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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.

Martin Ranch fault (Class A) No. 731

Last Review Date: 2011-02-03

citation for this record: **McCalpin, J.P., compiler, 2011, Fault number 731, Martin Ranch fault, 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 02:03 PM.**

Synopsis	Surface expression of the Martin Ranch fault consists of an approximately 4-km-long fault scarp and possible deflection of the Bear River at a point about 10 km south of the scarp. Only the scarp is shown here. The fault scarp is thought to be the expression of extensional normal-slip reactivation of part of the Laramide-age Absaroka thrust fault; the normal slip is thought to have initiated about 2.4 ka, or synchronous with the most recent event on the nearby Bear River fault zone [730]. Two trenches have been excavated across this scarp. West (1993 #825) believed that surface rupture should not be considered independent from that on the Bear River fault zone, but the existing data do not preclude an alternative interpretation.
Name comments	In his original work, West (1989 #824) used the names Absaroka fault and Martin Ranch scarp interchangeably to refer to the part of the Absaroka thrust fault that has normal-slip reactivation in

	the late Quaternary. In later papers (West, 1992 #826; 1993 #825), the feature is called the Martin Ranch normal fault scarp; in this compilation, we use Martin Ranch as the preferred name of the fault. As shown, the fault extends from near the intersection of Wyoming State Highway 89 and the boundary of T. 13/14 N. south-southwest about 4 km. Its concealed trace may extend another 10 km to the south. **Fault ID:** Shown on compilation of Quaternary faults by Gibbons and Dickey (1983 #821).
County(s) and State(s)	UINTA COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* The location is based on fault mapping at 1:24,000-scale by West (1989 #824) and at 1:100,000-scale by Gibbons and Dickey (1983 #821). Location of fault traces further constrained by satellite imagery and topography at scale of 1:24,000. Reference satellite imagery is ESRI_Imagery_World_2D with a minimum viewing distance of 1 km (1000 m).
Geologic setting	The well-studied Absaroka thrust fault is a major east-directed structure of the Laramide-age Overthrust Belt. The down-to-the-west (normal) scarp on the floor of Bear River valley represents reactivation of the fault in the opposite sense in response to regional extension. Maximum cumulative normal throw is 1.4 m (West, 1989 #824) in Quaternary deposits.
Length (km)	4 km.
Average strike	N18°E
Sense of movement	Normal *Comments:* (West, 1989 #824)
Dip	30–70° W. *Comments:* Dip of the fault is schematically shown by West (1989 #824; 1992 #826; 1993 #825) to be about 70° W. in upper 1.5 km

	and decreases to about 30° W. at 2 km depth.
Paleoseismology studies	West (1989 #824) excavated two trenches across the Martin Ranch fault scarp. Site 731-1. The northernmost Lower Martin Ranch trench was located about 700 m from the north end of the scarp and crossed a 1-m-high scarp on the lower of two terraces near the site. The timing of the single event exposed in the trench was not constrained by chronologic dating, but is interpreted to be middle to late Holocene. Site 731-2. The southern Upper Martin Ranch trench was on a 1.45-m-high scarp on the higher of two faulted terraces about 1.2 km from the north end of the scarp. The most recent event occurred between 700 yr 14C yr BP and 3500 14C yr BP and is constrained by three radiocarbon dates. Gibbons and Dickey (1983 #821) excavated one trench near Martin Reservoir; however, their data are not published and location of their trench was not given.
Geomorphic expression	Linear north-trending fault scarp formed on Quaternary terrace alluvium of two different ages. The scarp on upper (older) terrace is 1.45 m high and has a maximum slope angle of 14.5°; on the lower terrace, it is 0.75–1.3 m high. West (1989 #824) noted that a deflection of the course of Bear River about 10 km south of the scarp may be due to tectonic processes, whereas warping of the ground surface is noted north of the scarp. Thus, the total length of deformation may be about 15 km.
Age of faulted surficial deposits	West (1989 #824) reported offset of upper and middle (?) Quaternary alluvium.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* West (1989 #824; 1992 #826; 1993 #825) inferred that the late Holocene timing of the most recent earthquake is contemporaneous with the most recent event on the Bear River fault zone [730], which is dated at about 2320?860 yr ago. The constraining radiocarbon ages from trench 731-2 allows this interpretation, but this interpretation is not unique. West believed

	that the surface faulting at trench 731-1 is coeval with that of trench 731-2, but no datable material was recovered from trench 731-1.
Recurrence interval	*Comments:* Evidence for a penultimate event predating the late Holocene is inconclusive, thus no recurrence information is available.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* West (1989 #824) published a vertical displacement rate of 0.6–0.7 mm/yr. However, the interval of time that resulted in the 1.3–1.6 m of late Holocene slip is unknown; the published rate can only be a maximum, if one considers the slip on the prior event to be characteristic and the interval since the last event to be a minimum recurrence interval. Geomorphic evidence indicates that the average late Quaternary slip rate is much less than the rate cited above.
Date and Compiler(s)	2011 James P. McCalpin, GEO-HAZ Consulting, Inc.
References	#821 Gibbons, A.B., and Dickey, D.D., 1983, Quaternary faults in Lincoln and Uinta Counties, Wyoming, and Rich County, Utah: U.S. Geological Survey Open-File Report 83-288, 1 sheet, scale 1:100,000. #824 West, M.W., 1989, Neotectonics of the Darby-Hogsback and Absaroka thrust pls., Uinta County, Wyoming and Summit County, Utah with applications to earthquake hazard assessment: Golden, Colorado School of Mines, unpublished Ph.D. dissertation, 450 p., 17 pls. #826 West, M.W., 1992, An integrated model for seismogenesis in the Intermountain seismic belt: Bulletin of the Seismological Society of America, v. 82, p. 1350-1372. #825 West, M.W., 1993, Extensional reactivation of thrust faults accompanied by coseismic surface rupture, southwestern Wyoming and north-central Utah: Geological Society of America Bulletin, v. 105, p. 1137-1150.

Questions or comments?