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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.

Boulder front fault (Class A) No. 639

Last Review Date: 2010-11-09

Compiled in cooperation with the Idaho Geological Survey

citation for this record: **Crone, A.J., and Neier, R.S., compilers, 2010, Fault number 639, Boulder front fault, 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 03:03 PM.**

Synopsis	The Boulder Front fault bounds the southwestern side of the Boulder Mountains, northwest of Ketchum, Idaho. Although not studied in detail, reconnaissance studies indicate that late Quaternary and Holocene deposits are offset near the mouth of Boulder Creek. Well-defined scarps are difficult to identify elsewhere along the range front, but the fault trace may coincide with the alignment of springs. No detailed studies have been conducted on this fault to refine its history of late Quaternary movement.
Name comments	The fault was initially mapped by Scott (1982 #278) as a short feature that offset late Quaternary and Holocene deposits near the

	mouth of Boulder Creek. The fault was informally called the Boulder Creek fault in a report on the Little Wood River dam site by Geomatrix Consultants, Inc. (1989 #6333). The name Boulder front fault was used by Rodgers and others (1995 #6330), but they refer to the fault in a cursory manner and do not discuss any significant aspects of Quaternary faulting.
County(s) and State(s)	BLAINE COUNTY, IDAHO
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* The fault has not been mapped or studied in detail. Published traces of the fault are only shown on 1:250,000-scale maps of Scott (1982 #278), Geomatrix Consultants, Inc. (1989 #6333), and Worl and others (1991 #6339); the location of the fault is further constrained by satellite imagery and topography at scale of 1:100,000. Reference satellite imagery is ESRI_Imagery_World_2D with a minimum viewing distance of 1 km (1,000 m).
Geologic setting	The fault is located in the upper reaches of the Big Wood River, about 18 km northwest of Ketchum, Idaho. The fault defines the southern boundary of a central portion of the Boulder Mountains. The geologic structure in the area of the Boulder front fault is the product of orogenic events that date back to the Antler orogeny of Late Devonian to Early Mississippian age, which produced tilting, faulting, and regional uplifts (Rodgers and others, 1995 #6330). Compression during the Sevier orogeny in Late Jurassic to Cretaceous time produced crustal shortening by folding and by movement on major, low-angle thrust faults, some of which may have tens of kilometers of slip. Dextral-normal faulting occurred on southwesterly dipping, low-angle faults in early(?) Eocene time, and in middle Eocene to Oligocene time, dip-slip displacements totaling a few hundred meters occurred on northeast-trending normal faults. Extensional movement on these faults was coeval with the main eruptive phase of the Challis volcanic rocks. In Neogene time, movement on northwest-striking normal faults broke the crust into northeast-tilted blocks. The Boulder front fault is described as one of these significant Neogene faults, which, in the vicinity, include the Sawtooth [640],

	Sun Valley and Big Smokey faults (Rodgers and others, 1995 #6330), and regionally, includes the Lost River [601], Lemhi [602], and Beaverhead [603] faults.
Length (km)	9 km.
Average strike	N63°W
Sense of movement	Normal *Comments:* Studies of the fault are limited. Geomatrix Consultants, Inc. (1989 #6333) describe the fault as a down-to-the-south normal fault based on the fault's outcrop pattern at Boulder Creek.
Dip	About 45° SW *Comments:* Studies of the fault have been limited. Geomatrix Consultants, Inc. (1989 #6333) report this dip value based on the fault's outcrop pattern at Boulder Creek.
Paleoseismology studies	
Geomorphic expression	The most prominent expression of the fault is near Boulder Creek, where a prominent, 1.5- to 2-m-high scarp is present on proximal glacial moraines and associated outwash deposits. Southeast of Boulder Creek, the scarp is more difficult to trace because it trends along a steep mountain front, but its location may coincide with a group of aligned springs. Elsewhere, the trace of the fault is inferred on the basis of mapping of lineaments (Geomatrix Consultants, Inc., 1989 #6333). The best expression of the fault is a scarp formed on a latest Pinedale-age recessional outwash terrace, which is inset into a Pinedale moraine (about 20 ka). The composite scarp on this terrace has a surface offset of 4-5 m and a maximum slope angle of 24? (Geomatrix Consultants, Inc., 1989 #6333). Fluvial deposits inset into this terrace also appear to have a 0.3- to 0.5-m-high scarp that can be traced to the fault scarp on the Pinedale moraine. Worl and others (1991 #6339) map the fault as being about 20-km long and extending from near Galena Summit southeastward to the end of the range front.
Age of faulted surficial deposits	Holocene. The small scarp inset into the latest Pleistocene outwash terrace is thought to be Holocene in age, although the specific age of these deposits remains unknown.

Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Latest Pleistocene moraines and outwash deposits are offset. These deposits are correlated with deposits of the Pinedale glaciation in the Northern Rocky Mountains of the U.S., which are thought to have an age of about 20 ka. A small scarp is present on younger deposits inset into the outwash terrace, and although the specific age of the deposits in not known, they are inferred to be Holocene in age based on their proximity to the active channel of Boulder Creek (Geomatrix Consultants, Inc., 1989 #6333).
Recurrence interval	*Comments:* The fault has not been studied in sufficient detail to determine a recurrence interval. The description reported by Geomatrix Consultants, Inc. (1989 #6333) indicates recurrent movement in late Pleistocene time because older deposits have higher scarps, but the age of individual deposits is very poorly constrained and the number of paleoevents that formed large scarps on old deposits is unknown.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Little data are presently available to define a slip rate. Studies by Geomatrix Consultants, Inc. (1989 #6333) indicated that a scarp, 4- to 5-m high, is present on outwash deposits that are thought to be about 20 ka. These data suggest a low slip rate, and in the absence of solid information on the age of faulted deposits and the amount of offset in those deposits, the Boulder Front fault probably has a long-term slip rate of less than 0.2 mm/yr.
Date and Compiler(s)	2010 Anthony J. Crone, U.S. Geological Survey, Emeritus Ricky S. Neier, University of Idaho
References	#6333 Geomatrix Consultants, Inc., 1989, Final report seismotectonic evaluation for Little Wood River Dam site: Technical report to U.S. Department of Interior, Bureau of Reclamation, Denver, Colorado, 104 p., 2 pls. #6330 Rodgers, D.W., Link, P.K., and Huerta, A.D., 1995, Structural framework of mineral deposits hosted by Paleozoic

	rocks in the northeastern part of the Hailey 1° x 2° quadrangle, south-central Idaho: U.S. Geological Survey Bulletin 2064-B, p. B1-B18, 1 pl., scale 1:100,000. #278 Scott, W.E., 1982, Surficial geologic map of the eastern Snake River Plain and adjacent areas, 111° to 115° W., Idaho and Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-1372, 2 sheets, scale 1:250,000. #6339 Worl, R.G., Kiilsgard, T.G., Bennett, E.H., Link, P.K., Lewis, R.S., Mitchell, V.E., Johnson, K.M., and Snyder, L.D., 1991, Geologic map of the Hailey 1° x 2° quadrangle, Idaho: U.S. Geological Survey Open-File Report 91-340, 1 sheet, scale 1:250,000.