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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.

Ninemile fault (Class A) No. 705

Last Review Date: 1996-03-11

Compiled in cooperation with the Montana Bureau of Mines and Geology

citation for this record: **Haller, K.M., compiler, 1996, Fault number 705, Ninemile 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 02:02 PM.**

Synopsis	The Ninemile fault is a principle fault in the Lewis and Clark line. Little is known about its Quaternary history, but small earthquakes have occurred in the vicinity of this fault (Qamar and Stickney, 1983 #58). Although there is no definitive evidence of Quaternary movement, this fault is included herein because of the pronounced range-front morphology, which could be the result of Quaternary faulting. Significant movement on the Ninemile fault has occurred (Wells, 1974 #1044; Wallace and others, 1990 #1045). Tertiary deposits are clearly deformed (Wells, 1974 #1044; Harrison and others, 1986 #1046); all Quaternary surficial deposits near the fault are post-glacial in age and are undeformed (Ostenaa and others, 1990 #540).

Name comments	Origin of the name not known. Fault is shown and discussed by Pardee (1950 #46), but no name was given. McMurtrey and others (1965 #1052) referred to this structure as the Clark Fork fault. The Ninemile fault in McMurtrey and others (1965 #1052) is shown as a thrust fault on the southern side of Ninemile Creek; they refer to a Ph.D. dissertation by F.W. Hall for their source. Wells (1974 #1044) mapped this structure as having multiple traces and called it the Ninemile fault zone; two of the traces are shown here but the commonly used name is retained. Fault extends from about 1 km southeast of the Sanders-Missoula County line near the headwaters of Ninemile Creek southeastward to the confluence of Marshall Creek and Clark Fork, northeast of Missoula. **Fault ID:** Refers to fault number 89 (unnamed fault at northeastern edge of Missoula basin) of Witkind (1975 #317).
County(s) and State(s)	MISSOULA COUNTY, MONTANA
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Location is based on mostly concealed trace from 1:250,000-scale map of Harrison and others (1986 #1046), in part after Wells (1974 #1044). Southern part of fault is from 1:500,00-scale map of Witkind (1975 #317).
Geologic setting	Down-to-south, normal (?) fault bounding the southwestern flank of the Squaw Peak and Jocko Ranges. Wells (1974 #1044) suggests that if movement is entirely dip slip, then 8.8-12.1 km of displacement is possible; however, structural relations do not preclude as much as 29 km of right-lateral displacement.
Length (km)	70 km.
Average strike	N54°W
Sense of movement	Normal *Comments:* Wells (1974 #1044) indicates that geologic relations of Tertiary beds indicate southwest side down, but dextral movement is also possible.

Dip Direction	SW
Paleoseismology studies	
Geomorphic expression	Faceted spurs have long been recognized (Pardee, 1950 #46) along the fault but the origin may be due to differential erosion near the fault zone (Ostenaa and others, 1990 #540). No scarps are known to exist on alluvium; Ostenaa and others (1990 #540) briefly examined several sites along the fault and found no evidence of late Quaternary faulting.
Age of faulted surficial deposits	Fault is shown as continuous in bedrock and buried by Quaternary deposits (Harrison and others, 1986 #1046).
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Pardee (1950 #46) speculated that movement on this fault was Pliocene or early Pleistocene in age. Witkind (1975 #317) included this structure in his compilation and indicated that the fault was probably Quaternary based on Pardee's statement. Limited reconnaissance by Ostenaa and others (1990 #540) found no evidence of Quaternary faulting, but scarps may not be preserved due to erosional conditions and the lack of deposits old enough to record the most recent movement.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Inferred low slip rate based on absence of scarps on upper Quaternary deposits.
Date and Compiler(s)	1996 Kathleen M. Haller, U.S. Geological Survey
References	#1046 Harrison, J.E., Griggs, A.B., and Wells, J.D., 1986, Geologic and structure maps of the Wallace 1° x 2° quadrangle, Montana and Idaho: U.S. Geological Survey Miscellaneous Investigations Map I-1509-A, 2 sheets, scale 1:250,000. #1052 McMurtrey, R.G., Konizeski, R.L., and Brietkrietz, A.,

1965, Geology and ground water resources of the Missoula basin, Montana: Montana Bureau of Mines and Geology Bulletin 47, 35 p., 3 pls.

#540 Ostenaa, D., Manley, W., Gilbert, J., LaForge, R., Wood, C., and Weisenberg, C.W., 1990, Flathead Reservation regional seismotectonic study—An evaluation for dam safety: U.S. Bureau of Reclamation Seismotectonic Report 90-8, 161 p., 7 pls.

#46 Pardee, J.T., 1950, Late Cenozoic block faulting in western Montana: Geological Society of America Bulletin, v. 61, p. 359-406.

#58 Qamar, A.I., and Stickney, M.C., 1983, Montana earthquakes, 1869-1979—Historical seismicity and earthquake hazard: Montana Bureau of Mines and Geology Memoir 51, 79 p., 3 pls.

#1045 Wallace, C.A., Lidke, D.J., and Schmidt, R.G., 1990, Faults of the central part of the Lewis and Clark line and fragmentation of the Late Cretaceous foreland basin in west-central Montana: Geological Society of America Bulletin, v. 102, p. 1021-1037.

#1044 Wells, J.D., 1974, Geologic map of the Alberton quadrangle, Missoula, Sanders, and Mineral Counties, Montana: U.S. Geological Survey Geologic quadrangle Map GQ-1157, 1 sheet, scale 1:62,500.

#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.