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.

Tin Mountain fault (Class A) No. 188

Last Review Date: 2002-02-08

Compiled in cooperation with the California Geological Survey

citation for this record: **Machette, M.N., Klinger, R.E., Piety, L.A., and Bryant, W.A., compilers, 2002, Fault number 188, Tin Mountain fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:25 PM.**

Synopsis	The Tin Mountain fault extends along the western side of the Cottonwood Mountains near Tin Mountain, for about 30 km between Ubehebe Crater on the north and Lost Burro Gap on the south. It strikes north-northeast and dips to the west. The fault forms pronounced lineaments, bedrock escarpments, and scarps on surficial deposits that may predate the most recent ash eruption of Ubehebe Crater. The most recent movement on the fault is considered to be <130 ka, but this estimate is not well constrained. The fault has been studied using a variety of aerial photographs at scales of 1:2,000 to 1:80,000, compilation of existing data, and limited field examination, but there have been no detailed studies of scarp morphology. Slip rate or recurrence

	interval data have not been reported, nor have any paleoseismic studies been conducted owing to the fault's location within Death Valley National Park.
Name comments	The Tin Mountain fault is located along the western side of the Cottonwood Mountains near Tin Mountain. It extends from about 2 km north of Ubehebe Crater (on the north) to about 5 km southwest of Lost Burro Gap in the northern part of Racetrack Valley (on the south). The fault was named by Reheis (1991 #1602) for its proximity to Tin Mountain. **Fault ID:** Refers to fault TM (Tin Mountain) of Piety (1995 #915).
County(s) and State(s)	INYO COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location of fault from Qt_flt_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written communication to K.Haller, August 15, 2017) attributed to Reheis and Noller (1991 #1195) and Reheis (1991 #1602). The maps show several subparallel traces generally at the base of the range front, but also as short traces extending into the unnamed valley west of the front. Their fault locations are based on inspection of scale low-sun-angle photographs at about 1:2,000 scale (p. 3, Brogan and others, 1991 #298), and traditional aerial photographs at 1:24,000 to 1:80,000 scales (Reheis and Noller, 1991 #1195; Reheis, 1991 #1602). The fault was also studied by Zhang and others (1990 #199).
Geologic setting	The Tin Mountain fault extends northward along the western side of the Cottonwood Mountains near Tin Mountain. It has a strike similar to the faults along the eastern side of Racetrack Valley (part of the Racetrack Valley faults of Piety, 1995 #915). The Tin Mountain fault could be related to, possibly an extension of, this fault, or vice versa. The Tin Mountain fault is separated from the eastern of the Racetrack Valley faults by an en echelon right step at Lost Burro Gap just north of Racetrack Valley. The Tin Mountain fault and the eastern of the Racetrack Valley faults

	together extend from the northwest-striking Hunter Mountain fault on the south to the northwest-striking Northern Death Valley fault zone [141] on the north. The northern end of the Tin Mountain nearly intersects Northern Death Valley fault zone north of Ubehebe Crater in northern Death Valley.
Length (km)	37 km.
Average strike	N8°E
Sense of movement	Normal *Comments:* Displacement along the Tin Mountain fault is shown by Reheis (pl. 1, 1991 #1602) as down to the west. Displacements have apparently been dip-slip only Reheis (p. 3, 1991 #1602).
Dip Direction	W *Comments:* No dip measurements have been reported.
Paleoseismology studies	
Geomorphic expression	Short portions of the Tin Mountain fault are shown by (Reheis, 1991 #1602) as being characterized by topographic lineaments bounding a linear range front. Scarps associated with the Tin Mountain fault are shown by Reheis and Noller (1991 #1195) and (Reheis, 1991 #1602) as primarily west-facing. No detailed morphometric analyses of scarps has been performed.
Age of faulted surficial deposits	Most of the Tin Mountain fault is portrayed by (Reheis, 1991 #1602) as relatively prominent scarps or lineaments on surfaces of undifferentiated Quaternary deposits. Scarps or lineaments at the northern end of the fault are shown as weakly to moderately expressed on surfaces of Quaternary deposits (Reheis and Noller, 1991 #1195). The central part of the Tin Mountain fault is portrayed by Reheis (1991 #1602) as a fault that is in Quaternary deposits and that was identified from previous mapping. The Tin Mountain fault cuts one landslide along the front of the Cottonwood Mountains southwest of Tim Mountain and is concealed by another large landslide along the range front near Quartz Spring (pl. 1 in Reheis, 1991 #1602). Fault scarps that are mapped by Brogan and others (pl. 1C in 1991 #298), southwest of Ubehebe Crater, and that may be associated with the Tin Mountain fault are noted by Brogan (1991 #298), to be mantled

	by unfaulted ash deposits. However, recent studies of Ubehebe Crater deposits by Ralph Klinger (written commun., 2001) suggest that the ash is only several hundred years old (Klinger and Sarna-Wojcicki, 2001 #4770).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* There are no definitive studies on the age of offset deposits along the Tin Mountain fault. There seems to be a consensus for Quaternary movement, but no younger timing estimates. Conversely, the presence of scarps on unconsolidated alluvial sediment suggests movement that is probably <100 ka (Hanks and Andrews, 1989 #338), based on rates of scarp degradation in the Basin and Range. We herein consider the fault to have been active in the past 130 ka, pending further research.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* There are no published data on the size of fault scarps, age of deformed surficial deposits, or timing of net displacement along the fault. Owing to the relatively discontinuous (preserved?) nature of the fault scarps, we suspect that the slip rate is probably <0.2 mm/yr, in accord with other less active faults in the Basin and Range.
Date and Compiler(s)	2002 Michael N. Machette, U.S. Geological Survey, Retired Ralph E. Klinger, U.S. Bureau of Reclamation Lucy A. Piety, U.S. Bureau of Reclamation William A. Bryant, California Geological Survey
References	#298 Brogan, G.E., Kellogg, K.S., Slemmons, D.B., and Terhune, C.L., 1991, Late Quaternary faulting along the Death Valley-Furnace Creek fault system, California and Nevada: U.S. Geological Survey Bulletin 1991, 23 p., 4 pls., scale 1:62,500. #338 Hanks, T.C., and Andrews, D.J., 1989, Effect of far-field slope on morphologic dating of scarplike landforms: Journal of Geophysical Research, v. 94, no. B1, p. 565-573. #4770 Klinger, R.E., and Sarna-Wojcicki, A.M., 2001, Field trip

guide for Day A, northern Death Valley, *in* Machette, M.N., Johnson, M.L., and Slate, J.L., eds., eds., Quaternary and late Pliocene geology of the Death Valley region—Recent observations on tectonics, stratigraphy, and lake cycles (Guidebook for the 2001 Pacific Cell, Friends of the Pleistocene Fieldtrip): U.S. Geological Survey Open-File Report 01-51, p. A5-A49.

#915 Piety, L.A., 1995, Compilation of known and suspected Quaternary faults within 100 km of Yucca Mountain, Nevada and California: U.S. Geological Survey Open-File Report 94-112, 404 p., 2 pls., scale 1:250,000.

#1602 Reheis, M.C., 1991, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the eastern parts of the Saline Valley 1:100,000 quadrangle, Nevada and California, and the Darwin Hills 1:100,000 quadrangle, California: U.S. Geological Survey Open-File Report 90-500, 6 p., 2 pls., scale 1:100,000.

#1195 Reheis, M.C., and Noller, J.S., 1991, Aerial photographic interpretation of lineaments and faults in late Cenozoic deposits in the eastern part of the Benton Range 1:100,000 quadrangle and the Goldfield, Last Chance Range, Beatty, and Death Valley Junction 1:100,000 quadrangles, Nevada and California: U.S. Geological Survey Open-File Report 90-41, 9 p., 4 sheets, scale 1:100,000.

#199 Zhang, P., Ellis, M., Slemmons, D.B., and Mao, F., 1990, Right-lateral displacements and the Holocene slip rate associated with prehistoric earthquakes along the southern Panamint Valley fault zone—Implications for southern Basin and Range tectonics and coastal California deformation: Journal of Geophysical Research, v. 95, no. B4, p. 4857—4872.