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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.

Boundary fault (Class A) No. 1041

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Synopsis	The Boundary fault is a northeast-striking, down-to-the-southeast, range-front fault that is located along the north margin of Yucca Flat. The fault is shown on several maps ranging in scale from 1:24,000 to 1:250,000. All of the maps show the 3-km-long northeast part as a Quaternary fault. The 3-km-long southwest part is shown as a Quaternary fault on some maps, but not on others. Along the 3-km-long northeast part of the fault, Miocene tuff and Quaternary alluvium are downfaulted against Paleozoic, Mesozoic, and Tertiary bedrock. The southwest part of the fault, also about 3 km long, is shown to cut bedrock and as being partially buried by Quaternary alluvium and Miocene tuff on one map. On another map, however, this southwest part of the fault is shown to cut Quaternary alluvium with an estimated age range of about 160 ka to at most 800 ka. On two photogeologic maps of Quaternary faults, the southwest part of the fault is shown principally as a scarp on Quaternary deposits. Minimal field study of the fault has been reported The fault has been trenched, however, and uranium-thorium analyses of laminar caliche

	samples from the fault zone in that trench, suggest latest Pleistocene or Holocene displacement along the fault. Scarp-height data and estimates of slip rate and recurrence interval have not been reported.
Name comments	The fault was mapped and first named as part of the systematic 1:24,000 geologic mapping of the Nevada Test Site (Barnes and others, 1963 #1442). The Boundary fault is a short, slightly sinuous, generally northeast-striking structure directly north of Yucca Flat between Oak Spring Wash and Butte Wash. The fault apparently is named after the north boundary of the Nevada Test Site, a boundary that is located about 2 km north of the north end of the fault. **Fault ID:** Referred to as BD by Piety (1995 #915)
County(s) and State(s)	NYE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* The Boundary fault is shown on several maps ranging in scale from 1:24,000 to 1:250,000 (Barnes and others, 1963 #1442; Carr, 1974 #1470; Frizzell and Shulters, 1990 #1037; Swadley and Hoover, 1990 #1663; Dohrenwend and others, 1992 #289; Reheis, 1992 #1604). All maps show the 3-km-long NE part as a Quaternary fault. The 3-km-long SW part is shown as a Quaternary fault on some maps (Swadley and Hoover, 1990 #1663; Dohrenwend and others, 1992 #289; Reheis, 1992 #1604; Piety, 1995 #915), but not on others (Barnes and others, 1963 #1442; Carr, 1974 #1470; Frizzell and Shulters, 1990 #1037). The NE part is well located on all maps. The SW part is shown as a single trace on one map (Swadley and Hoover, 1990 #1663) and as single and closely spaced double traces on another (Barnes and others, 1963 #1442). Location of fault traces shown herein are from Reheis (1992 #1604) who compiled the fault on a 1:100,00-scale topographic map from photogeologic study of aerial photographs at scales of 1:60,000 and 1:80,000.
Geologic setting	The Boundary fault is northeast-striking fault that is present between the north extreme of central Yucca Flat and the southern

	extreme of the Belted Range (south of Oak Spring Butte in the Belted Range). This fault shows down-to-the-southeast displacement and appears to be a range-bounding fault along the southeast flank of Quartzite Ridge, which separates the basin beneath Yucca Flat from the bedrock block of Quartzite Ridge. Miocene tuff and Quaternary alluvium are downfaulted against Paleozoic, Mesozoic, and Tertiary bedrock along the northeast part of the fault for about 3 km. Along the southwest part of the fault, which is also about 3 km long, the fault cuts bedrock and is partially buried by Quaternary alluvium and Miocene tuff on one map (Barnes and others, 1963 #1442). On another map (Swadley and Hoover, 1990 #1663), the southwest part of the fault cuts Quaternary alluvium with an estimated age between about 160 ka and at most 800 ka (their Qap deposits). On photogeologic maps by Dohrenwend and others (1992 #289) and Reheis (1992 #1604) scarps on Quaternary deposits or surfaces are shown along the southwest part of the fault. The northeast end of the Boundary fault appears to connect with the north end of the north-striking Yucca fault [1042] that also shows evidence for late Pleistocene or Holocene activity. The relation of this fault to nearby faults, such as the Yucca fault [1042] in the central part of Yucca Flat, is not known.
Length (km)	6 km.
Average strike	N28°E
Sense of movement	Normal *Comments:* As shown by Dohrenwend and others (1992 #289) and by Reheis (1992 #1604), southeast-facing scarps along the fault and the range-front character of the fault indicate down-to-the-southeast offset, possibly also indicating that the fault dips to the southeast and has a normal sense of movement.
Dip Direction	SE *Comments:* Inferred to be SE based on the presence of southeast-facing scarps and the range-front character of the fault (Dohrenwend and others, 1992 #289; Reheis, 1992 #1604) suggest that the fault dips to the southeast.
Paleoseismology studies	Trench 1041-1. Szabo and others (1981 #1674) reported dates from uranium-thorium analyses of >8 ka and greater than or equal

	to 24 ka for laminar caliche exposed in a trench across the northeast part of Boundary fault (their samples 50 and 51, tables 1 and 3). The younger caliche is displaced by the fault; the older caliche is from the fault zone (Szabo and others, 1981 #1674, p. 28). They concluded that a faulting event occurred after deposition of most of the laminar caliche. The location of this trench as shown herein, is approximate and based on the location of the samples shown on a figure 6 in Szabo and others (1981 #1674). A description of rock units or deposits and the character of the fault, as exposed in the trench, is not given in Szabo and others (1981 #1674). The existence elsewhere of such a description is unknown.
Geomorphic expression	Swadley and Hoover (1990 #1663) reported that lineaments and scarps developed on surfaces of Quaternary deposits are observable on aerial photos. Photogeologic mapping by Dohrenwend and others (1992 #289) and Reheis (1992 #1604) shows west-facing scarps developed on Quaternary deposits or surfaces. Dohrenwend and others (1992 #289) assigned a late Pleistocene age to some of these scarp-bearing deposits or surfaces.
Age of faulted surficial deposits	Characterized by Swadley and Hoover (1990 #1663) as developed on surfaces of Quaternary alluvial deposits of two different ages, one with an estimated age between about 160 ka and at most 800 ka and one with an estimated age of >740 ka. Photogeologic mapping by Dohrenwend and others (1992 #289), shows the fault as a series of scarps on Pleistocene depositional or erosional surfaces. Based on their photogeologic study, Dohrenwend and others (1992 #289) assigned a late Pleistocene age (10-130 ka) to scarp-bearing deposits or surfaces along the south part of the fault and assigned a less certain late Pleistocene age to scarp-bearing deposits or surfaces along the north part of the fault.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Photogeologic mapping by Dohrenwend and others (1992 #289), suggests that the youngest movement along Boundary fault is no older than late Pleistocene (10-130 ka). The morphology of the scarp "suggests younger significant offset than on the Rock Valley fault" (Szabo and others, 1981 #1674, p. 28). A comparison of the characteristics of this scarp to those of scarps

	in north-central Nevada studied by Wallace (1977 #166), also suggested to Szabo and others (1981 #1674) that the scarp formed about 10 ka. Szabo and others (1981 #1674) also reported dates (uranium-thorium analyses; samples 50 and 51, tables 1 and 3) of >8 ka and greater than or equal to 24 ka for laminar caliche exposed in a trench across the northeast part of Boundary fault. The younger caliche is displaced by the fault, whereas the older caliche is from the fault zone and appears "to be crushed and jostled somewhat by subsequent movements" (Szabo and others, 1981 #1674, p. 28). On the basis of the uranium-thorium analyses and the scarp characteristics, they concluded that the fault "may have moved a little as recently as 8,000 years ago" (Szabo and others, 1981 #1674, table 3, p. 19).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No scarp-height data or displacement measurements have been reported. The late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) 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. #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. #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. #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. #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. #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. #1674 Szabo, B.J., Carr, W.J., and Gottschall, W.C., 1981, Uranium-thorium dating of Quaternary carbonate accumulations in the Nevada Test Site region, southern Nevada: U.S. Geological Survey Open-File Report 81-119, 35 p. #166 Wallace, R.E., 1977, Profiles and ages of young fault scarps, north-central Nevada: Geological Society of America Bulletin, v. 88, no. 9, p. 1267–1281.