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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.

Canyon Ferry fault, Toston section (Class A) No. 671c

Last Review Date: 2010-12-06

Compiled in cooperation with the Montana Bureau of Mines and Geology

citation for this record: **Haller, K.M., compiler, 2010, Fault number 671c, Canyon Ferry fault, Toston 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 02:04 PM.**

Synopsis	**General:** Although poorly studied until recently, the fault is shown on several regional neotectonic maps. The heights of scarps on upper Quaternary deposits are reported by Stickney and Bartholomew (1987 #85). The trenching and geomorphic studies of Anderson and LaForge (2003 #6897) and Anderson and others (2005 #6898) have shown the fault is longer and more active than previously thought. **Sections:** This fault has 3 sections. Differentiation of the sections is based on the presence or absence of fault scarps and echelon

	gaps in the fault trace.
Name comments	**General:** Although Pardee (1950 #46) was probably the first to mention this fault as a tectonically young structure (late Cenozoic), it remained unnamed in the literature until Johns and others (1982 #259) referred to it as the Canyon Ferry-Duck Creek fault and the Lower Sixmile Creek fault. Stickney and Bartholomew (1987 #85) were first to document Quaternary movement and refer to it as the Canyon Ferry fault. The fault extends from Oregon Gulch south to near Toston, Mont. (Anderson and others, 2005 #6898; Wong and others, 1999 #7038). **Section:** This section extends from Highway 12 to south of Toston, Mont., as defined by Wong and others (1999 #7038). However, more recent geologic mapping (Vuke, 2007 #7059; 2009 #7060) refers only to the part of the fault south of the Sixmile Creek fault as the Toston fault. The northern part of the fault as shown here is called the Townsend fault zone. **Fault ID:** Refers to fault 42 (unnamed echelon faults west side of Big Belt Mountains) of Witkind (1975 #317); fault 125 (Canyon Ferry-Duck Creek fault) of Johns and others (1982 #259); fault 18 (Canyon Ferry fault) of Stickney and Bartholomew (1987 #85); Confederate Gulch, Duck Creek and Gurnett Creek scarps of Stickney and Bartholomew (1987 #242); and Confederate Gulch fault of Stickney and Bartholomew (written commun., 1992 #556).
County(s) and State(s)	BROADWATER COUNTY, MONTANA
Physiographic province(s)	
Reliability of location	Poor Compiled at 1:50,000 scale. *Comments:* Location of range-front and piedmont fault trace is from Vuke (2009 #7060) with minor modifications to reflect that shown in figure 5-1 of Wong and others (1999 #7038). Vuke (2007 #7059, 2009 #7060) depicts the the southern part of the fault differently; this compilation shows the southern end as mapped by Vuke (2009 #7060) and Wong and others (1999 #7038). Location of the fault is considered to be poor due to discontinuous scarps and width of line that represents in the fault

	even though original base map is at scale of 1:24,000.
Geologic setting	High-angle, down-to-the-southwest, range-front normal fault that bounds the southwestern side of Big Belt Mountains. The fault reportedly has 450–1,200 m of late Cenozoic displacement (Johns and others, 1982 #259). As shown by Witkind (1975 #317), the Canyon Ferry fault extends toward the southeast along the subdued front of the Big Belt Mountains (Pardee, 1950 #46) and would include the Ray Creek and Deep Creek faults of Johns and others (1982 #259). However, this southern extension of the Canyon Ferry fault is not included in this compilation based on the absence of evidence indicating Quaternary movement.
Length (km)	km.
Average strike	(for section) versus N39°W (for whole fault)
Sense of movement	Normal *Comments:* Scarps on Quaternary deposits indicate down-to-the-west offset of alluvial surfaces (Wong, 1999 #7038).
Dip Direction	W
Paleoseismology studies	
Geomorphic expression	The fault along this section is poorly expressed and is characterized by a linear west-facing topographic bench, which separates younger floodplain deposits of the Missouri River from older alluvium to the east, by truncated fluvial terraces at the mouth of Dry Creek, and by a linear bedrock-alluvial contact (Wong and others, 1999 #7038).
Age of faulted surficial deposits	
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* Although the age of youngest faulting is poorly constrained for the Toston fault, evidence suggests recurrent movement during the past 500 k.y.

Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* A low slip rate category is assigned herein based on the statement in Wong and others (1999 #7038) that structural and topographic relief across the Toston fault appears much smaller compared to the Canyon Ferry fault to the north.
Date and Compiler(s)	2010 Kathleen M. Haller, U.S. Geological Survey
References	#6897 Anderson, L.W., and LaForge, R., 2003, Seismotectonic study for Canyon Ferry Dam, Missouri River Basin Project, Montana: U.S. Bureau of Reclamation Seismotectonic Report 2003-1, 70 p. #6898 Anderson, L.W., Olig, S.S., and Forman, S.L., 2005, Paleoseismic investigation of the Canyon Ferry fault, west-central Montana, *in* Lund, W.R., ed., Proceedings Volume—Basin and Range Province Seismic Hazards Summit II: Utah Geological Survey Miscellaneous Publication 05-2, 17 p. #259 Johns, W.M., Straw, W.T., Bergantino, R.N., Dresser, H.W., Hendrix, T.E., McClernan, H.G., Palmquist, J.C., and Schmidt, C.J., 1982, Neotectonic features of southern Montana east of 112°30' west longitude: Montana Bureau of Mines and Geology Open-File Report 91, 79 p., 2 sheets. #46 Pardee, J.T., 1950, Late Cenozoic block faulting in western Montana: Geological Society of America Bulletin, v. 61, p. 359-406. #242 Stickney, M.C., and Bartholomew, M.J., 1987, Preliminary map of late Quaternary faults in western Montana: Montana Bureau of Mines and Geology Open-File Report 186, 1 pl., scale 1:500,000. #85 Stickney, M.C., and Bartholomew, M.J., 1987, Seismicity and late Quaternary faulting of the northern Basin and Range province, Montana and Idaho: Bulletin of the Seismological Society of America, v. 77, p. 1602-1625. #556 Stickney, M.C., and Bartholomew, M.J., 1992 written

	commun., Preliminary map of late Quaternary faults in western Montana (digital data): Montana Bureau of Mines and Geology (digital version of MBMG Open-File Report 186), 1 pl., scale 1:500,000. #7060 Vuke, S.M., 2009, Geologic map of the southern Townsend basin, Broadwater and Gallatin Counties, Montana: Montana Bureau of Mines and Geology Open File Report 586, 23 p., 1 plate, scale 1:24000, http://www.mbmg.mtech.edu/mbmgcat/public/ListCitation.asp?pub_id=31200&. #7059 Vuke, S.M., compiler, 2007, Geologic map of the Radersburg-Toston basin, Montana: Montana Bureau of Mines and Geology Open File Report 561, 18 p., 1 plate, scale 1:24000, http://www.mbmg.mtech.edu/mbmgcat/public/ListCitation.asp?pub_id=30070&. #317 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in western Montana: U.S. Geological Survey Open-File Report 75-285, 36 p. pamphlet, 1 sheet, scale 1:500,000. #7038 Wong, I.G., Olig, S.S., Gorton, A.E., and Naugler, W.E., 1999, Seismotectonic evaluation of the Broadwater Power Project, Toston Dam, Montana: Report prepared for Montana Department of Natural Resources and Conservation, Helena, Mont., 57 p.