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Quaternary Fault and Fold Database of the United States

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East Tahoe fault (Class A) No. 1651

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Synopsis	The East Tahoe fault is inferred to bound the east margin of the Lake Tahoe basin, principally based on the presence of a prominent (<1,100-m-high) steep (commonly 30?) escarpment, much of which is subaqueous. The Lake Tahoe basin is a north-trending graben containing more than 400 m of gently west-tilted sediment. Several short intermontane faults in the western part of the Carson Range are included in this zone because of their similar orientation and (or) possible splaying relationship to the inferred offshore fault. This fault reportedly is associated with hot springs offshore of about Brockway and may have been imaged on a seismic reflection profile offshore of Deadman Point, that apparently shows a prominent bedrock escarpment bounding the east side of the basin and bedding terminating against a planar west-dipping bedrock surface (fault?), which are possibly suggestive of young movement. Recent bathymetry of Lake Tahoe reveals that the escarpment is deeply dissected, has an irregular base and, in at least the Glenbrook Bay area, is buried at the base by well-developed sediment aprons. However, the

	expression of the subaqueous fault probably has been modified by the deposition of thick debris avalanche deposits that appear to have accumulated against the eastern basin escarpment which are related to one or more very large debris avalanches that initiated on the west wall of the basin. Schweickert and others (1999 #3637) speculated that at least one "megalandslide" on the west side of the basin was triggered by a Holocene faulting event, but provide no supporting information for this contention. No evidence has been reported that the East Tahoe fault displaces Quaternary deposits on the north or south shores of the lake. Although the intermontane faults in the Carson Range are only mapped in bedrock, many of these faults bound small bedrock basins or closed depressions containing ponded or perched alluvial deposits (e.g., Marlette Lake) or deflect small drainages consistent with Quaternary movement. However these features also may be related to glacial erosion. Reportedly the faults bounding Marlette Lake exhibit geomorphic evidence of late Quaternary movement. One short fault northeast of Marlette Lake reportedly juxtaposes Quaternary glacial deposits against Tertiary rhyolite. Geologic mapping onshore and a seismic reflection profiles and recent detailed bathymetric mapping (Gardner and others, 1998 #3625; 1999 #3626) offshore are the sources of data. Detailed studies of the fault have not been conducted.
Name comments	Refers to faults mapped and (or) inferred bounding the east side of the Lake Tahoe basin, the west flank of the Carson Range, for example by Grose (1985 #3635; 1986 #3609), Hawkins and others (1986 #3627), Lewis (1988 #2526), Lewis and Grose (1988 #2527), Schweickert and others (1999 #3631), Ramelli and others (1994 #2573), and referred to as the East Tahoe fault (Hawkins and others, 1986 #3627; dePolo and others, 1997 #1367; Schweickert and others, 1999 #3637).
County(s) and State(s)	EL DORADO COUNTY, CALIFORNIA CARSON CITY COUNTY, NEVADA DOUGLAS COUNTY, NEVADA WASHOE COUNTY, NEVADA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS
Reliability of location	Poor Compiled at 1:100,000 scale. *Comments:* Most of the length of the fault's inferred location is

	based on interpretation of high-resolution bathymetric data of the floor of Lake Tahoe (Gardner and others, 2000 #5904), and thus is considered poorly constrained. The faults are shown on large-scale figure 4 of Gardner and others (2000 #5904); they were visually transferred to map of Smith and others (1998 #5905), scale approximately 1:125,000 for digitizing. Gardner shows the fault trace as being within in the upper half of the subaqueus topographic escarpment; in contrast, the inferred fault trace of Hawkins and others (1986 #3627), generally coincides with the base of salients along the escarpment. Good locations for onshore faults are provided by 1:24,000-scale maps of Grose (1985 #3635; 1986 #3609) and 1:125,000-scale map of Matthews (1968 #3610).
Geologic setting	The East Tahoe fault is inferred to bound the east margin of the Lake Tahoe basin, principally based on the presence of a prominent (<1,100-m-high) steep (commonly 30?) escarpment, much of which is subaqueous (e.g., Birkeland, 1963 #3622; Burnett and Matthews, 1971 #3634; Hyne and others, 1972 #3629; Hawkins and others, 1986 #3627; Schweickert and others, 1999 #3631). The Lake Tahoe basin is a north-trending graben (Birkeland, 1963 #3622; Durrell, 1965 #3624; Bateman and Wahrhaftig, 1966 #3621; Burnett, 1968 #3623) containing more than 400 m of gently west-tilted sediment (Hyne and others, 1972 #3629). The presence of the fault is also supported by magnetic data (Henyey and Palmer, 1974 #3628). Several short intermontane faults in the western part of the Carson Range (Matthews, 1968 #3610; Grose, 1985 #3635; 1986 #3609) are included in this zone because of their similar orientation and (or) possible splaying relationship to the inferred offshore fault.
Length (km)	36 km.
Average strike	N6°E
Sense of movement	Normal *Comments:* Not studied in detail; sense of movement largely inferred from Lake Tahoe bathymetry (e.g., Hyne and others, 1972 #3629; Gardner and others, 1998 #3625; 1999 #3626).
Dip Direction	W; E
Paleoseismology studies	

Geomorphic expression	The fault appears to be expressed by a <1,100-m-high, steep, commonly 30? (Hyne and others, 1972 #3629), largely bathymetric escarpment that is deeply dissected, has an irregular base and, in at least the Glenbrook Bay area, is buried at the base by well-developed sediment aprons (Gardner and others, 1999 #3626). The base of much of the escarpment is abrupt, but Schweickert and others (1999 #3631) report that no scarps are evident on the bathymetry of Gardner and others (1998 #3625). However, the expression of the subaqueous fault probably has been modified by the deposition of thick debris avalanche deposits that appear to have accumulated against the eastern basin escarpment, which are related to one or more very large debris avalanches that initiated on the west wall of the basin (Hyne and others, 1972 #3629; Schweickert and others, 1999 #3637; Gardner and others, 1999 #3626). Schweickert and others (1999 #3637) speculated that a Holocene faulting event, probably on one of the faults in the Tahoe basin, triggered a "megalandslide" on the west side of the basin, but provide no supporting information for this contention. The fault reportedly is associated with hot springs offshore of about Brockway (Burnett and Matthews, 1971 #3634) and may have been imaged on a seismic reflection profile offshore of Deadman Point (Hyne and others, 1972 #3629) that apparently shows a prominent bedrock escarpment along the east side of the basin and bedding terminating against a planar west-dipping bedrock surface (fault?), possibly suggestive of young movement. Many of the intermontane faults in the Carson Range bound small bedrock basins or closed depressions containing alluvial deposits or deflect small drainages consistent with Quaternary movement (e.g., Matthews, 1968 #3610) however these geomorphic features also may be related to glacial erosion. Lewis (1988 #2526) reported that the faults mapped by Grose (1986 #3609) bounding Marlette Lake exhibit geomorphic evidence of late Quaternary movement. One short fault northeast of Marlette Lake reportedly juxtaposes Quaternary glacial deposits against Tertiary rhyolite (Bonham, 1969 #2999).
Age of faulted surficial deposits	Quaternary(?); Tertiary. Faults in this zone displace Tertiary and older bedrock, and are only suspected of displacing Quaternary deposits (Hawkins and others, 1986 #3627; Schweickert and others, 1999 #3631) with one possible exception, a short intermontane fault in the Carson Range northeast of Marlette Lake that reportedly juxtaposes Quaternary glacial deposits against Tertiary rhyolite (Bonham, 1969 #2999).

Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Although timing of most recent paleoevent is not well constrained, a Quaternary time is suspected based on onshore and offshore studies (e.g., Grose, 1985 #3635; 1986 #3609; Hawkins and others, 1986 #3627; dePolo and others, 1997 #1367); a late Quaternary time was reported by Lewis (1988 #2526) for faults in the Marlette Lake area.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Not studied in detail. A low slip rate is inferred from general knowledge of slip rates estimated for other faults in the region. In order to estimate regional earthquake activity, dePolo and others (1997 #1367) assigned a vertical slip rate of 0.1 to 0.5 mm/yr to the fault, but they also note that the value is not based on detailed studies and "should not be used for engineering studies without review." Lahren and others (1999 #3630) speculated that "The Tahoe basin... likely accommodates much of the 12 mm/yr NW [-directed dextral] motion between the Sierra Nevada block and the BRP [Basin and Range Province]"; however they presented no evidence in support of this conclusion.
Date and Compiler(s)	1999 Thomas L. Sawyer, Piedmont Geosciences, Inc.
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Questions or comments?