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Quaternary Fault and Fold Database of the United States

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Lima Reservoir fault (Class A) No. 646

Last Review Date: 2010-11-17

Compiled in cooperation with the Montana Bureau of Mines and Geology

citation for this record: **Haller, K.M., compiler, 2010, Fault number 646, Lima Reservoir 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 02:04 PM.**

Synopsis	Little is known about this fault; one trenching study has been published, which suggests multiple faulting events in postglacial (<15 ka) time.
Name comments	Earliest reference to this fault is in Myers and Hamilton (1964 #250). However, the original source of name is Bartholomew and Stickney (1987 #9) who also called this feature the Lima Reservoir graben (Stickney and Bartholomew, 1987 #85; Stickney and Bartholomew, 1987 #242) and southwest, middle, and northeast segments of the Lima graben in Montana Bureau of Mines and Geology digital database (Stickney and Bartholomew, written commun. 1992 #556). Most recent publications use the name Lima Reservoir fault (Bartholomew and others, 2002

	#7028; 2009 #7029), which is the name we use in this compilation for both the Lima Reservoir graben and the unnamed fault near Trail Creek in earlier compilation. **Fault ID:** Refers to feature number 10 (Lima Reservoir graben) of Stickney and Bartholomew (1987 #85). Shown as North Shore scarps, one of three sets of scarps defining the Lima Reservoir graben of Stickney and Bartholomew (1987 #242) and the Lima graben of Stickney and Bartholomew (written commun. 1992 #556).
County(s) and State(s)	BEAVERHEAD COUNTY, MONTANA
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Location of fault is from M. Stickney (written commun., 2011). Figures 2 and 3 of Bartholomew and others (2002 #7028) show the fault differently than depicted here. The scarps are highly modified by landsliding as noted by Lonn and others (2000 #7055).
Geologic setting	The Lima Reservoir fault is located on the northwest side of the 6- to 10-km-wide Centennial Valley west of the westernmost Centennial fault. Its trace is sinuous and merges into a landslide. Maximum scarp height is about 9 m; total amount of throw is unknown.
Length (km)	3 km.
Average strike	N71°W
Sense of movement	Normal *Comments:* (Bartholomew and others, 2002 #7028)
Dip Direction	S
Paleoseismology studies	A trench (646-1) was excavated in 1986 across the middle, down-to-the-south scarp (Bartholomew and Stickney, 1987 #9; Stickney and others, 1987 #295). The trench site (identified as Trench MGMG1886-6 in Bartholomew and others, 2002 #7028) was located in the western one-third of the scarp. Interpretation of the

	trench log in the few years following the field investigation included at least two faulting events resulting in more than 7 m of offset of Pleistocene deposits and at least 5 m of offset of upper Quaternary? (pre-Pinedale) deposits; in addition, earlier faulting event(s?) generated sandblows. Subsequently, Bartholomew and others (2002 #7028) provided more details of their findings as well as a detailed location of the trench, which greatly improved our original, approximate location. Two additional trenches were excavated east of the first trench site (M. Stickney, written commun., 2011). These additional new trenches extend the paleoseismic record back to include eight surface-deforming earthquakes in 45 k.y. (Bartholomew and others, 2009 #7029).
Geomorphic expression	Myers and Hamilton (1964 #250) indicate presence of 6-m-high scarps.
Age of faulted surficial deposits	Pleistocene fluvial deposits (Bartholomew and Stickney, 1987 #9)
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Stickney and Bartholomew (1987 #242) indicate that the northern of the three scarps is late Quaternary in age; however, the southern two were shown as postglacial, as supported by trenching data (Bartholomew and Stickney, 1987 #9; Stickney and others, 1987 #295, Bartholomew and others, 2002 #7028). Anastasio and others (2010) provide evidence for two Pleistocene or Holocene ruptures on each of the Lima Reservoir faults. Ostenaa and Wood (1990 #318) contend that these scarps may be subsidiary to the Centennial fault [643], which is thought to be Holocene along its western section.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Previous inferred low rate of slip is based on 1- to 2-m-high scarps on lower Holocene deposits and 6- to 8-m-high

	scarps on upper Quaternary deposits (Stickney and Bartholomew, 1987 #85). Later interpretations by Bartholomew and others (2002 #7028) suggest the fault zone has undergone about 8.8 m of apparent displacement and about 2 m of net horizontal extension during the past 20 k.y., for a horizontal rate of about 0.44 mm/yr; Bartholomew and others (2002 #7028) further point out that the reported rate is many times higher than other latest Pleistocene faults in the region. Furthermore, they calculate rates for each of their six events that range from 0.02 mm/yr for north-south compressional events to 0.24 mm/yr for Basin and Range extensional events, with the remaining deficit of slip being accommodated by east-west compression. Anastasio and others (2010) conclude that the average vertical displacement rate is 0.31±0.06 mm/yr.
Date and Compiler(s)	2010 Kathleen M. Haller, U.S. Geological Survey
References	#7793 Anastasio, D.J., Majerowicz, C.N., Pazzaglia, F.J., and Regalla, C.A., 2010, Late Pleistocene–Holocene ruptures of the Lima Reservoir fault, SW Montana: Journal of Structural Geology, v. 32, p. 1996–2008, ISSN 0191-8141, https://doi.org/10.1016/j.jsg.2010.08.012. #9 Bartholomew, M.J., and Stickney, M.C., 1987, Late Quaternary faulting in southwestern Montana: Geological Society of America Abstracts with Programs, v. 19, p. 258-259. #7029 Bartholomew, M.J., Bone, M.J., Rittenour, T.M., Michelson, A.M., and Stickney, M.C., 2009, "Stress switching" along the Lima Reservoir fault in Yellowstone's wake: Geological Society of America Abstracts with Programs, v. 41, no. 7, p. 55. #7028 Bartholomew, M.J., Stickney, M.C., Wilde, E.M., and Dundas, R.G., 2002, Late Quaternary paleoseismites—Syndepositional features and section restoration used to indicate paleoseismicity and stress-field orientations during faulting along the main Lima Reservoir fault, southwestern Montana, *in* Ettensohn, F.R., Rast, N., and Brett, C.E., eds., Ancient seismites: Boulder, Colorado, Geological Society of America Special Paper 359, p. 290-47. #7055 Lonn, J.D., Skipp, B., Ruppel, E.T., Janecke, S.U., Perry, W.J., Jr., Sears, J.W., Bartholomew, M.J., Stickney, M.C., Fritz, W.J., Hurlow, H.A., and Thomas, R.C., 2000, Preliminary

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