

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](#).

Lost River fault, Challis section (Class A) No. 601a

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Compiled in cooperation with the Idaho Geological Survey

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Synopsis

General: The Lost River fault is a 130-km-long, southwest-facing, normal fault along the southwestern base of the Lost River Range. Most investigators agree that the main fault has six segments, but the extent to which large ruptures of various ages have crossed or stopped at the various segment boundaries remains unresolved. Accordingly, the Lost River fault was divided into sections based on mapping, morphological study, dating, and trenching of scarps and the surfaces they offset—the six sections (a–f) correspond to the segments that make up the main fault. The seventh section consists of a complex of

discontinuous scarps [601g] that link the main Lost River fault to the smaller, antithetic Lone Pine normal fault [604] to the west. Work during the years following the 1983 Borah Peak earthquake concentrated on the northern sections where surface ruptures formed during the earthquake, whereas work during the late 1960s and 1970s, followed by additional studies during the 1990s concentrated on the southern sections. All but the northernmost and the two southernmost sections show evidence of latest Quaternary surface ruptures. The few determinations of individual recurrence intervals of large surface ruptures vary from 1 to nearly 100 k.y. Slip rates determined at specific points along the fault vary between less than 0.1 mm/yr to approximately 0.2 mm/yr, and the southern sections appear to have had slower late Quaternary rates than the middle sections. Paleoseismic data suggest that the three central parts of the fault possibly ruptured within a few thousands of years of each other during the early Holocene.

Sections: This fault has 7 sections. Scott and others (1985 #76) defined segmentation of Lost River fault and is the source of section names except northernmost segment [601a], which was renamed by Crone and others (1985 #18; 1987 #19) to be consistent with other segment names. Scarps formed during Borah Peak earthquake across Willow Creek hills [601g] are included as part of this fault. The on-trend, discontinuous scarps south of range (as mapped by Kuntz and others, 1984 #293) are described separately as part of the Idaho Rift systems fault [3501].

**Name
comments**

General: Anderson (1934 #595) first reported that the southwest side of the Lost River Range was bounded by a fault. However, Baldwin (1951 #427) later recognized Basin and Range style faulting in this area, as well as recent movement and large amounts of throw across this and nearby faults. Baldwin's 1951 article is probably one of earliest to use the name Lost River fault for this structure, which extends along the entire length of the southwest flank of Lost River Range from near Arco, Idaho, on the south to near Challis, Idaho, on the north

Section: Also called Northern segment as defined by Scott and others (1985 #76); it was renamed Challis segment for consistency by Crone and others (1985 #18; 1987 #19). Extends from the northern end of Lost River Range southeastward to Devils Canyon.

Country(s) and

County(s) and State(s)	CUSTER COUNTY, IDAHO
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	<p>Poor Compiled at 1:100,000 scale.</p> <p><i>Comments:</i> Location of fault generally based on topography, scarps on alluvium are absent. Source of map trace based on 1:24,000-scale maps of Crone (unpublished data) 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).</p>
Geologic setting	<p>This part of east-central Idaho and southwest Montana is made of Precambrian and Paleozoic rocks that were shortened by folding and faulting and were 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 Lost River fault is a high-angle, down-to-the-southwest, range-front normal fault, with a minor sinistral component of slip. The fault bounds the southwest side of the Lost River Range and separates the range from Round Valley, Antelope Flat, Thousand Springs Valley, Barton Flat, and the Big Lost River. In its north-central portion, the Lost River fault is joined from the west by the much shorter, northeast-dipping Lone Pine fault [604]. The two normal faults bound an intervening graben. The much greater length and larger topographic relief of the Lost River fault indicate that it is probably the master fault, and that the Lone Pine fault probably terminates against it at depth. Hypocentral locations and focal mechanisms of earthquakes in 1983 and 1984 and their numerous aftershocks support this suggestion (Doser and Smith, 1985 #276; Jackson, 1994 #833). Densmore and others (2005 #7016) suggest that maximum throw across the Lost River fault is 4–6 km.</p>
Length (km)	This section is 26 km of a total fault length of 127 km.
Average strike	N27°W (for section) versus N35°W (for whole fault)
Sense of movement	<p>Normal</p> <p><i>Comments:</i> Normal sense of movement is inferred based on the</p>

	topographic expression of range front.
Dip	less than 75° SW <i>Comments:</i> Cross sections showing locations of the 1984 Devils Canyon earthquake (ML 5.8), which is thought to have occurred on the Lost River fault, and its aftershocks suggest that the dip of the central part of the Challis segment is 75° SW, and the average dip of the fault plan derived from focal mechanisms is 53 ± 18° SW (Payne and others, 2004 #7015).
Paleoseismology studies	
Geomorphic expression	No scarps are present on alluvium (Scott and others, 1985 #76); local topography suggests the fault has at least two subparallel strands at south end of section (Crone and Haller, 1991 #186).
Age of faulted surficial deposits	
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) <i>Comments:</i> Faulting history of the section poorly understood, but reconnaissance studies indicate no evidence of late Quaternary movement (Scott and others, 1985 #76). Crone and Haller (1991 #186) suggest Quaternary movement, but no data are available to provide further constraint.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr <i>Comments:</i> Slip rate is inferred to be low based on the absence of scarps on late Quaternary deposits. The long-term slip rate is probably the lowest of any section of Lost River fault as reflected by low topographic and structural relief across the fault.
Date and Compiler(s)	2010 Kathleen M. Haller, U.S. Geological Survey Russell L. Wheeler, U.S. Geological Survey, Emeritus

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