

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](#).

Towanta Flat graben (Class B) No. 2401

Last Review Date: 2004-06-04

Compiled in cooperation with the Utah Geological Survey

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Synopsis

Suspected middle and late Quaternary faults in Towanta Flat adjacent to the southern flank of the western Uinta Mountains. Detailed site mapping, exploratory trenching and soil development have been used to interpret a history of at least three surface-faulting events since 250–500 ka. These events are thought to be pre-Bull Lake (>60–150 ka) in age, based on soil development and correlation with similar soils in the region. However, no datable materials were found in the trenches, so the actual times of faulting are poorly constrained. In addition, the lack of significant net tectonic displacement across the graben, together with a fault orientation that differs from planes defined by microseismicity, suggests that the faults may have a non-

	<p>seismogenic origin (<i>i.e.</i>, Class B features). The recurrence-interval estimates given herein graben reflect the consensus values of the Utah Quaternary Fault Parameters Working Group (Lund, 2004 #6733). The preferred values reported in Lund (2004 #6733) approximate mean values based on available paleoseismic-trenching data, and the minimum and maximum values approximate two-sigma (5th and 95th percentile) confidence limits. The confidence limits incorporate both epistemic (<i>e.g.</i>, data limitation) and aleatory (<i>e.g.</i>, process variability) uncertainty (Lund, 2004 #6733).</p>
Name comments	Fault ID: Refers to fault number 12-2 of Hecker (1993 #642).
County(s) and State(s)	DUCHESNE COUNTY, UTAH
Physiographic province(s)	COLORADO PLATEAUS
Reliability of location	<p>Good Compiled at 1:24,000 scale.</p> <p><i>Comments:</i> Mapped or discussed by Hansen (1969 #4986, 1969 #4985), Utah Geological and Mineral Survey (1977 #5016), Anderson and Miller (1979 #4494), Martin and others (1985 #4998), Nelson and Weisser (1985 #206), and Piety and Vetter (1999 #4463). Location of fault based on mapping from Martin and others (1985 #4998).</p>
Geologic setting	<p>Short northeast-striking graben-bounding faults in Towanta Flat northeast of Mountain Home. Scarps parallel the Tertiary-age Uinta Basin and related South Flank faults. Slopes in the northern part of the Uinta Basin are pediments planed by erosion and mantled with a veneer of gravel and sand from the Uinta Mountains. The structural axis of the basin trends east-west and is about 16 km north of the topographic low (followed by the Duchesne River).</p>
Length (km)	5 km.
Average strike	N54°E
Sense of movement	Normal

<p>Dip</p>	<p>70–86° SE.</p> <p><i>Comments:</i> Dip of fault measured in Towanta Flat trench 1 on the northwestern graben-bounding fault in gravelly outwash and colluvium (Martin and others, 1985 #4998).</p>
<p>Paleoseismology studies</p>	<p>The U.S. Bureau of Reclamation (Nelson and Weisser, 1985 #206; Martin and others, 1985 #4998) excavated three trenches on Towanta Flat. Two trenches (trenches 2 and 3) were excavated across aerial-photo lineaments in a glacial meltwater channel in the southeastern part of Towanta Flat (site 2401-1). The other trench (trench 1) was excavated across a 5-m-high scarp bounding the graben on the north near its western end (site 2401-2), about 3.5 km southwest of trenches 2 and 3. No samples were collected from the trenches for laboratory age determinations. Trench 1 revealed stratigraphic and structural relations that indicate at least three surface-faulting events. Nelson and Weisser (1985 #206) interpret the events as pre-Bull Lake (>60-150 ka) and post-250–500 ka in age, based on soil development and correlation with similar soils in the region. Trenches 2 and 3 exposed unfaulted Bull Lake deposits.</p>
<p>Geomorphic expression</p>	<p>The faults are expressed as scarps on alluvium forming a generally northeast-trending graben. Scarp heights range from 5–15 m high. Nelson and Weisser (1985 #206) found no significant net tectonic displacement across the graben (although the throw across individual scarps was 2.1-2.6 m per event). This lack of net slip, together with an orientation that differs from planes defined by microseismicity (aftershock sequence of the 1977 M_L4.5 earthquake near Towanta Flat), the limited extent of the scarps, and an average recurrence interval that is less than half as long as the time since the most recent event, suggests that the faults may not have a seismogenic origin (Class B) and may not be capable of significant future surface-rupturing events. A reported late Pleistocene fault east of Tabiona that lies along the projected strike of the Towanta Flat faults (Ritzma, referenced in Anderson and Miller, 1979 #4494) shows no displacement in bedrock. An anomalous linear drainage used to infer the presence of the fault faults (Ritzma, referenced in Martin and others, 1985 #4998) is apparently a strike stream.</p>
<p>Age of faulted surficial</p>	<p>Middle and late Quaternary.</p>

deposits	
Historic earthquake	
Most recent prehistoric deformation	<p>middle and late Quaternary (<750 ka)</p> <p><i>Comments:</i> Hecker (1993 #642) indicates an age for most recent movement of 130–500 ka, whereas Piety and Vetter (1999 #4463) show an age of 60–500 ka based on data in Martin and others (1985 #4998) and Nelson and Weisser (1985 #206). Some workers (Hansen, 1969 #4985, 1969 #4986; Utah Geological and Mineral Survey, 1977 #5016) assigned late Pleistocene and Holocene ages to the scarps, based on estimated ages of faulted deposits and the freshness of the scarps</p>
Recurrence interval	<p>50 k.y. (preferred); minimum 25, maximum 200 k.y. (<250-500 ka)</p> <p><i>Comments:</i> Piety and Vetter (1999), based on data in Martin and others (1985 #4998) and Nelson and Weisser (1985 #206), indicate three or more ruptures since 250–500 ka. Consensus recurrence-interval range reported in Lund (2004 #6733), based on a mean recurrence of 25–90 k.y. for surface-faulting events occurring between 250–500 ka and 130–150 ka, and no earthquakes since 130–150 ka (Martin and others, 1985 #4998). The range reflects the lower and upper inter-event interval limits (25–125 k.y.; Martin and others, 1985 #4998) for the three surface-faulting events, with a broader upper bound due to an unknown earthquake chronology (Lund, 2004 #6733).</p>
Slip-rate category	<p>Less than 0.2 mm/yr</p> <p><i>Comments:</i> Lund (2004 #6733) indicates that the Towanta Flat graben as a whole has no net slip across the structure; however, the maximum vertical displacement rate on individual faults ranges from 0.02–0.04 mm/yr (Martin and others, 1985 #4998). Piety and Vetter (1999 #4463) indicate that the maximum vertical displacement rate for the Towanta Flat graben faults is less than or equal to 0.09 mm/yr.</p>
Date and Compiler(s)	<p>2004</p> <p>Bill D. Black, Utah Geological Survey Christopher B. DuRoss, Utah Geological Survey Greg N. McDonald, Utah Geological Survey Suzanne Hecker, U.S. Geological Survey</p>

References

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- #4998 Martin, R.A., Jr., Nelson, A.R., Weisser, R.R., and Sullivan, J.T., 1985, Seismotectonic study for Taskeech Dam and Reservoir site, Upalco Unit and Upper Stillwater Dam and Reservoir site, Bonneville Unit, Central Utah Project, Utah: U.S. Bureau of Reclamation Seismotectonic Report 85-2, 95 p.
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- #4463 Piety, L.A., and Vetter, U.R., 1999, Seismotectonic report for Flaming Gorge Dam, Colorado River Storage Project, northeastern Utah: U.S. Bureau of Reclamation Seismotectonic Report 98-2, 78 p.
- #5016 Utah Geological and Mineral Survey, 1977, Earthquakes shake northwest Uinta Basin: Utah Geological and Mineral Survey, Survey Notes, v. 11, no. 4, p. 1,3.

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