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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.

Annabella graben faults (Class A) No. 2472

Last Review Date: 1999-10-01

Compiled in cooperation with the Utah Geological Survey

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Synopsis	Poorly understood zone of latest Pleistocene or early Holocene faults near Annabella at the north end of the northern Sevier fault [2355]. Fault timing is based on the fault scarps having a morphology comparable to the Bonneville shoreline (14.5 ka).
Name comments	**Fault ID:** Refers to fault number 9-32 of Hecker (1993 #642).
County(s) and State(s)	SEVIER COUNTY, UTAH
Physiographic province(s)	COLORADO PLATEAUS

Reliability of location	Good Compiled at 1:125,000 scale. *Comments:* Mapped or discussed by Anderson and Bucknam (1979 #518) and Anderson and Barnhard (1992 #612). Fault traces from 1:250,000-scale mapping of Anderson and Bucknam (1979 #518).
Geologic setting	Normal and strike-slip faults that form a wide graben (the Annabella graben) in a structurally complex bend at the northern end of the northern Sevier fault [2355], east of Annabella. The faults bound the western edge of the Sevier Plateau and separate a weakly deformed, east-tilted Sevier Plateau block bounded by the northern Sevier fault from a highly deformed series of west-tilted blocks downfaulted toward the plateau. The deformation appears younger than the Sevier River Formation, which is dated as young as 5.6 Ma in this area.
Length (km)	13 km.
Average strike	N38°E
Sense of movement	Normal
Dip Direction	NW
Paleoseismology studies	
Geomorphic expression	Faults within the upthrown and downthrown blocks have diverse orientations and slip directions, although dip- and oblique-slip faults predominate over strike-slip faults. Normal-fault dip directions are mostly incompatible with the presence of a major, range-front fault system. Late Quaternary faulting and historical seismicity are concentrated within the Annabella graben, indicating high stress accumulation within a possible structural juncture. The deformation may also be related to flowage of the Arapien Shale, exposed northeast of the graben, and growth of the south end of the Sanpete-Sevier Valley anticline. In addition to faulting, youthful tectonism takes the form of closed basins on mountain flanks, deflections of major drainages, and aligned inflections of parallel ridge crests. Individual fault scarps within the graben are less than 5 km long and record spatial differences in rates of late Quaternary faulting. The highest scarp, which is on the main strand of the northern Sevier fault, has a cumulative

	displacement of about 109 m in late Quaternary(?) deposits and may be the highest alluvial scarp in Utah. The short lengths of both the zone of young faulting and of individual faults argue against causative earthquakes with large magnitudes
Age of faulted surficial deposits	Late Quaternary.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Single-event scarp morphology suggests the most-recent event has an age comparable to the Bonneville shoreline (Anderson and Bucknam, 1979 #518; 1992 #612). A 1982 magnitude 4.0 earthquake and aftershock sequence, associated with internally inconsistent faulting kinematics, was centered in the Annabella graben in a historically rare association of seismicity with mapped Quaternary faults.
Recurrence interval	*Comments:* The 35? midslope angle of the 90-m-wide, 109-m-high scarp implies numerous faulting events closely spaced in time. Hecker (1993 #642) estimates 4.7 to 5.2 m displacement per event, although the slip rate is unknown. The age and rate of deformation within the structural juncture is likely not characteristic of deformation along the remainder of the northern and southern Sevier faults, where larger, longer return-period earthquakes are likely.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Hecker (1993) estimates 4.7 to 5.2 m displacement per event, although the slip rate is unknown.
Date and Compiler(s)	1999 Bill D. Black, Utah Geological Survey Suzanne Hecker, U.S. Geological Survey
References	#612 Anderson, R.E., and Barnhard, T.P., 1992, Neotectonic framework of the central Sevier Valley area, Utah, and its relationship to seismicity, *in* Gori, P.L., and Hays, W.W., eds., Assessment of regional earthquake hazards and risk along the

	Wasatch front, Utah: U.S. Geological Survey Professional Paper 1500, p. F1-F47. #518 Anderson, R.E., and Bucknam, R.C., 1979, Map of fault scarps in unconsolidated sediments, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Open-File Report 79-1236, 15 p. pamphlet, 1 sheet, scale 1:250,000. #642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000.