Hurricane fault (Pechmann and others, 1995 #4442).
Length (km)	This section is 71 km of a total fault length of 238 km.

Average strike	N22°E (for section) versus N11°E,N39°E,N39°E,N39°E (for whole fault)
Sense of movement	Normal *Comments:* Based on regional relations and normal displacement of Paleozoic bedrock across the fault zone.
Dip	70° to 55° W. *Comments:* Based on fault exposures in the Grand Canyon and south along the fault as far as the Peach Springs area (Hamblin, 1965 #1522).
Paleoseismology studies	
Geomorphic expression	Faulting has generated a moderately high, steep, embayed, west-facing escarpment on Paleozoic bedrock. Paleozoic units are vertically displaced by as much as 700 m, but the total displacement decreases to the south along the fault. The fault zone has complex geometry, with multiple fault strands along much of this section. The faults typically are located in valleys or canyons along most of this section, and young deposition along the fault is very limited. Available detailed mapping indicates that young surficial deposits are not faulted, although some very dissected, Pliocene-Quaternary deposits near the southern end of the fault may be displaced by a few meters (Billingsley and others, 1990 #2189).
Age of faulted surficial deposits	Paleozoic, Pliocene-Quaternary
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Quaternary fault activity is based primarily on the fault's fairly linear escarpment. There is no documented evidence of displacement of Quaternary deposits, but Pliocene-Quaternary deposits may be displaced near the southern end of this section.
Recurrence	

interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No displacement rate estimates have been made for this section. However, on the basis of its distal location and the inferred slip rate of the presumedly more active Whitmore Canyon section [999d] to the north, we infer a long-term average slip rate of less than 0.2 mm/yr.
Date and Compiler(s)	1998 Philip A. Pearthree, Arizona Geological Survey
References	#4438 Arabasz, W.J., and Smith, R.B., 1979, The November 1971 earthquake swarm near Cedar City, Utah, *in* Arabasz, W.J., Smith, R.B., and Richins, W.D., eds., Earthquake studies in Utah, University of Utah Seismograph Stations: University of Utah, Department of Geology and Geophysics, p. 423-432. #2179 Billingsley, G.H., Wenrich, K.J., and Huntoon, P.W., 1986, Breccia pipe and geologic map of the southeastern Hualapai Indian Reservation and vicinity, Arizona: U.S. Geological Survey Open-File Report 86-458B, 26 p., 2 pls., scale 1:48,000. #2189 Billingsley, G.H., Wenrich, K.J., Huntoon, P.W., and Young, R.A., 1990, Breccia pipe and geologic map of the southwestern Hualapai Indian Reservation and vicinity, Arizona: U.S. Geological Survey Open-File Report 86-0458D, 33 p., 2 sheets, scale 1:48,000. #2190 Gardner, L.S., 1941, The Hurricane fault in southwestern Utah and northwestern Arizona: American Journal of Science, v. 239, no. 4, p. 241-260. #1522 Hamblin, W.K., 1965, Origin of "reverse drag" on the downthrown side of normal faults: Geological Society of America Bulletin, v. 76, p. 1145-1164. #2073 Menges, C.M., and Pearthree, P.A., 1983, Map of neotectonic (latest Pliocene-Quaternary) deformation in Arizona: Arizona Geological Survey Open-File Report 83-22, 48 p., scale 1:500,000. #4442 Pechmann, J.C., Arabasz, W.J., and Nava, S.J., 1995, Seismology, *in* Christenson, G.E., ed., The September 2, 1992 ML 5.8 St. George earthquake, Washington County, Utah: Utah

	Geological Survey Circular 88, p. 1. #4443 Richins, W.D., Zandt, G., and Arabasz, W.J., 1981, Swarm seismicity along the Hurricane fault zone during 1980-81—A typical example for SW Utah [abs.]: Eos, Transactions of the American Geophysical Union, v. 62, no. 45, p. 966. #3473 Stewart, M.E., and Taylor, W.J., 1996, Structural analysis and fault segment boundary identification along the Hurricane fault in southwestern Utah: Journal of Structural Geology, v. 18, p. 1017-1029. #2194 Wenrich, K.J., Billingsley, G.H., and Huntoon, P.W., 1986, Breccia pipe and geologic map of the northeastern Hualapai Indian Reservation and vicinity, Arizona: U.S. Geological Survey Open-File Report 86-458A, 29 p., 2 sheets, scale 1:48,000.