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Quaternary Fault and Fold Database of the United States

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Lone Pine fault, unnamed northern section (Class A) No. 604a

Last Review Date: 2010-10-27

Compiled in cooperation with the Idaho Geological Survey

citation for this record: **Haller, K.M., and Wheeler, R.L., compilers, 2010, Fault number 604a, Lone Pine fault, unnamed northern 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 03:02 PM.**

Synopsis	**General:** Details of this fault are poorly known. No recent work has been completed at time of this compilation except for reconnaissance work on this section [604b], which ruptured during 1983 Borah Peak earthquake. **Sections:** This fault has 2 sections. Sections are defined as the southeastern section of the fault [604b] that ruptured during 1983 Borah Peak earthquake, and the remainder of fault [604a].
Name comments	**General:** An early reference to the Lone Pine fault is Baldwin (1951 #427), wherein he describes the fault as extending from the

	Salmon River south to Willow Creek hills. **Fault ID:** Refers to number 194 ("unnamed fault") in Witkind (1975 #320).
County(s) and State(s)	CUSTER COUNTY, IDAHO
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:100,000 scale. *Comments:* Location is based on the 1:250,000-scale map of Fisher and others (1983 #431), 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	This part of east-central Idaho and southwest Montana is made of Precambrian and Paleozoic rocks that were shortened by folding and faulting and was thrust northeastward during the late Mesozoic. Mid- to late Cenozoic extension broke the thrust complex into northwest-trending basins and ranges and continues today. The Lone Pine fault is a high-angle, down-to-the-northeast, range-front, normal fault that separates Antelope Flat and Round Valley to the northeast from Lone Pine Peak on the southwest. At its southeastern end, the northeast-dipping Lone Pine fault joins the longer, southwest-dipping Lost River fault [601]. The two normal faults bound an intervening graben. Analysis of the 1984 Devil Canyon earthquake mainshock (ML 5.8) and its aftershocks indicated that the Lone Pine and Lost River faults are conjugate structures (Jackson, 1994 #833; Payne and others, 2004 #7015), but the seismological results by themselves could not determine which fault is the master fault and which is the antithetic fault. However, the much greater length and topographic relief of the Lost River fault suggest that it is the master fault. This suggestion is supported by the occurrence of the 1983 Borah Peak earthquake (MS 7.3) and its aftershocks on the Lost River fault (Crone and others, 1987 #19). The Borah Peak mainshock occurred at a depth of 16 km (Doser and Smith, 1985 #276), well below the 10- to 11-km depth where the Devil Canyon aftershocks indicate that the two faults meet (Jackson, 1994 #833; Payne and others, 2004 #7015). Thus, the Lost River fault extends 5-6 km deeper than its junction with the Lone Pine fault.

Length (km)	This section is 21 km of a total fault length of 26 km.
Average strike	N39°W (for section) versus N50°W (for whole fault)
Sense of movement	Normal
Dip	58° NE *Comments:* Aftershocks of the 1984 Devil Canyon earthquake (M5.8) defined a three-dimensional V, formed of two tabular zones that dip toward each other and meet at their common bottom (Jackson, 1994 #833; Payne and others, 2004). The northeast-dipping limb of the V apparently reactivated a patch of the northern section of the Lone Pine fault [604a]. The reactivated patch is 5 km long, extends from 3 to 11 km in depth. The average dip of the Lone Pine fault is 47 ?19? NE, and the best fit solution for the dip of the fault is 58? NE (Payne and others, 2004 #7015).
Paleoseismology studies	
Geomorphic expression	Distinct scarps characterize the southern part of the fault at least as far north as Spar Canyon. The eastern flank of Lone Pine Mountain is steep and somewhat planar. Moreover, it is heavily forested making it difficult to detect any scarps. But Lone Pine Mountain is the highest peak along this group of hills suggesting that the total amount of slip is also higher.
Age of faulted surficial deposits	
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* General absence of documented scarps on alluvium suggests movement on this section may be substantially older than the prehistoric scarps to south [604b]; thus, a conservative age estimate is used in this compilation.
Recurrence interval	
Slip-rate	Less than 0.2 mm/yr

category	*Comments:* Low slip-rate category is assigned based on the general absence of scarps on alluvium.
Date and Compiler(s)	2010 Kathleen M. Haller, U.S. Geological Survey Russell L. Wheeler, U.S. Geological Survey, Emeritus
References	#427 Baldwin, E.M., 1951, Faulting in the Lost River Range area of Idaho: American Journal of Science, v. 249, p. 884-902. #19 Crone, A.J., Machette, M.N., Bonilla, M.G., Lienkaemper, J.J., Pierce, K.L., Scott, W.E., and Bucknam, R.C., 1987, Surface faulting accompanying the Borah Peak earthquake and segmentation of the Lost River fault, central Idaho: Bulletin of the Seismological Society of America, v. 77, p. 739-770. #276 Doser, D.I., and Smith, R.B., 1985, Source parameters of the 28 October 1983 Borah Peak, Idaho, earthquake from body wave analysis: Bulletin of the Seismological Society of America, v. 75, p. 1041-1051. #431 Fisher, F.S., McIntyre, D.H., and Johnson, K.M., compilers, 1983, Geologic map of the Challis 1° x 2° quadrangle, Idaho: U.S. Geological Survey Open-File Report 83-523, 60 p. pamphlet, 2 sheets, scale 1:250,000. #833 Jackson, S.M., 1994, Seismic evidence of conjugate normal faulting—The 1984 Devil Canyon earthquake sequence near Challis, Idaho: Boise, Idaho, Boise State University, unpublished M.S. thesis, 156 p. #7015 Payne, S.J., Zollweg, J.E., and Rodgers, D.W., 2004, Stress triggering of conjugate normal faulting—Late aftershocks of the 1983 Ms 7.3 Borah Peak, Idaho, earthquake: Bulletin of the Seismological Society of America, v. 94, no. 3, p. 828-844. #320 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in Idaho: U.S. Geological Survey Open-File Report 75-278, 71 p. pamphlet, 1 sheet, scale 1:500,000.