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Quaternary Fault and Fold Database of the United States

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Incline Village fault (Class A) No. 1650

Last Review Date: 1999-06-24

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Synopsis	The Incline Village fault is a north-striking intrabasin fault zone that has a prominent piedmont fault in Incline Village and subparallel to anastomosing subaqueous faults bounding a prominent bathymetric escarpment on the floor of Lake Tahoe, from Crystal Bay at least 6 km southward. The escarpment appears to be the eastern edge of a west-tilted homocline composed of bedrock (Hyne and others, 1972 #3629). The fault may be related to the North Tahoe fault [1649] based on proximity, and subparallel strike and sense of displacement. The piedmont fault is expressed as a 4-km-long, 10- to 12-m-high scarp on late Quaternary (i.e., Tahoe and Tioga?) outwash deposits in Incline Village, that exhibits a 25?-30? maximum slope angle and based on stratigraphic and geomorphic relationships is younger than about 35 to 12 k.y. The offshore faults form a small left-step with the piedmont fault, and are expressed as abrupt slope breaks at base of the steep less than 80-m-high compound bathymetric escarpment. The fault has been imaged on a seismic reflection profile southeast of Stateline Point

	as a prominent bedrock scarp on the floor of Lake Tahoe and apparently as bedding terminating against a planar east-dipping bedrock surface. An about 1-m-high northeast-trending scarp overlying warped and faulted young lake sediment was recently imaged on high-resolution seismic reflection profiles in near-shore Crystal Bay. Near the south end, the fault zone may form right-stepping subaqueous scarps on young lake sediment. Detailed 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 by Hyne and others (1972 #3629), Grose (1986 #3609), Lewis (1988 #2526), Lewis and Grose (1988 #2527), Kumamoto and others (1994 #2523; 1995 #3632), Schweickert and others (1999 #3631). The north end of the fault is in Incline Village and extends southward, offshore beneath Lake Tahoe at Crystal Bay nearly to the Washoe-Carson City county line. Named the Incline Village fault by Lewis (1988 #2526).
County(s) and State(s)	CARSON CITY COUNTY, NEVADA WASHOE COUNTY, NEVADA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations onshore are based on 1:24,000-scale map of Grose (1986 #3609) and 1:125,000-scale map of Matthews (1968 #3610). Northernmost offshore fault from Kumamoto and others (1994 #2523; 1995 #3632).
Geologic setting	The Incline Village fault is a north-striking intrabasin fault zone that has a short, prominent piedmont fault in Incline Village and subparallel to anastomosing subaqueous faults bounding a prominent bathymetric escarpment on the floor of Lake Tahoe, from Crystal Bay at least 6 km southward (Hyne and others, 1972 #3629; Grose, 1986 #3609; Lewis, 1988 #2526; Lewis and Grose, 1988 #2527; Kumamoto and others, 1994 #2523; Kumamoto and others, 1995 #3632; Schweickert and others, 1999 #3631). The escarpment appears to be the eastern edge of a west-tilted homocline composed of bedrock (Hyne and others, 1972 #3629).

	The Lake Tahoe basin is a north-trending graben (e.g., 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 fault may be related to the North Tahoe fault [1649] (e.g., Lewis, 1988 #2526; Schweickert and others, 1999 #3631).
Length (km)	20 km.
Average strike	N22°E
Sense of movement	Normal *Comments:* Not studied in detail; sense of movement from Hyne and others (1972 #3629), Grose (1986 #3609), Lewis (1988 #2526), Kumamoto and others (1994 #2523; 1995 #3632), Schweickert and others (1999 #3631).
Dip Direction	E
Paleoseismology studies	
Geomorphic expression	The piedmont fault is expressed as a 4-km-long, 10- to 12-m-high scarp on late Quaternary (i.e., Tahoe and Tioga?) outwash deposits in Incline Village that exhibits a 25?-30? maximum slope angle, and based on stratigraphic and geomorphic relationships is younger than about 35 to 12 k.y. (Grose, 1986 #3609; Lewis, 1988 #2526; Lewis and Grose, 1988 #2527). The offshore faults form a small left-step with the piedmont fault, and are expressed as abrupt slope breaks at base of the steep less than or equal to 80-m-high compound escarpment (Hyne and others, 1972 #3629). The fault has been imaged on a seismic reflection profile southeast of Stateline Point as a prominent bedrock scarp on the floor of Lake Tahoe and apparently as bedding terminating against a planar east-dipping bedrock surface. An about 1-m-high northeast-trending scarp overlying warped and faulted young lake sediment was recently imaged on high-resolution seismic reflection profiles in near-shore Crystal Bay (Kumamoto and others, 1994 #2523; 1995 #3632). Near south end, zone may form right-stepping subaqueous scarps on young lake sediment).
Age of faulted surficial deposits	Holocene; late Pleistocene; Quaternary. The piedmont fault displaces late Quaternary alluvial deposits as young as Holocene in age and, at the shoreline of Lake Tahoe, juxtaposes these

	deposits against young beach deposits. Offshore faults displace Quaternary lake sediment implied to be Holocene in age (Hyne and others, 1972 #3629; Kumamoto and others, 1994 #2523; 1995 #3632).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Although timing of most recent paleoevent is not well-constrained, a latest Quaternary time is suggested for the Incline Village fault both onshore and offshore (Hyne and others, 1972 #3629; Lewis, 1988 #2526; Lewis and Grose, 1988 #2527; Kumamoto and others, 1994 #2523; 1995 #3632).
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Not studied in detail. dePolo and others (1997 #1367) report a vertical slip rate estimate of 0.01 to 0.1 mm/yr for the fault; basis unknown. However, the prominent scarp in Incline Village reportedly represents 8.2 m of vertical separation and is less than 35 to 12 k.y. old (Lewis, 1988 #2526; Lewis and Grose, 1988 #2527), implying a higher late Quaternary vertical slip rate. 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 contention. The geomorphic evidence presented by Lewis (1988 #2526) and Lewis and Grose (1988 #2527) is the basis of the slip-rate category selected here.
Date and Compiler(s)	1999 Thomas L. Sawyer, Piedmont Geosciences, Inc.
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#3624 Durrell, C., 1965, LaPorte to the summit of the Grizzly Mountains, Plumas County, California: Geological Society of Sacramento, field trip guidebook.

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	#3630 Lahren, M.M., Schweickert, R.A., Smith, K., Karlin, R., and Howles, J., 1999, Active faults of the Lake Tahoe Basin, California and Nevada—Implications: Geological Society of America Abstracts with Programs, v. 31, no. 6, p. A-72. #2526 Lewis, R.L., 1988, Geology, neotectonics, and geologic hazards of the Mount Rose 7.5 minute quadrangle, northern Tahoe Basin, Nevada: Golden, Colorado School of Mines, unpublished M.S. thesis, 121 p., scale 1:24,000. #2527 Lewis, R.L., and Grose, T.L.T., 1988, Late Quaternary faulting in the northeastern Tahoe Basin and northern Carson Range, Nevada: Eos, Transactions of the American Geophysical Union, v. 69, no. 44, p. 1459. #3610 Matthews, R.A., 1968, Geologic map of the north half of the Lake Tahoe Basin, California and Nevada: California Division of Mines and Geology Open-File Report, scale 1:62,500. #3631 Schweickert, R.A., Lahren, M.M., Smith, K., and Karlin, R., 1999, Preliminary fault map of the Lake Tahoe basin, California and Nevada: Seismological Research Letters, v. 70, no. 3, p. 306-313.