

## **2251, LITTLE DOLORES RIVER FAULT**

**Structure Number:** 2251.

Comments: Fault 75 in Kirkham and Rogers (1981); fault 281 in Witkind (1976); fault Q-1 in Widmann and others (1998); part of Hecker's (1993) Uncompahgre fault zone (number 18-3).

**Structure Name:** Little Dolores River fault.

Comments: The majority of the Little Dolores River fault is in Utah. This northwest-trending fault extends southeast from Westwater Canyon in Utah into Colorado along the northeast flank of Snyder Mesa. The fault crosses the Little Dolores River just before entering Colorado. The fault lies on the northeast flank of the Uncompahgre uplift.

**Synopsis:** The Little Dolores River fault extends from Utah into Colorado on the northeast flank of the Uncompahgre uplift. Evidence for Quaternary movement on this fault was cited in Witkind (1976) based on personal communication with Fred Cater. Based on the timing of abandonment of Unawep Canyon, Cater (1966) indicated uplift of the Uncompahgre Plateau began in the mid-Pliocene and continued into the Pleistocene, resulting in as much as 640 meters of differential uplift. Despite the lack of evidence of faulted Quaternary deposits along the Little Dolores River fault, it has been classified as a Quaternary fault (Howard and others, 1978; Kirkham and Rogers, 1981; Colman, 1985), and no references have been published that refute this age assignment.

**Date of compilation:** 6/97 (Colorado) and 10/99 (Utah).

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**State:** Utah; Colorado.

**County:** Grand; Mesa.

**1° x 2° sheet:** Grand Junction, Moab.

**Province:** Colorado Plateaus.

**Reliability of location:** Good.

Comments: Mapping from Cashion (1973) and Gualtieri (1988).

**Geologic setting:** This fault lies on the northeast margin of the Uncompahgre uplift along the Utah/Colorado border near the Little Dolores River. The Uncompahgre uplift is a northwest-trending, east-tilted fault block. The Little Dolores River fault is a high-angle fault that is down to the northeast.

**Sense of movement:** N.

Comments: Heyman (1983) mapped this fault as down-to-the-northeast on a fault plane dipping 80-85° SW., indicating a reverse fault. However, Kirkham and Rogers (1981) listed this fault as normal.

**Dip:** Near vertical.

Comments: Heyman (1983) measured a dip of 85° SW. for the Little Dolores River fault in Utah in the vicinity of T. 20 S., R. 25 E., but this is not believed to represent overall fault dip.

**Dip direction:** NA

**Geomorphic expression:** Geomorphic indicators of youthful faulting have not been reported.

**Age of faulted deposits:** The Salt Wash Sandstone Member of the Jurassic Morrison Formation is the youngest deposit known to be offset by this fault. The majority of the fault lies in Precambrian to lower Mesozoic bedrock, and about 5 percent of the fault is concealed by Quaternary deposits (Cashion, 1973).

**Paleoseismology studies:** None.

**Timing of most recent paleoevent:** (5) Quaternary (<1.6 Ma).

Comments: Despite a lack of evidence for offset in Quaternary deposits, faults associated with the Uncompahgre uplift are often considered to have experienced Quaternary movement. Evidence for Quaternary movement on this fault was cited in Witkind (1976) based on personal communication with Fred Cater. Based on the timing of abandonment of Unaweep Canyon, Cater (1966) indicated uplift of the Uncompahgre Plateau began in the mid-Pliocene and continued into the Pleistocene, resulting in as much as 640 meters of differential uplift. Despite the lack of direct evidence for Quaternary movement, this fault has been classified as a Quaternary fault (for example, Howard and others, 1978; Kirkham and Rogers, 1981; Colman, 1985), and no references have been published that refute this age assignment.

**Recurrence interval:** No data.

Comments:

**Slip-rate category:** Unknown, probably <0.2 mm/yr.

Comments: Based on the lack of fault-related geomorphic features in Quaternary deposits and on calculations of an overall uplift rate of 0.4 meters/1,000 years since 1.8 Ma for the Uncompahgre uplift (Perry, 1989; Perry and Annis, 1990), a slip rate of <0.2 mm/yr is estimated for this fault (Widmann and others, 1998).

**Length**           End to end (km): 16  
                      Cumulative trace (km): 16

**Average strike** (azimuth): N59°W

## ***REFERENCES***

- Cashion, W.B., 1973, Geologic and structure map of the Grand Junction quadrangle, Colorado and Utah: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-736, scale 1:250,000.
- Cater, F.W., Jr., 1966, Age of the Uncompahgre uplift and Unaweep Canyon, west-central Colorado: U.S. Geological Survey Professional Paper 550-C, p. C86-C92.
- Colman, S.M., 1985, Map showing tectonic features of late Cenozoic origin in Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1566, scale 1,000,000.
- Gualtieri, J.L., 1988, Geologic map of the Westwater 30' x 60' quadrangle, Grand and Uintah Counties, Utah and Garfield and Mesa Counties, Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-1765, scale 1:100,000.

- Hecker, Suzanne, 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 2 plates, scale 1:500,000, 257 p.
- Heyman, O.G., 1983, Distribution and structural geometry of faults and folds along the northwestern Uncompahgre uplift, western Colorado and eastern Utah, *in* Averett, W.R., editor, Northern Paradox basin - Uncompahgre uplift: Grand Junction Geological Society, p. 45-57.
- Howard, K.A., Aaron, J.M., Brabb, E.E., Brock, M.R., Gower, H.D., Hunt, S.J., Milton, D.J., Muehlberger, W.R., Nakata, J.K., Plafker, G., Prowell, D.C., Wallace, R.E., and Witkind, I.J., 1978, Preliminary map of young faults in the United States as a guide to possible fault activity: U.S. Geological Survey Miscellaneous Field Studies Map MF-916, 2 sheets, scale 1:5,000,000.
- Kirkham, R.M., and Rogers, W.P., 1981, Earthquake potential in Colorado: Colorado Geological Survey Bulletin 43, 171 p., 3 plates.
- Perry, T.W.V., 1989, Tectonic inference and computer simulation in stream longitudinal profile evolution, Unaweep Canyon and vicinity, Colorado and Utah [abs.]: Geological Society of America Abstracts with Programs, v. 21, no. 6, p. 269.
- Perry, T.W., and Annis, D.R., 1990, Pleistocene history of the Gunnison River in Unaweep Canyon, Colorado, and implications for Colorado Plateau uplift [abs.]: Geological Society of America Abstracts with Programs, v. 22, no. 3, p. 75.
- Widmann, B.L., Kirkham, R.M., and Rogers, W.P., 1998, Preliminary Quaternary fault and fold map and database of Colorado: Colorado Geological Survey Open-File Report 98-8, 331 p.
- Witkind, I.J., 1976, Preliminary map showing known and suspected active faults in Colorado: U.S. Geological Survey Open-File Report 76-154, 42 sheets, scale 1:500,000.