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Quaternary Fault and Fold Database of the United States

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Teton fault, Steamboat Mountain section (Class A) No. 768a

Last Review Date: 1999-12-07

citation for this record: **Pierce, K.L., compiler, 1999, Fault number 768a, Teton fault, Steamboat Mountain 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 02:02 PM.**

Synopsis	**General:** The Teton fault is a major range-bounding fault along the eastern margin of the Teton Range. Spectacular post-glacial (<15 ka) scarps are present along 60 km of the fault trace and can be seen from the valley floor owing to their large height. Post-glacial offset is as much as 30 m along the middle part of the range, but diminishes to the north and south, mimicking the overall height of the range. Although quite active in the latest Quaternary, the fault has been seismically quiet in historic time. **Sections:** This fault has 6 sections. Three sections have been defined for main range front, but we add a more northerly section and two associated subsidiary faults (herein sections) that are within the range.
Name	**General:** Referred to as the Teton fault by Love and Reed (1968

comments	#3796). This fault bounds the eastern margin of the Teton Range and Steamboat Mountain (north of Jackson Lake), and extends from Steamboat Mountain on the north to Phillips Creek on the south. The original location of the fault trace was compiled on and digitized from a 1:62,500-scale base map of Grand Teton National Park; the location was refined based on publicly available LiDAR data. Gilbert and others (1983 #1338) and Wong and others (2000 #4484) considered the inferred projection of the Hermitage Point fault to be a possible splay or continuation of the Teton fault, but it is not included herein owing to lack of associated scarps and equivocal evidence that it has been active in Quaternary time (Wong and others, 2000 #4484). **Section:** This northernmost section of the Teton fault extends from a point east of Steamboat Mountain (ca. 200 m west of U.S. Highway 89/287) south about 4 km, where it is submerged beneath Jackson Lake. As mapped, the fault does not cross U.S. Highway 89/287, and its southern connection with the northern section [768b] is purely conjectural. Gilbert and others (1983 #1338) and Wong and others (2000 #4484) considered the inferred projection of the Hermitage Point fault to be a possible splay or continuation of this section of the Teton fault, but it is not included herein owing to lack of associated scarps and equivocal evidence for its Quaternary activity.
County(s) and State(s)	TETON COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Compiled at 1:62,5000 scale from Ostenaa and others (sheet 1, 1993 #2290) 1:24,000-scale map. This northernmost extension of the fault, which is on the northeast side of Jackson Lake, has much less structural relief and less offset of deposits of the last glaciation than the northern section [768b] of the main range front fault, west of Jackson Lake (Ostenaa and others, 1993 #2290; Smith and others, 1993 #2294).
Geologic setting	The Teton fault is a major range-bounding fault that forms the eastern margin of the Teton Range. Initial movement on the fault is commonly associated with the arrival of the Yellowstone

	hotspot in this part of northwestern Wyoming; however, there is no consensus regarding the total amount of offset and age of initiation of faulting. Reported total displacement is 2.5–3.5 km (Byrd and others, 1994 #2263), 6–9 km (Smith and others 1993 #2294), and 10 km (Love, 1977 #3796). Faulting may have begun about 5 to 6 m.y. ago (Pierce and Morgan, 1992 #2297) or during the Miocene (5–13 Ma, Smith and others, 1993 #2294). Gravity models, the about 10° westward tilting of the approximately 2-Ma Huckleberry Ridge Tuff, and the absence of basement-sourced Precambrian clasts in Jackson Hole sediments all suggest that the displacement on the Teton fault was small prior to about 5 Ma and that the majority of the offset has accrued since about 2 Ma (Foster and others, 2010 #7045).
Length (km)	This section is 5 km of a total fault length of 59 km.
Average strike	N21°E (for section) versus N19°E (for whole fault)
Sense of movement	Normal
Dip	>45° *Comments:* Inferred from strike along the Teton Range front to the south, which suggests more than 45-degree dip. However, gravity models suggest a low dip (Behrendt and others, 1968 #3798) and kinematic models suggest a 45-70? dip (Byrd and others, 1994 #2263).
Paleoseismology studies	
Geomorphic expression	North of Jackson Lake, a scarp can be traced from near the shore north to the east side of Steamboat Mountain (Ostenaa and others, 1993 #2290; Smith and others, 1993 #2294). On more level terrain east and south of Steamboat Mountain, the fault is expressed as a 10-20 m wide graben and backtilted zone. Ostenaa and others (sheet 1, 1993 #2290) measured one scarp profile south of Steamboat Mountain that suggested about 2.8 m of surface offset. At this site, the fault forms a >50 m wide graben: the main scarp is 9.6 m high and has a maximum scarp slope angle of 29?. East of Steamboat Mountain, the fault dies out as a series of less than 1-m-high scarps.
Age of faulted	Although not stated explicitly, Ostenaa and others (sheet 1, 1993

surficial deposits	#2290) imply that the scarps are formed on glaciated landscapes that have a thin veneer of Pinedale till (ca. 15 ka) that overlie Huckleberry Ridge Tuff.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Based on inference of offset Pinedale till (Ostenaa and others, 1993 #2290) and apparent young morphology of scarp measured at one site.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Poorly constrained, but fault section assigned to low slip-rate category based on occurrence of small (2.8 m) offset of Pinedale age (<15 ka) deposits; a faster slip-rate category (0.2-1 mm/yr) is assigned to the section immediately to the south [768b] based on its greater structural relief.
Date and Compiler(s)	1999 Kenneth L. Pierce, U.S. Geological Survey, Emeritus
References	#3798 Behrendt, J.C., Tibbetts, B.L., Bonini, W.E., and Lavin, P.M., 1968, A geophysical study in Grand Teton National Park and vicinity, Teton County Wyoming: U.S. Geological Survey Professional Paper 516-E, 23 p., 3 pls., scale 1:250,000. #2263 Byrd, J.O.D., Smith, Robert B., and Geissman, John W., 1994, The Teton fault, Wyoming—Topographic signature, neotectonics, and mechanisms of deformation: Journal of Geophysical Research, v. 99, no. B10, p. 20,095–20,122. #1338 Gilbert, J.D., Ostenaa, D., and Wood, C., 1983, Seismotectonic study of Jackson Lake Dam and Reservoir, Minidoka Project, Idaho-Wyoming: U.S. Bureau of Reclamation Seismotectonic Report 83-8, 123 p., 11 pl. #3796 Love, J.D., and Reed, J.R., Jr., 1968, Creation of the Teton landscape—The geologic story of Grand Teton National Park: Grand Teton Natural History Association, 120 p. #2290 Ostenaa, D.A., Wood, C., and Gilber, J.D., 1993,

Seismotectonic study for Grassy Lake Dam-Minidoka Project, Wyoming: U.S. Bureau of Reclamation Seismotectonic Report 93-3, 68 p., scale 1:24,000.

#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.

#2294 Smith, R.B., Byrd, J.D.O., and Susong, D.D., 1993, The Teton fault, Wyoming—Seismotectonics, Quaternary history, and earthquake hazards, *in* Snoke, A.W., Steidtmann, J.R., and Roberts, S.M., eds., Geology of Wyoming: Geological Survey of Wyoming Memoir No. 5, p. 628-667.

#4484 Wong, I., Olig, S., and Dober, M., 2000, Preliminary probabilistic seismic hazard analyses—Island Park, Grassy Lake, Jackson Lake, Palisades, and Ririe Dams: U.S. Department of the Interior, Bureau of Reclamation Technical Memorandum D8330-2000-17.