Jump to Navigation

Quaternary Fault and Fold Database of the United States

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Togwotee Lodge faults (Class A) No. 769

Last Review Date: 1999-12-08

citation for this record: **Pierce, K.L., compiler, 1999, Fault number 769, Togwotee Lodge faults, 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 02:02 PM.**

Synopsis	These recently mapped faults offset glacial deposits just west of Togwotee Lodge and related deposits on the south side of Flagstaff Creek, about 1-2 km west of Togowotee Lodge. The faults form east-facing scarps that range from 6 m of offset of Pinedale moraines (>25 ka) to 21 m offset of 140 ka Bull Lake moraines. The lateral extent of the faults is poorly established owing to the preliminary nature of the mapping (K.L. Pierce, unpubl. mapping 1989, 1991), the forest cover, and hilly terrain. These scarps are some of the most eastward mapped in the region, and may reflect reactivation of older faults or creation of new faults in association with eastward migration of the Yellowstone hotspot.
Name comments	These faults are informally referred to as the Togwotee Lodge faults for their proximity to Togowotee Lodge on U.S. Highway 26/287, about 15 km west of Togwotee Pass (Angle Mountain 7.5-minute quadrangle). The faults extend both north and south of

	the highway, but their lateral extent beyond the valley of Blackrock Creek is poorly known owing to forest cover and hilly terrain. Their mapped extent is rather short (250 m to about 2 km); they may extend further north and south than mapped.
County(s) and State(s)	TETON COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Traces are from unpublished 1:24,000-scale mapping of Angle Mountain 7.5-minute quadrangle by Kenneth L. Pierce (1989, 1991), compiled at 1:250,000 on a topographic base map. Locations are well defined where fault offsets Bull Lake or Pinedale moraines. However, the landscape in this area is forested and quite hilly. Extension of the fault further north or south would require careful study.
Geologic setting	These faults are about 40 km east of the Teton fault [768] in generally unfaulted terrain. They lie within Pierce and Morgan's (1992 #2297) belt I of "new and reactivated faults.
Length (km)	4 km.
Average strike	N13°W
Sense of movement	Normal *Comments:* The faults have fairly straight trends across hilly landscape suggesting a high dip.
Dip Direction	E
Paleoseismology studies	
Geomorphic expression	Two 1.5-2 km long fault traces (A on the west and B on the east) are present on the margins of Blackrock Creek, west of Togwotee Lodge. Also, three short fault scarps (C) were found south of the eastern trace (B). These scarps are discussed separately below. A. East scarp. Scarps along the fault were first noted by Love and Love (1983 #2296) and measured by K.L. Pierce (field notes,

	1989). A singular fault scarp with sag pond at its base is well expressed 1.2 km west of Togowotee Lodge. This east-facing scarp has the following heights and maximum scarp-slope angles: 8.8 m/44?, 12.6 m/39?, 8.0 m/26?, and 8 m/38.5? (K.L. Pierce, locality 89P75). Scarps that appear to be fault-related were noted along strike 0.5 km and 1.2 km to the south-southeast of the highway. B. West scarp. About 0.9 km south of Flagstaff Creek, there is a scarp on west-sloping Bull Lake? moraines (140 ka), which are downdropped about 21 m to the east. Another possible fault scarp 0.1 km north of Flagstaff Creek is on west-sloping early Pinedale moraines (>25 ka), which are down dropped about 6 m to the east and have a maximum scarp-slope angle of 14?. Fault trace is clearly defined where it offsets Bull Lake moraines. C. South scarps. These faults form a graben along ridge crest. Two strands of fault strike NW and have offsets and maximum scarp angles of 8.5 m/30? and 2.2 m/31.5?. To the east, an antithetic fault about 100 m perpendicular to the NW strike has about 3 m offset and a maximum scarp angle of 18-20? (mid-scarp sector) superposed on a gentler scarp, implying multiple movements. A sag pond is preserved on the hanging wall of the fault. Description based on field notes of Ken Pierce, Sept. 16, 1991 (localities 91P43, 44, and 45).
Age of faulted surficial deposits	A variety of glacial deposits are deformed by the three different scarps: Fault scarp A. Fault offsets Pinedale glacial deposits. Fault scarp B. Fault offsets Bull lake moraines that have muted morphology; andesitic volcanic rocks within the till have weathering rinds >1 mm thick. These moraines are correlated with 140-ka Bull Lake deposits at West Yellowstone. Fault also offsets Pinedale moraines correlated with Burned Ridge moraines, which are thought to be at least 25 ka. Fault scarp C. These scarps are above the Pinedale glacial limit, but within area of glacial erratics of Bull Lake age.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Based on multiple-event offset of Pinedale moraines thought to be at least 25,000 yrs old. Timing supported by steepness of scarp(s) C and preservation of sag pond on the

	hanging wall of the fault.
Recurrence interval	16-23 k.y. (<140 ka) *Comments:* There are no published recurrence intervals, but the following data support the above estimates. Fault B , which has a 6 m offset on Pinedale moraines (>25 ka), is probably a result of more than two events (2-3 m offset per event?), whereas the 21 m offset of 140 ka Bull Lake moraines is probably a result of more than 7-10 events (2-3 m offset per event?). The later data suggest long-term average recurrence at intervals of 16-23 k.y. (6-9 intervals in 140 k.y.)
Slip-rate category	Less than 0.2 mm/yr *Comments:* For fault B, the <0.2 mm/yr slip-rate category is based on 21 m of offset of 140-ka Bull Lake moraines. This data yields a long-term slip rate of <0.15 mm/yr, whereas 6 m offset of ~25 ka Pinedale moraines yields a rate of <0.24 mm/yr (both estimates are maximum since they have open-ended time intervals for stress accumulation). For fault(s) C, the calculated rate is 0.06 mm/yr based on 8.5 m offset in about 140 ka, although freshness of scarps suggests higher rate or young faulting event. On the basis of these data, the <0.2 mm/yr slip-rate category is defined for these faults.
Date and Compiler(s)	1999 Kenneth L. Pierce, U.S. Geological Survey, Emeritus
References	#2296 Love, J.D., and Love, J.M., 1983, Road log, Jackson to Dinwoody and Return: Wyoming Public Information Circular 20, 33 p. #2297 Pierce, K.L., and Morgan, L.A., 1992, The track of the Yellowstone hotspot—Volcanism, faulting, and uplift, *in* Link, P.K., Kuntz, M.A., and Platt, L.B., eds., Regional geology of eastern Idaho and western Wyoming: Geological Society of America Memoir 171, p. 1-53.

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