Jump to Navigation

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.

Mirror Plateau faults, younger section (Class A) No. 749a

Last Review Date: 1998-03-27

citation for this record: **Pierce, K.L., compiler, 1998, Fault number 749a, Mirror Plateau faults, younger 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 01:59 PM.**

Synopsis	**General:** This group of Quaternary faults form of anastomosing band on and near the Mirror Plateau (fig. 3 and Plate 1, Love, 1961 #3801). The plateau is underlain by Eocene volcanic rocks, partly covered with 0.63-Ma Lava Creek Tuff (U.S. Geological Survey, 1972 #639). The faults are parallel to and 7-11 km outboard of the structural margin of the 0.63-Ma Yellowstone caldera (Christiansen, 2001 #1784), which is the leading edge of the Yellowstone hotspot (Pierce and Morgan, 1992 #539). The faults have strong geomorphic expression and commonly appear to have dammed or offset stream drainages (Love, 1961 #3801). In the Mirror Plateau area, younger faults [749a] that we classify as <15 ka (post-glacial) have generally been mapped as solid across Pinedale till, whereas older faults [749b] classified as <750 have generally been mapped as dashed across Pinedale till. The Pinedale till on U.S. Geological Survey maps (1972 #639)

	includes Pinedale "rubble veneer" mapped at 1:62,500 scale (Pierce, 1974 #2217; Pierce, 1974 #2238), and which is so thin that nearly all the escarpments are on bedrock rather than on glacial deposits. **Sections:** This fault has 2 sections. Faults on Mirror Plateau with evidence of <15 ka movement are collectively described as the younger section [749a] and those with evidence of <750 ka movement are collectively described as the older section [749b].
Name comments	**General:** Referred to as the Mirror Plateau faults by Love (p. 1751, 1961 #3801). These faults are mostly on the Mirror Plateau and extend to the southeast. **Section:** This informally named section includes those younger Mirror Plateau faults with <15 ka activity. They are in the central part of the Mirror Plateau.
County(s) and State(s)	PARK COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:125,000 scale. *Comments:* Mapped as either solid or long-dashed faults at 1:62,000 scale on surficial geologic quadrangles (Richmond and Waldrop, 1972 #2261; Pierce, 1974 #2217; Pierce, 1974 #2238) and bedrock quadrangles (Prostka and others, 1975 #2259; Prostka and others, 1975 #2260; Prostka and others, 1975 #3802); also shown on Yellowstone Park compilations at 1:125,000 scale (U.S. Geological Survey, 1972 #639). Fault traces recompiled at 1:125,000-scale on map with topographic base.
Geologic setting	These faults are parallel to and 7-11 km outboard of the northeast of the margin the 0.63-Ma Yellowstone caldera (Christiansen, 2001 #1784), which is on the leading edge of the Yellowstone hotspot (Pierce and Morgan, 1992 #539). They form of an anastomosing band on and near the Mirror Plateau (fig. 3 and Plate 1, Love, 1961 #3801), where the bedrock is Eocene volcanic rock partly covered with 0.63 Ma Lava Creek Tuff (U.S. Geological Survey, 1972 #639). P-wave and gravity studies suggest hydrothermal or partially molten material is at depth beneath this area (Smith and Braile, 1993 #2271).

Length (km)	This section is 18 km of a total fault length of 23 km.
Average strike	N36°W (for section) versus N39°W (for whole fault)
Sense of movement	Normal
Dip Direction	NE; SW
Paleoseismology studies	
Geomorphic expression	Well expressed as scarps primarily on bedrock that is mantled by thin glacial till and veneer of rubble. Landscape well glaciated and freshness of scarp morphology thought to reflect post-glacial offset. Pierce (1974 #2217) noted that "For a fault scarp 10-50 feet [sic, 3-15 m] high it is difficult to tell whether the till along the fault scarp has been offset a few feet since the Pinedale glaciation or simply deposited on both sides of the fault scarp." Richmond and Waldrop (1972 #2261) indicated offsets and scarp heights in the 15-40 foot (5-12 m) range, but the compiler considers it important to document that not all of this offset is post-glacial, although some faults have sag ponds and offset stream drainages. Existing study of these faults is of a reconnaissance nature.
Age of faulted surficial deposits	Inferred to be latest Pleistocene Pinedale till and rubble veneer.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Freshness of scarp morphology largely results from presence of bedrock in near surface. Local sag ponds and marshy areas and offset drainages indicate a post-glacial timing for offset. However, it is difficult to observe actual offset of thin deposits of Pinedale till and rubble veneer. Pierce (1974 #2217) noted "In one place in the center of the Mirror Plateau, pull-apart cracks with half a foot of vertical offset expose living tree roots indicating recent movements."
Recurrence interval	*Comments:* An estimate of <15 k.y. can be made if one assumes

	only a single faulting event in post-glacial time (since about 15 ka). However if, as concluded by Richmond and Waldrop (1972 #2261), some 40-foot (14-m) high scarps are post-glacial, this would require multiple (probably >5 offsets) in post-glacial time, and a recurrence interval more like 3 k.y. The compiler thinks this assertion needs to be demonstrated, rather than inferred.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* If 5 m (to 12 m) of offset has occurred during the past 15 k.y., which seems reasonable based on the presence of some sag ponds and the freshness of the scarps, a slip rate of >0.3 mm/yr appears to be a reasonable estimate. On this basis, a slip-rate category of 0.2-1.0 mm/yr is assigned to this group of faults.
Date and Compiler(s)	1998 Kenneth L. Pierce, U.S. Geological Survey, Emeritus
References	#1784 Christiansen, R.L., 2001, The Quaternary and Pliocene Yellowstone Plateau volcanic field of Wyoming, Idaho, and Montana: U.S. Geological Survey Professional Paper 729-G, 145 p., 3 pls., scale 1:125,000. #3801 Love, J.D., 1961, Reconnaissance study of Quaternary faults in and south of Yellowstone National Park, Wyoming: Geological Society of America Bulletin, v. 72, p. 1749-1764. #2217 Pierce, K.L., 1974, Surficial geologic map of the Abiather Peak and parts of adjacent quadrangles, Yellowstone National Park, Wyoming and Montana: U.S. Geological Survey Miscellaneous Geologic Investigations I-646, scale 1:62,500. #2238 Pierce, K.L., 1974, Surficial geologic map of the Tower Junction quadrangle and part of the Mount Wallace quadrangle, Yellowstone National Park, Wyoming and Montana: U.S. Geological Survey Miscellaneous Geologic Investigations I-647, scale 1:62,500. #539 Pierce, K.L., and Morgan, L.A., 1992, The track of the Yellowstone hot spot—Volcanism, faulting, and uplift, *in* Link, P.K., Kuntz, M.A., and Platt, L.B., eds., Regional geology of eastern Idaho and western Wyoming: Geological Society of America Memoir 179, p. 1-53, 1 pl. #2260 Prostka, H.J., Blank, H.R., Jr., Christiansen, R.L., and Ruppel, E.T., 1975, Geologic map of the Tower Junction

quadrangle, Yellowstone National Park, Wyoming and Montana: U.S. Geological Survey Geologic quadrangle Map GQ-1247, scale 1:62,500.

#3802 Prostka, H.J., Ruppel, E.T., and Christiansen, R.L., 1975, Geologic map of the Abiathar Peak quadrangle, Yellowstone National Park, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1244, 1 sheet, scale 1:62,500.

#2259 Prostka, H.J., Smedes, H.W., and Christiansen, R.L., 1975, Geologic map of the Pelican Cone quadrangle, Yellowstone National Park and vicinity, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1243.

#2261 Richmond, G.M., and Waldrop, H.A., 1972, Surficial geologic map of the Pelican Cone quadrangle, Yellowstone National Park and adjoining area, Wyoming: U.S. Geological Survey Miscellaneous Geologic Investigations I-638, scale 1:62,500.

#2271 Smith, R.B., and Braile, L.W., 1993, Topographic signature, space-time evolution, and physical properties of the Yellowstone-Snake River plain volcanic system—the Yellowstone hotspot, *in* Snoke, A.W., Steidtmann, J.R., and Roberts, S.M., eds., Geology of Wyoming: Geological Survey of Wyoming, Memoir No. 5, p. 694-754.

#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.