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Quaternary Fault and Fold Database of the United States

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Buffalo Fork fault, northern section (Class A) No. 767a

Last Review Date: 1998-03-26

citation for this record: **Pierce, K.L., and Machette, M.N., compilers, 1998, Fault number 767a, Buffalo Fork fault, 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 02:02 PM.**

Synopsis	**General:** The Laramide Buffalo Fork thrust fault is an important crustal feature that thrusts upper Paleozoic sedimentary rocks westward onto Cretaceous rocks. Parts of this thrust have been reactivated in Cenozoic time with down-to-the-east normal faulting, including one site of observed post-glacial fault scarps and another of tilted late Quaternary lake sediment. This fault is in a remote area seldom visited by geologists that are experienced in neotectonics; thus, evidence of Quaternary movement may have been missed. Because of its older history, this structure might serve to accommodate ongoing tectonic activity. There have been several Quaternary basalt extrusions in the hanging wall of the fault. **Sections:** This fault has 3 sections. Fault divided on basis of young activity in the middle section [767b] and older movement

	on the ends [northern section, 767a; southern section, 767c].
Name comments	**General:** Referred to as the Buffalo Fork thrust (fault) by Love and Keefer (1975 #2285). The Buffalo Fork thrust bounds the east margin of the Two Oceans Plateau and extends from Yellowstone Lake on the north to Togowotee Pass area on the south. The northern part [767a] represents normal-fault reactivation of Buffalo Fork thrust fault. Although this fault was also referred to as the South Arm fault by Wong and others (2000 #4484), the Buffalo Fork fault name has precedence and is used herein. **Section:** This informally named section of the Buffalo Fork fault extends between Yellowstone Lake and about 5 km (?) north of the southern Yellowstone Park boundary. This section of fault is older than the middle section, where post-glacial activity is recognized. **Fault ID:** Refers to fault 237 (unnamed) of Witkind (1975 #819).
County(s) and State(s)	TETON COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:125,000 scale. *Comments:* Mapped by Love and Keefer (1975 #2285) at 1:62,500 scale and Christiansen (2001 #1784) at 1:125,000 scale. Fault traces recompiled at 1:125,000-scale on map with topographic base
Geologic setting	The Buffalo Fork thrust is a major Laramide structure in northwest Wyoming (Love and Keefer, 1975 #2285). Late Cenozoic extension may have been accommodated along or near this zone of structural weakness (p. D45-46 in Love and Keefer, 1975 #2285). Christiansen (2001 #1784) has recently affirmed this reactivation. Because of its older history, this structure might serve to accommodate ongoing tectonic activity. There have been several Quaternary basalt extrusions in the hanging wall of the fault (U.S. Geological Survey, 1972 #639; Christiansen, 2001 #1784).
Length (km)	This section is 25 km of a total fault length of 30 km.

Average strike	N°E (for section) versus N1°E (for whole fault)
Sense of movement	Normal *Comments:* Normal fault reactivation of Laramide Buffalo Fork thrust recognized by Love and Keefer (1975 #2285) and more recently affirmed by Christiansen (2001 #1784).
Dip Direction	E
Paleoseismology studies	
Geomorphic expression	Near south arm of Yellowstone Lake, forms east-facing scarp on 0.63 Ma Lava Creek Tuff.
Age of faulted surficial deposits	Middle Pleistocene (0.63 Ma Lava Creek Tuff)
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* Locally offsets 0.63 Ma Lava Creek Tuff.
Recurrence interval	*Comments:* No event have been dated, but the recurrence is probably long (i.e., >10 to 100 k.y.?).
Slip-rate category	Less than 0.2 mm/yr *Comments:* The section of the fault has less than 20 m of offset of 0.63 Ma Lava Creek Tuff locally, which yields a long-term rate of 0.03 mm/yr. Conversely, Wong and others (2000 #4484) suggested fault slip rates ranging from 0.4-1.4 mm/yr, each with separate weighting. However, these rates are based on an assumption of activity identical to their appraisal of the Yellowstone Lake (Eagle Bay [757]) fault. Wong and others' (2000 #4484) reported slip rates are model dependent and do not represent actual measured values. The late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) suggest the slip rate during this period is of a lesser magnitude. Accordingly, the <0.2 mm/yr slip-rate category has been assigned to this fault.

Date and Compiler(s)	1998 Kenneth L. Pierce, U.S. Geological Survey, Emeritus Michael N. Machette, U.S. Geological Survey, Retired
References	#1784 Christiansen, R.L., 2001, The Quaternary and Pliocene Yellowstone Plateau volcanic field of Wyoming, Idaho, and Montana: U.S. Geological Survey Professional Paper 729-G, 145 p., 3 pls., scale 1:125,000. #2285 Love, J.D., and Keefer, W.R., 1975, Geology of sedimentary rocks in southern Yellowstone National Park, Wyoming: U.S. Geological Survey Professional Paper 729-D, 60 p. #639 U.S. Geological Survey, 1972, Geologic map of Yellowstone National Park: U.S. Geological Survey Miscellaneous Geologic Investigations I-711, 1 sheet, scale 1:125,000. #819 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in Wyoming: U.S. Geological Survey Open-File Report 75-279, 35 p. pamphlet, 1 sheet, scale 1:500,000. #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.