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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.

Upper Yellowstone Valley faults (Class A) No. 761

Last Review Date: 1998-03-19

citation for this record: **Pierce, K.L., compiler, 1998, Fault number 761, Upper Yellowstone Valley 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 02:02 PM.**

Synopsis	This is a group of en echelon normal faults that offset recessional glacial and younger deposits on both sides of the Upper Yellowstone Valley (Richmond and Pierce, 1971 #2278; 1972 #2277), thereby forming a young graben. Some of these faults extend into bedrock of the Eocene Absaroka Supergroup. These faults were mapped in 1966 prior to general recognition of Quaternary faulting and development of methods of study and measurement of fault scarps on surficial materials; the compiler has reservations about this early vintage mapping. The graben-like morphology of the valley is complicated in that during glacial times (but before and after a thick ice cap covered the Yellowstone Plateau), a large glacier flowed northward down the Upper Yellowstone Valley. In doing so, it enhanced the valley's trench-like or U-shaped appearance and scoured well below the present topography; subsequently, this trough was filled with

	unconsolidated sediment that might compact and produce settlement structures.
Name comments	These faults are on the eastern and western sides of the Upper Yellowstone Valley in Yellowstone National Park (U.S. Geological Survey, 1972 #639; 1972 #1057), but they also extend south of the park on the Two Ocean 15-minute quadrangle (Richmond and Pierce, 1971 #2278; 1972 #2277). They were referred to as the Yellowstone River faults by Case (1997 #3449; 1997 #3450) and the Yellowstone River fault system by Wong and others (2000 #4484). However, we prefer the more descriptive name "Upper Yellowstone Valley faults" for use in this database. **Fault ID:** This large group of faults is described together as a single entity.
County(s) and State(s)	PARK COUNTY, WYOMING TETON COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:125,000 scale. *Comments:* Southern part mapped at 1:62,500 scale by Richmond and Pierce (1971 #2278; 1972 #2277) and northern part (within national park) from 1:125,000-scale map by U.S. Geological Survey (1972 #1057). Fault traces recompiled at 1:125,000-scale on map with topographic base.
Geologic setting	Faults are on both sides of a 1- to 2-km-wide trench of the upper Yellowstone River Valley inferred to be a graben in Absaroka Volcanic Supergroup rocks (Richmond and Pierce, 1971 #2278; 1972 #2277; Smedes and others, 1989 #2280). Under full-glacial conditions, ice filled this valley and flowed to the southwest across the Two Ocean Plateau. When the ice cap on the Yellowstone Plateau retreated (deglaciation), a glacier flowed northward down this valley from the high terrain in its headwaters. Glacial recession to a position upstream of this fault system had occurred by 11,600?350 yr BP (about 13,500 cal yr BP, p. 96 in Richmond, 1986 #2279). Thus, the faults within the upper Yellowstone River Valley must be post-glacial in age.

Length (km)	25 km.
Average strike	N9°W
Sense of movement	Normal
Dip Direction	E; W *Comments:* Probably typical normal faults with footwall in Eocene volcanic rocks. Presumably normal faults with east-side faults dipping west and west-side faults dipping east, thereby forming a graben.
Paleoseismology studies	
Geomorphic expression	Richmond and Pierce (1971 #2278) reported offset of Pinedale till, kame deposits, and outwash gravel, and neoglacial alluvium. The maximum offset of surficial deposits on both the east and west sides of the valley is reported to be about 5 m.
Age of faulted surficial deposits	Late glacial (Pinedale) and Holocene.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Faulted deposits in this area were mostly deposited near the end of the last major deglaciation (about 13.5 ka). Scarps on late glacial deposits are as high as 5 m, suggesting more than one offset event in the past 13.5 k.y.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Maximum offset associated with individual scarps of the Upper Yellowstone Valley faults is about 5 m in post-glacial time (13,500 yr), but the associated recurrence intervals are not known. Wong and others (2000 #4484) suggested fault slip rates of 0.4 and 1.4 mm/yr, each with separate weighting. These reported slip rates are model dependent and do not represent

	actual measured values. The late Quaternary characteristics of this fault (overall geomorphic expression, continuity of scarps, age of faulted deposits, etc.) suggest the slip rate during this period is of a less magnitude. On the basis of slip rate estimates for other similar faults in the area, these are assigned to the <0.2 mm/yr slip-rate category.
Date and Compiler(s)	1998 Kenneth L. Pierce, U.S. Geological Survey, Emeritus
References	#3450 Case, J.C., 1997, Earthquakes and active faults in Wyoming: Geological Survey of Wyoming Preliminary Hazard Report 97-2, 58 p. #3449 Case, J.C., Larsen, L.L., Boyd, C.S., and Cannia, J.C., 1997, Earthquake epicenters and suspected active faults with surficial expression in Wyoming: Geological Survey of Wyoming Preliminary Hazards Report 97-1, 1 sheet, scale 1:1,000,000. #2279 Richmond, G.M., 1986, Stratigraphy and chronology of glaciations in Yellowstone National Park, *in* Sibrava, V., Bowen, D.Q., and Richmond, G.M., eds., Quaternary glaciations in the northern hemisphere: Quaternary Science Reviews, v. 5, p. 83-98, 1 pl. #2278 Richmond, G.M., and Pierce, K.L., 1971, Surficial geologic map of the Two Ocean Pass quadrangle, Yellowstone National Park and adjoining area, Wyoming: U.S. Geological Survey Miscellaneous Geologic Investigations I-635, scale 1:62,500. #2277 Richmond, G.M., and Pierce, K.L., 1972, Surficial geologic map of the Eagle Peak quadrangle: U.S. Geological Survey Miscellaneous Geologic Investigations I-637, scale 1:62,500. #2280 Smedes, H.W., M'Gonigle, J.W., and Prostka, J.J., 1989, Geologic map of the Two Ocean Pass quadrangle, Yellowstone National Park and vicinity, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1667, scale 1:62,500. #1057 U.S. Geological Survey, 1972, Surficial geologic map of Yellowstone National Park: U.S. Geological Survey Miscellaneous Geologic Investigations I-710, 1 sheet, scale 1:125,000.

	#639 U.S. Geological Survey, 1972, Geologic map of Yellowstone National Park: U.S. Geological Survey Miscellaneous Geologic Investigations I-711, 1 sheet, scale 1:125,000. #4484 Wong, I., Olig, S., and Dober, M., 2000, Preliminary probabilistic seismic hazard analyses—Island Park, Grassy Lake, Jackson Lake, Palisades, and Ririe Dams: U.S. Department of the Interior, Bureau of Reclamation Technical Memorandum D8330-2000-17.