

# 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](#).

## South Granite Mountains fault system, Muddy Gap section (Class A) No. 779c

Last Review Date: 1999-05-17

*citation for this record:* Machette, M.N., compiler, 1999, Fault number 779c, South Granite Mountains fault system, Muddy Gap 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 03:16 PM.

### Synopsis

**General:** This 125-km-long, west-northwest trending, north-dipping fault system is located along the north margin of a low chain of anomalous west-northwest-trending mountain ranges within the Wyoming Basin province of central Wyoming. Two episodes of movement have been documented on the fault system. The first was near the end of the Eocene when the Granite Mountains (to the north) were uplifted at least 3 km, and during the Pliocene to Quaternary when the fault system was reactivated in the opposite sense (down-to-the-north) resulting in subsidence of the previously uplifted Precambrian-cored Sweetwater Arch. Part of this subsidence was accommodated by the Split Rock syncline [778], which lies north of the South Granite Mountains fault system. There has been a thorough reconnaissance of the fault system and detailed paleoseismic investigations at two locations along its middle portion. This study revealed clear

evidence for Quaternary deformation on the three central faults (sections) of the system, but Quaternary deformation has not been proven for the distal sections (Class B structures). Pleistocene to Holocene displacement was found in the Green Mountain and Ferris Mountains areas, and minor Quaternary displacement was found in the Muddy Gap area. However, all five sections are considered to be of potential Quaternary age because of the prevalence of lineaments, springs, alignment of vegetation and fault scarps. Trenching has shown that a displacement of about 0.5 m (net vertical) is typical of the average surface-rupturing event on the Ferris Mountains section of the fault system. In addition, using reported average to maximum displacement ratios for historic faulting events, they proposed that the active (late Quaternary) sections of the South Granite Mountains fault system might have a maximum surface faulting event of 1–1.5 m displacement.

**Sections:** This fault has 5 sections. Geomatrix Consultants (1988 #2980) defined five segments (herein considered as sections) for the South Granite Mountains fault system. From west to east, these are the Crooks Mountain [779a], Green Mountains [779b], Muddy Gap [779c], Ferris Mountains [779d] and Seminole Mountains [779e] sections. Quaternary movement (Class A structures) has been documented in the Green Mountain area, along the Ferris Mountains, and in the Muddy Gap area. As such, only these three sections are described in detail; the Crooks Mountain (779a) and Seminole Mountains [779e] sections are considered to be of Class B (potential Quaternary) structures, pending further investigations.

**Name  
comments**

**General:** Named for its location south of the Granite Mountains. However, the fault is in fact much closer to the mountain chain formed by the Green, Ferris, and Seminole Mountains, which it borders on their north sides. The fault system is defined by Geomatrix Consultants (1988 #2980) as having five sections; the western end of the system is near Alkali Creek on the western end of the Crook Mountains and the eastern end is at Saylor Creek, north of Horseshoe Ridge at the eastern end of the Seminole Mountains.

**Section:** Named for Muddy Gap (a geographic feature and small town) along U.S. Highway 287. The section extends west-northwest along the northern side of the Red Hills and western portion of the Ferris Mountains. Geomatrix Consultants (1988 #2980) defined the eastern end of the section as being just west of

	<p>Cherry Creek [779d] where there is an abrupt change in orientation of the northern front of the Ferris Mountains. The western end of the section is at the eastern end of the Green Mountains block, east of Willow Creek [779b]. As such, Geomatrix Consultants (1988 #2980) reported the section as 23 km long.</p> <p><b>Fault ID:</b> Referred to as normal fault 3 on figure 2-1 of Geomatrix Consultants (1988 #2973) and fault 242 of Witkind (1975 #819).</p>
<p><b>County(s) and State(s)</b></p>	<p>CARBON COUNTY, WYOMING FREMONT COUNTY, WYOMING</p>
<p><b>Physiographic province(s)</b></p>	<p>WYOMING BASIN</p>
<p><b>Reliability of location</b></p>	<p>Poor Compiled at 1:250,000 scale.</p> <p><i>Comments:</i> Trace based on map of entire fault system (fig. 3-1) at about 1:330,000 scale by Geomatrix Consultants (1988 #2980), (1988 #2980) with modifications based on Geomatrix Consultants (1988 #2980) 1:250,000 scale map (plate 2). The trace was transferred to 1:250,000-scale map with topographic-base for digitizing. This trace is a generalization from Love and others (1979 #3470) and Love and Christiansen (1985 #2287). The fault is shown in generalized fashion at 1:500,000 scale by Witkind (1975 #819) and Geomatrix Consultants (1988 #2980), and at 1:1,000,000 scale by Case and others (1997 #3449).</p>
<p><b>Geologic setting</b></p>	<p>The South Granite Mountains fault system trends west-northwest along the northern flanks a chain of low mountain ranges comprised of Crooks Mountain (on the west), the Green Mountains, Ferris Mountains, and Seminoe Mountains (on the east). The fault system forms the southern margin of the Sweetwater Arch, a west-northwest-trending asymmetric Laramide-age anticline consisting of a steeply dipping southern limb and a gently dipping northern limb (Love, 1970 #3445). The central to western portion of the arch is comprised of Precambrian granitic knobs that protrude above Miocene to Pliocene sediment. The southern limb is comprised of the South Granite Mountains. After being buried by conglomerate in the Eocene, the arch started to subside via structural downwarping along the Split Mountain syncline and by normal displacement along the North</p>

	and South Granite Mountain fault systems. Subsidence continued into the Pliocene, but Quaternary movement has only been documented on portions of the South Granite Mountains fault system. The system's east-west orientation and normal sense of movement are consistent with the north-south extensional stress regime proposed for the Wyoming foreland by Zoback and Zoback (1980 #176)(1980).
<b>Length (km)</b>	This section is 21 km of a total fault length of 133 km.
<b>Average strike</b>	N64°W (for section) versus N72°W (for whole fault)
<b>Sense of movement</b>	Normal  <i>Comments:</i> Down to the north in Pliocene to Quaternary time; in Eocene, movement was in opposite (down-to-the-south) sense (Love, 1970 #3445). Love (1970 #3445) suggested a minimum post-Miocene displacement of 650 m for the fault system.
<b>Dip Direction</b>	NE  <i>Comments:</i> Appears to dip steeply (Love, 1970 #3445).
<b>Paleoseismology studies</b>	
<b>Geomorphic expression</b>	Discontinuous low fault scarps are present for a few kilometers at the eastern end of the section. The scarp heights decrease to the west, and along the westernmost part of the northern flank of the Ferris Mountains, the trace of the fault is only defined by topographic breaks in slope. From the Ferris Mountains west toward Muddy Gap, there are numerous lithologic (bedrock) lineaments formed by near vertical strata that strike northwest parallel to the fault (Geomatrix Consultants, 1988 #2980). There is no evidence for deformation of late Quaternary alluvial-fan or terrace deposits along the central and western portion of this fault section.
<b>Age of faulted surficial deposits</b>	There is no evidence for deformation of late Quaternary deposits along the central and western portion of the fault section, but Geomatrix Consultants (1988 #2980) could not preclude Quaternary faulting owing to the presence of fault-parallel lineaments. Ages of displaced deposits at the eastern end of the section are not cited by Geomatrix Consultants (1988 #2980).

<b>Historic earthquake</b>	
<b>Most recent prehistoric deformation</b>	undifferentiated Quaternary (<1.6 Ma)  <i>Comments:</i> No late Quaternary faulting has occurred on alluvial fan or terrace deposits along western and central portions of section but there are discontinuous low fault scarps along eastern portion of section. As such, the section is best characterized as having Quaternary movement.
<b>Recurrence interval</b>	
<b>Slip-rate category</b>	Less than 0.2 mm/yr  <i>Comments:</i> Low slip rate is inferred by compiler on basis of a lack of late Quaternary faulting of alluvial fan or terrace deposits along western and central portions of section and presence of discontinuous low fault scarps along eastern portion of section. However, if the section boundary is in error, these eastern scarps may be related to the moderately active Ferris Mountains section [779d] rather than the relatively inactive Muddy Gap section [779c].
<b>Date and Compiler(s)</b>	1999 Michael N. Machette, U.S. Geological Survey, Retired
<b>References</b>	#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.  #2973 Geomatrix Consultants, Inc., 1988, Northwestern Wind River Basin seismotectonic evaluation: Technical report to U.S. Department of Interior, Bureau of Reclamation, Denver, under Contract 6-CS-81-07310, 116 p., 3 pls.  #2980 Geomatrix Consultants, Inc., 1988, Wyoming Basin geomorphic province seismotectonic evaluation: Technical report to U.S. Department of Interior, Bureau of Reclamation, Denver, under Contract 6-CS-81-07310, 167 p., 2 pls.  #3445 Love, J.D., 1970, Cenozoic geology of the Granite Mountain area, central Wyoming: U.S. Geological Survey Professional Paper 495-C, 154 p., 10 pls.

#2287 Love, J.D., and Christiansen, A.C., 1985, Geologic map of Wyoming: State Geologic Map, 3 sheets, scale 1:500,000.

#3470 Love, J.D., Christiansen, A.C., Earle, J.L., and Jones, R.W., 1979, Preliminary geologic map of the Casper 1° x 2° quadrangle central Wyoming: U.S. Geological Survey Open-File Report 79-961, 13 p., 1 pl., scale 1:250,000.

#819 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in Wyoming: U.S. Geological Survey Open-File Report 75-279, 35 p. pamphlet, 1 sheet, scale 1:500,000.

#176 Zoback, M.L., and Zoback, M., 1980, State of stress in the conterminous United States: Journal of Geophysical Research, v. 85, no. B11, p. 6113-6156.

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