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Sawatch fault, southern section (Class A) No. 2308b

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Compiled in cooperation with the Colorado Geological Survey

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Synopsis	**General:** The Sawatch fault is a range-front fault on the east side of the Sawatch Range from about Leadville south to the South Arakansas River. The faults comprise the western boundary of the upper Arkansas Valley graben, a Neogene west-tilted structure that forms the northernmost topographically prominent expression of the Rio Grande Rift. The graben developed along the axial crest of the Laramide Sawatch anticline. Trenching investigations on the southern part of the fault indicated six surface ruptures since about 150 ka, suggesting a recurrence interval of 10–0 k.y.; the most recent faulting event occurred less than 4 k.y. ago

	(Ostenaa and others, 1981 #2730). **Sections:** This fault has 2 sections. Ostenna and others (1981 #2730) described the Sawatch fault as bounding two coeval grabens, which they referred to as the north Arkansas graben and the south Arkansas graben. Unruh and others (1992 #2776) used these physiographic divisions to define their north and south segments of the Sawatch fault. Fault segments described by Unruh and others (1992 #2776), and Lettis and others (1996 #4453) are herein refered to as sections. Subdued scarps are present on Bull Lake deposits along the northern section of the fault. Along the southern section, scarps up to 10 m high are present on Bull Lake deposits, and scarps average about 2 m high on Pinedale deposits.
Name comments	**General:** The Sawatch fault is expressed as a series of more than 16 generally north-trending fault scarps along eastern margin of the Sawatch Range between Leadville and Salida. Until recently, the south section of the fault was known as the Sawatch fault (e.g. Witkind, 1976 #2792; Kirkham and Rogers, 1981 #792), and the faults comprising the north section of the fault were as yet unnammed. Ostenaa and others (1981 #2730) described the Sawatch fault as bounding the upper Arkansas Valley, which they further subdivided into the north Arkansas graben and the south Arkansas graben. Unruh and others (1992 #2776) used these physiographic divisions to define their north and south segments of the Sawatch fault, which they termed the Northern Sawatch fault and the Southern Sawatch fault. Although this fault has been described in the literature as segmented (Unruh and others, 1992 #2776; Lettis and others, 1996 #4453), studies are not extensive enough on each section of the fault to warrant designation as a segmented fault. The fault is therefore herein described as a sectioned fault. **Section:** Unruh and others (1992 #2776) used the term Southern Sawatch fault to describe that part of the Sawatch fault that extends south from the Twin Lakes area. Herein this section of the fault is simply referred to as the southern section of the Sawatch fault. The southern section extends from south of the Twin Lakes area to the South Arkansas River, west of Salida. The southern section extends across the strike-slip fault bounding the southern end of the Chalk Cliffs that Richards and others (2010 #7282) suggests represents a major segment boundary responsible for the offset of the the southern Sawatch fault; however, differences in fault behavior north and south of the Chalk Cliffs is not

	demonstrated. **Fault ID:** Fault number Q56b of Widman and others (1998 #3441); fault 159 in Kirkham and Rogers (1981 #792); fault 'G' in Knepper (1974b #2714); faults 148, 149, 151 and 357 in Witkind (1976 #2792).
County(s) and State(s)	CHAFFEE COUNTY, COLORADO
Physiographic province(s)	SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* The southern section of the Sawatch fault was mapped by Limbach (1975 #2716) at a scale of 1:24,000, by Scott (1975 #2733) and Scott and others (1975 #2737) at 1:62,500, by Arestad (1977 #2556) at 1:187,500, by Colman and others (1985 #1954) at 1:125,000, and by Tweto and others (1976 #2774) at 1:250,000. The trace used herein is from Colman and others (1985 #1954) further constrained by satellite imagery and topography at scale of 1:100,000. Reference satellite imagery is ESRI_Imagery_World_2D with a minimum viewing distance of 1 km (1000 m).
Geologic setting	The Sawatch fault is a high-angle, down-to-the-east normal fault. It lies on the eastern margin of the Sawatch Range between Leadville and Salida and forms the western boundary of the upper Arkansas Valley graben, a Neogene west-tilted structure that forms the northernmost topographically prominent expression of the Rio Grande rift. The graben developed along the axial crest of the Laramide-age Sawatch anticline. The fault is one of the larger faults in the northern Rio Grande rift.
Length (km)	This section is 41 km of a total fault length of 84 km.
Average strike	N3°W (for section) versus N3°W,N3°W (for whole fault)
Sense of movement	Normal *Comments:* Limbach (1975 #2716) and Witkind (1976 #2792) indicated normal movement on this fault section. However, en echelon scarps indicate a left-lateral component of slip (Kirkham and Rogers, 1981 #792).

Dip	70° E. *Comments:* Witkind (1976 #2792) reported a northeast dip for faults on the east flank of the Collegiate Peaks. A cross section by Limbach (1975 #2716) showed a dip of about 70° E. north of Cottonwood Creek.
Paleoseismology studies	Ostenaa and others (1981 #2730) excavated five trenches across scarps along the southern section of the Sawatch fault. Trench investigations were not discussed individually nor exact location of the trenches was not indicated in the original report; however, summaries of their findings were presented. Trenches at the Cottonwood trench site near Cottonwood Creek and at the Eddy trench site south of Chalk Creek (two site are shown by Miller, 1999 #7057– revealed at least six episodes of surface faulting since 100–150 ka. Each event was inferred to have produced less than 0.2 to 0.3 m of surface displacement. The most recent event on this section of the fault was radiocarbon dated at less than 4 ka.
Geomorphic expression	Numerous scarps are present along the southern section of the Sawatch fault. Scarps are 8 to 10 m high on Bull Lake deposits and about 2 m high on Pinedale deposits (Ostenaa and others, 1981 #2730). The scarps form an en echelon series of left-stepping faults (Kirkham and Rogers, 1981 #792). Miller (1999 #7057) suggests geologic relations observed at Chalk Creek are the result of progressive migration of active strands toward the valley, which reduces the sinuosity in the fault.
Age of faulted surficial deposits	Scarps as much as 10 m high are present on Bull Lake deposits whereas scarps on Pinedale deposits average about 2 m in height (Ostenaa and others, 1981 #2730). Offset of Quaternary deposits was also shown by Scott (1975 #2733), Scott and others (1975 #2737), and Tweto and others (1976 #2774). Limbach (1975 #2716) reported 3,000 m of Neogene displacement across this section of the Sawatch fault.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Ostenaa and others (1980 #2729) radiocarbon dated the most recent faulting event at less than 4 ka. Scarps on Pinedale deposits also suggest Holocene activity on the fault

	(Ostenaa and others, 1981 #2730; Unruh and others, 1992 #2776; Lettis and others, 1996 #4453). Howard and others (1978 #312) and Kirkham and Rogers (1981 #792) indicated late Quaternary movement on this section of the fault, whereas Colman (1985 #1953) indicated Holocene movement.
Recurrence interval	10–40 k.y. (<150 ka) *Comments:* Ostenaa and others (1981 #2730) calculated a recurrence interval of 10–40 k.y. based on trenching investigations, which revealed six surface rupture events since about 150 ka.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Maximum slip has been concentrated along the southern section of the fault (Ostenaa and others, 1981 #2730). Low slip rate is indicated based on 2 m of offset in 10–40 ka Pinedale deposits on the southern section.
Date and Compiler(s)	2015 Beth L. Widmann, Colorado Geological Survey Kathleen M. Haller, U.S. Geological Survey
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