

## **2454, JOES VALLEY FAULT ZONE INTRAGRABEN FAULTS**

**Structure number:** 2454.

Comments: Hecker's (1993) fault number 13-5.

**Structure name:** Joes Valley fault zone intragraben faults.

Comments:

**Synopsis:** Late Pleistocene to Holocene intragraben (antithetic?) faults in Joes Valley between the West and East Joes Valley faults.

**Date of Compilation:** 10/99.

**Compiler and affiliation:** Bill D. Black and Greg N. McDonald (Utah Geological Survey), and Suzanne Hecker (U.S. Geological Survey).

**State:** Utah

**County:** Sanpete.

**1° x 2° sheet:** Price.

**Province:** Colorado Plateaus.

**Reliability of location:** Good.

Comments: Mapping from Foley and others (1986).

**Geologic setting:** Generally north-trending normal faults in the north Joes Valley graben. The intragraben faults, which include the Middle Mountain and Bald Mountain faults, appear to merge with the East Joes Valley fault. Joes Valley is long, straight, north-trending graben that splits the Wasatch Plateau, which is capped mainly by Tertiary Flagstaff Limestone.

**Sense of movement:** N.

Comments:

**Dip:** No data.

Comments:

**Dip direction:** W and E.

**Geomorphic expression:** The Bald Mountain faults consist of two horst-bounding scarps in upper Pleistocene deposits; unfaulted late Pleistocene moraines apparently cover the north and south ends of the eastern fault. The Middle Mountain fault consists of several en-echelon, down-to-the-west scarps; the faults may be antithetic to the West Joes Valley fault based on similarities in movement histories. Trenches across the Middle Mountain fault expose two surface-faulting events separated by a soil inferred to be 14-30 ka in age; the events show measured displacements of <1 meter for the most recent event and about 3 meters for the earlier event. The estimated maximum credible earthquake for the Middle Mountain fault is 7.5 ( $M_s$ ). However, this estimate assumes the existence of a rupture pathway (presently unidentified) to the base of the seismogenic crust.

**Age of faulted deposits:** Holocene.

**Paleoseismology studies:** Foley and others (1986) excavated three trenches (trenches 1, 2, and 3) across the Middle Mountain fault east of the mouth of Reeder Canyon where two parallel en echelon scarps cross the three oldest of four upper Pleistocene alluvial fans (site 2454-1). A fourth trench (trench 5) was excavated about 3.5 kilometers south of the other trenches across a scarp that may be a southern extension of the Middle Mountain fault (site 2454-2).

Trench 1 was excavated along a projection of the fault trace across a depression on the fan where it was hoped that datable organic material would be found; such material was absent, however. Stratigraphic relations indicated at least two surface-faulting events. Trench 3 was excavated on the same lineament as, and about 300 meters south of, trench 1. Stratigraphic relations indicated at least two surface-faulting events.

Radiocarbon age estimates from three bulk-soil samples of an unfaulted, organic-rich paleosol A horizon provide a minimum limiting age for the most recent event. Trench 2 was excavated across a scarp on an en echelon section of the Middle Mountain fault about 200 meters west of the section on which trenches 1 and 3 were excavated. Trench 2 exposed generally coarse alluvial-fan deposits that contained areas with abundant burrows, including in the fault zone, obscuring evidence of fault displacement. At trench 2, Foley and others (1986) infer a single surface-faulting event of small (<1 meter) displacement and similar age as the most recent event recorded in trenches 1 and 3.

Trench 5 was excavated in an area containing a series of north-trending, subdued, west-facing scarps on the west side of Joes Valley Reservoir. The trench revealed an area of loose, disturbed, and bioturbated gravel interpreted to be the fault zone. Foley and others (1986) infer small-displacement (<1 meter) faulting due to the lack of a colluvial wedge. A step in the lower portion of the calcareous zone of the modern soil horizon suggests a second small-offset event may have occurred on this fault.

**Timing of most recent paleoevent:** (2) Latest Quaternary (<15 ka).

Comments: Age data (radiocarbon-age estimates and soil development) indicate the most recent event on the Middle Mountain fault occurred between 6 ka and 14-30 ka.

**Recurrence interval:** 10-15 ky (<14-30 ka).

Comments: For the Middle Mountain fault.

**Slip rate:** (D) <0.2 mm/yr.

Comments: 0.1-0.2 mm/yr for the Middle Mountain fault.

**Length:** End to end (km): 34

Cumulative trace (km): 39

**Average strike** (azimuth): N12°E

## **REFERENCES**

Foley, L.L., Martin, R.A., Jr., and Sullivan, J.T., 1986, Seismotectonic study for Joes Valley, Scofield and Huntington North Dams, Emery County and Scofield Projects, Utah: Denver, U.S. Bureau of Reclamation Seismotectonic Report No. 86-7, 132 p., scale 1:60,000 and 1:155,000.

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.