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Quaternary Fault and Fold Database of the United States

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Canyon Ferry fault, northern section (Class A) No. 671a

Last Review Date: 2010-12-06

Compiled in cooperation with the Montana Bureau of Mines and Geology

citation for this record: **Machette, M.N., compiler, 2010, Fault number 671a, Canyon Ferry 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 02:04 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 is defined herein as the range-front fault that extends along the Big Belt Mountains from Oregon Gulch southeastward to Hellgate Canyon (Anderson and LaForge, 2003 #6897). **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 LEWIS AND CLARK COUNTY, MONTANA
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Fault trace is from figures 2 and 3 of Anderson and LaForge (2003 #6897) and figure 1 of Anderson and others (2005 #6898), further constrained by satellite imagery and topography at scale of 1:100,000. Reference satellite imagery is ESRI_Imagery_World_2D with a minimum viewing distance of 1 km.
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)	This section is 18 km of a total fault length of 35 km.
Average strike	N52°W (for section) versus N39°W (for whole fault)
Sense of movement	Normal *Comments:* Largely inferred from topographic and structural setting (Pardee, 1950 #46; Mertie and others, 1951 #520; Nelson, 1963 #521; Johns and others, 1982 #259).
Dip Direction	SW
Paleoseismology studies	
Geomorphic expression	Impressive, steep front of the Big Belt Mountains along northern one-half of Canyon Ferry Lake. Pardee (1950 #46) reported truncated faceted spurs 300- to 600-m high. However, the fault trace appears to be buried everywhere by Quaternary alluvial and colluvial deposits.
Age of faulted surficial deposits	Mertie and others (1951 #520) showed Tertiary deposits as both faulted and in fault contact with Precambrian bedrock.
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Stickney and Bartholomew (1987 #85) indicated that movement on this part of the fault has not occurred in the past 130 k.y. (prior to late Pleistocene); Witkind (1975 #317) and Johns and others (1982 #259) reported only late Cenozoic movement. Pardee (1950 #46) speculated on young movement based on the prominent range front, but could only demonstrate post-Miocene displacement. However, the strong, fault-controlled range-front morphology and fault's lateral continuity with

	Quaternary scarps on the southern section (671b) suggest Quaternary movement.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Inferred low slip rate is based on lack of scarps preserved on Quaternary deposits.
Date and Compiler(s)	2010 Michael N. Machette, U.S. Geological Survey, Retired
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. #520 Mertie, J.B., Jr., Fischer, R.P., and Hobbs, S.W., 1951, Geology of the Canyon Ferry quadrangle, Montana: U.S. Geological Survey Bulletin 972, 97 p., 2 pls., scale 1:48,000. #521 Nelson, W.H., 1963, Geology of the Duck Creek Pass quadrangle Montana, *in* Contributions to general geology 1960: U.S. Geological Survey Bulletin 1121, p. J1-J56, 1 pl., scale 1:62,500. #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.

#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.