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Quaternary Fault and Fold Database of the United States

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Regulating Reservoir faults (Class A) No. 680

Last Review Date: 1993-04-23

Compiled in cooperation with the Montana Bureau of Mines and Geology

citation for this record: **Machette, M.N., compiler, 1993, Fault number 680, Regulating Reservoir faults, 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	Comprised of three, echelon, intrabasin, normal faults that trend northwest and lie between the Spokane Hills fault [679a] and the Spokane Bench fault [681]. Poorly studied, with the exception of a single trenching study for Regulating Reservoir.
Name comments	Found in trench excavations by M.W. Reynolds in 1975 (Schmidt, 1986 #533); later mapped by Schmidt (1986 #533) and Stickney (1987 #251). Johns and others (1982 #259) use the term Helena Regulating Reservoir fault for the locality of its discovery, although the term Regulating Reservoir is shown on local maps and thus accepted as the fault's name (Stickney and Bingler, 1981 #559). The fault consists of three echelon scarps that extend

	across Spokane Bench. **Fault ID:** Refers to fault 122 (Helena Regulating Reservoir fault) of Johns and others (1982 #259) and Regulating Reservoir fault (Stickney and Bingler, 1981 #559; Stickney, 1987 #251; Stickney and Bartholomew, written commun. 1992 #556).
County(s) and State(s)	LEWIS AND CLARK COUNTY, MONTANA
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Location from 1:50,000-scale map of Stickney (1987 #251). Also shown by Schmidt (1986 #533).
Geologic setting	Three intrabasin, echelon, down-to-the-southwest, normal faults that form discontinuous and dissected scarps on Spokane Bench. The faults trend northwesterly between the Spokane Hills fault [679a] and the Spokane Bench fault [681] and have been considered as splays of the latter (Johns and others, 1982 #259). The westernmost fault projects beneath Regulating Reservoir.
Length (km)	8 km.
Average strike	N45°W
Sense of movement	Normal *Comments:* Johns and others (1982 #259)
Dip	60°-80° W *Comments:* Determined from trenching study at the Regulating Reservoir (Schmidt, 1986 #533).
Paleoseismology studies	Trenching at the Regulating Reservoir in 1977 (Schmidt, 1986 #533) revealed a narrow zone of high-angle normal faults that dip 60-80? W. Although no datable materials were found, caliches that are considered to be early Pleistocene or late Pliocene show evidence of local faulting.
Geomorphic	The central fault of three faults is marked by a dissected scarp that

expression	is 12 to 30 m high on Spokane Bench (Schmidt, 1986 #533). Locally, Spokane Bench is tilted to the east, adjacent to the fault. Locally, stream channels and young alluvium bury the trace of the fault.
Age of faulted surficial deposits	Spokane Bench, which is faulted, is underlain by Tertiary(?) fluvial and lacustrine sediments, which are considered to be as old as Oligocene (Schmidt, 1986 #533) or as young as late Pliocene or early Pleistocene (Johns and others, 1982 #259). The bench may in fact be an erosional surface that is unconformable on the underlying materials (Pardee, 1950 #46), which are tilted. Reynolds reported that caliches formed in the sediment are brecciated along the projection of the fault (Schmidt, 1986 #533). Thus, although the faults are known to cut Tertiary sediment, they also deform Spokane Bench, which could be as young as early Pleistocene.
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Witkind (1975 #317) showed the fault as Quaternary, Schmidt (1986 #533) considered it to be potentially active, and Reynolds, as cited in Johns and others (1982 #259), suggested possible Holocene movement on the basis of a spatial association with the 1935 Helena earthquake and the presence of clastic dikes in trench excavations. However, the latter argument is not definitive, and thus we use the conservative estimate of Quaternary.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Low slip rate is inferred from the 12- to 30-m-high scarp on Spokane Bench, which could be as young as early Pleistocene.
Date and Compiler(s)	1993 Michael N. Machette, U.S. Geological Survey, Retired
References	#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. #533 Schmidt, R.G., 1986, Geology, earthquake hazards, and land use in the Helena area, Montana—A review: U.S. Geological Survey Professional Paper 1316, 64 p., 3 pls., scale 1:48,000 and 1:25,000. #251 Stickney, M.C., 1987, Quaternary geologic map of the Helena valley, Montana: Montana Bureau of Mines and Geology Geologic Map 46, 1 pl., scale 1:50,000. #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. #559 Stickney, M.C., and Bingler, E.C., 1981, Earthquake-hazard evaluation of the Helena valley area, Montana: Montana Bureau of Mines and Geology Open-File Report 83, 30 p., 1 pl., scale 1:24,000. #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.