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Quaternary Fault and Fold Database of the United States

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Yucca fault (Class A) No. 1042

Last Review Date: 1998-01-14

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Synopsis	The Yucca fault is a north-striking, east-dipping, down-to-the-east, intrabasin normal fault in the medial part of Yucca Flat. The fault is marked by a conspicuous scarp, possibly as much as 15 m high, formed in Quaternary alluvium. The north end of the Yucca fault appears to merge with, or terminate at, the northeast-striking Boundary fault [1041], which is a range-bounding fault along the northeast margin of Yucca Flat, that shows evidence for latest Pleistocene or Holocene displacement. The age of the last Quaternary displacement event along the Yucca fault is not tightly constrained, but it is estimated to be late Pleistocene or Holocene. Estimates of slip rate for the fault are low (<0.2 mm/yr) and no information on the recurrence interval has been reported. Part of the fault has been activated by nuclear testing in Yucca Flat.
Name comments	Name from Carr (1974 #1470) who applied the name to a north-striking, mid-valley, predominantly dip-slip fault in the central part of Yucca Flat; Piety (1995 #915) also referred to the fault by

	that name. dePolo (1998 #2845) portrayed this fault connected with the Butte fault to the north, and referred to the combined fault as the Yucca-Butte fault zone. Piety referred to the Butte fault as part of the Oak Springs Butte faults (her OAK); these faults, however, do not show convincing evidence for Quaternary activity and are excluded from this compilation of Quaternary faults. The most detailed field mapping of the fault was done by Swadley and Hoover (1990 #1663), but the fault is also shown on photogeologic Quaternary fault maps by Dohrenwend and others (1992 #289) and Reheis (1992 #1604), and shown on a compilation of Quaternary faults by Piety (1995 #915). The fault extends from Area 3 in the Nevada Test Site, sinuously northward in the central part of Yucca flat, to about Oak Spring Wash along the piedmont slope of Quartzite Butte at the north end of Yucca flat. **Fault ID:** Referred to as YC by Piety (1995 #915) and portrayed as G17 by dePolo (1998 #2845).
County(s) and State(s)	NYE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:48,000 scale. *Comments:* Location is from Swadley and Hoover (1990 #1663) who mapped fault traces of the Yucca fault on aerial photos at a scale of about 1:24,000 and later compiled the traces by photo-reduction on a 1:48,000-scale topographic map.
Geologic setting	The Yucca Fault is located near the center of and bisects Yucca Flat, a north-trending valley occupying a structural basin in the Nevada Test Site (Carr, 1984 #1472, p. 21). Displacement on Yucca fault resulted in formation of a fairly young medial basin in an existing basin (Carr, 1984 #1472, p. 25).
Length (km)	23 km.
Average strike	N6°W
Sense of movement	Normal *Comments:* Principle displacement is dip slip and down to the east

	(Barnes and others, 1963 #1442; Colton and McKay, 1966 #1481; Frizzell and Shulters, 1990 #1037; Swadley and Hoover, 1990 #1663). Carr (1984 #1472) suggested that the Yucca fault belongs to a set of north-striking faults with right-oblique displacement. Carr (1974 #1470, p. 27-28, fig. 9A) concluded that the left-stepping, en echelon pattern of scarps associated with the Yucca fault suggests right-lateral displacement.
Dip	50°-80°E *Comments:* Yucca fault dips 75° E. to 80° E. at the surface and probably flattens to dips of 55° to 65° at depth (Carr, 1974 #1470, p. 26). Dips of 50° E. to 60° E. are observed on the southern half of fault (Carr, 1974 #1470).
Paleoseismology studies	
Geomorphic expression	Marked for most of its length by a low, east-facing scarp (Barosh, 1968 #1443, p. 201). This scarp is noted to be "several hundred feet east of older buried parts of the fault zone" (Carr, 1974 #1470, p. 26). A scarp on an alluvial surface at the fault's northern end is noted by Barosh (1968 #1443) to be more than 12 m high and by Fernald and others (1968 #1512) to be about 15 m high. The height of the scarp is reported by Barosh (1968 #1443, p. 209) to be commonly 1.5 to 6 m. Carr (1974 #1470) did not find any evidence for multiple ruptures on at least the southern 16 km of the scarp associated with the Yucca fault. Barosh (1968 #1443, p. 209) reported low, east- and west-facing secondary scarps adjacent to the main scarp at a few places in central Yucca Flat. Dohrenwend and others (1992 #289) portray the fault as a nearly continuous, but slightly segmented, east-facing scarp on depositional or erosional surfaces of possible late Pleistocene age. Cracks and scarps that formed in alluvium during underground explosions are also preserved along the Yucca fault and branch faults adjacent to it on the east (Barosh, 1968 #1443, p. 210-211). These modern scarps slope 70? E or are vertical (Barosh, 1968 #1443, p. 211).
Age of faulted surficial deposits	Swadley and Hoover (1990 #1663) show the Yucca fault with displacement in Qap deposits (~160 ka to 800 ka) and QTa deposits (>740 ka) along most of its trace. Swadley and Hoover (1990 #1663) showed short portions of the Yucca fault as concealed by Holocene alluvium (younger that about 10 ka). They

	also portrayed Holocene alluvium as deposited against two scarps on surfaces of their Qap deposits. Dohrenwend and others, (1992 #289) portrayed the Yucca fault as scarps on depositional or erosional surfaces of possible late Pleistocene age (10- 130 ka).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Dohrenwend and others (1992 #289) portrayed the Yucca fault as scarps on depositional or erosional surfaces of possible late Pleistocene age (their Q2(?) surfaces with estimated ages between 10 ka and 130 ka), suggesting a late Pleistocene or Holocene age for surface rupture. Shroba and others (1988 #1641, p. 2) reported a minimum age of 35 ka for one of the younger events on the Yucca fault. This age was estimated by Knauss (1981 #1558) (cited in Shroba and others, 1988 #1641, p. 5) on the basis of uranium-series analyses on a carbonate-rich fracture filling. This 35-ka age, however, is considered poorly constrained stratigraphically. Barosh (1968 #1443, p. 201, 216) concluded that the low scarp "demonstrates the very recent age of the fault and there is no reason not to consider it an active fault". Fernald and others (1968 #1512, p. 50) reported that drainage development in Yucca Flat has been disrupted by displacement on the Yucca fault, which they concluded is still active. Carr (1974 #1470, p. 26) noted that the scarp has been modified by erosion but concluded on the basis of a comparison of the scarp associated with 100-yr-old scarps in Owens Valley that it probably formed between 1 ka and 10 ka. Some displacement along the southern end of the fault is historic in age and was induced by underground nuclear testing (Carr, 1974 #1470; Frizzell and Shulters, 1990 #1037). A late Quaternary (<130 ka) age for the most recent event is assigned to the fault, but that event might be as young as latest Quaternary (<15 ka).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* dePolo (1998 #2845) calculated a preferred vertical slip rate of 0.023 mm/yr for the fault, based on a "surface displacement" measurement made by Fernald and others (1968 #1512) and on estimates of surface ages interpreted from mapping

	of Swadley and Hoover (1990 #1663). The late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) also suggest a low slip rate. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault.
Date and Compiler(s)	1998 R. Ernest Anderson, U.S. Geological Survey, Emeritus
References	#1442 Barnes, H., Houser, F.N., and Poole, F.G., 1963, Geology of the Oak Spring quadrangle, Nye County, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-214, 1 sheet, scale 1:24,000. #1443 Barosh, P.J., 1968, Relationships of explosion-produced fracture patterns to geologic structure in Yucca Flat, Nevada Test Site, *in* Eckel, E.B., ed., Nevada Test Site: Geological Society of America Memoir 110, p. 199-217. #1470 Carr, W.J., 1974, Summary of tectonic and structural evidence for stress orientation at the Nevada Test Site: U.S. Geological Survey Open-File Report 74-176, 53 p. #1472 Carr, W.J., 1984, Regional structural setting of Yucca Mountain, southwestern Nevada, and late Cenozoic rates of tectonic activity in parts of the southwestern Great Basin, Nevada and California: U.S. Geological Survey Open-File Report 84-854, 114 p. #1481 Colton, R.B., and McKay, E.J., 1966, Geologic map of the Yucca Flat quadrangle, Nye County, Nevada: U.S. Geological Survey Geologic quadrangle Map GQ-582, 1 sheet, scale 1:24,000. #2845 dePolo, C.M., 1998, A reconnaissance technique for estimating the slip rate of normal-slip faults in the Great Basin, and application to faults in Nevada, U.S.A.: Reno, University of Nevada, unpublished Ph.D. dissertation, 199 p. #289 Dohrenwend, J.C., Schell, B.A., McKittrick, M.A., and Moring, B.C., 1992, Reconnaissance photogeologic map of young faults in the Goldfield 1° by 2° quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2183, 1 sheet, scale 1:250,000.

#1512 Fernald, A.T., Corchary, G.S., Williams, W.P., and Colton, R.B., 1968, Surficial deposits of Yucca Flat area, Nevada Test Site, *in* Eckel, E.B., ed., Nevada Test Site: Geological Society of America Memoir 110, p. 49-55.

#1037 Frizzell, V.A., Jr., and Shulters, J., 1990, Geologic map of the Nevada Test Site, southern Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-2046, 1 sheet, scale 1:100,000.

#1558 Knauss, K.G., 1981, Dating fault associated Quaternary material from the Nevada Test Site using uranium-series methods: Lawrence Livermore National Laboratory Report UCRL-53231, 51 p.

#915 Piety, L.A., 1995, Compilation of known and suspected Quaternary faults within 100 km of Yucca Mountain, Nevada and California: U.S. Geological Survey Open-File Report 94-112, 404 p., 2 pls., scale 1:250,000.

#1604 Reheis, M.C., 1992, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the Cactus Flat and Pahute Mesa 1:100,000 quadrangles and the western parts of the Timpahute Range, Pahranagat Range, Indian Springs, and Las Vegas 1:100,000 quadrangles, Nevada: U.S. Geological Survey Open-File Report 92-193, 14 p., 3 pls., scale 1:100,000.

#1641 Shroba, R.R., Muhs, D.R., and Rosholt, J.N., 1988, Physical properties and radiometric age estimates of surficial and fracture-fill deposits along a portion of the Carpetbag fault system, Nevada Test Site, Nye County, Nevada: U.S. Geological Survey Report DOE/NV/10583-1, 34 p.

#1663 Swadley, W., and Hoover, D.L., 1990, Geologic map of the surficial deposits of the Yucca Flat area, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-2047, 1 sheet, scale 1:48,000.

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