Jump to Navigation

Quaternary Fault and Fold Database of the United States

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Fish Lake Valley fault zone, Leidy Creek section (Class A) No. 49a

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Compiled in cooperation with the California Geological Survey

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Synopsis	**General:** Major structure consisting of a long zone of right-oblique and normal faults and subsidiary left-lateral faults and thrust faults that extend mainly north from the Northern Death Valley fault zone [114] from California into western Nevada. Most of the fault has been mapped at 1:24,000 scale and trenching has been conducted on the Leidy Creek [49a] and Oasis [49c] sections of the fault zone, but not in the Wildhorse Creek [49b] and Cucomongo Canyon [49d] sections, which border Death Valley National Park. The entire fault zone has been active, repeatedly, in the latest Quaternary (<15 ka), with some sections

	having evidence for late Holocene surface rupturing. Slip rates are typically 1–5 mm/yr, but exceed 5 mm/yr along the Oasis section. This fault zone is one of the most active in the western Basin and Range province. **Sections:** This fault has 4 sections. The sections are modified from those defined by Brogan and others and by Sawyer who called them subzones, on the basis of distinct differences in fault strike and faulting style and possible differences in the timing of the most recent event along the fault zone. The Leidy Creek and Wildhorse Creek sections are the same as Brogan and others' Chiatovich Creek and Dyer sections and Sawyer's "northern" and "Dyer" subzones. The Oasis section includes the Oasis and Horsethief Canyon sections of Brogan and others, and combines the "eastern" and "western" subzones (parallel fault strands) of Sawyer into one section. The Cucomongo Canyon section is the same as that of Brogan and others.
Name comments	**General:** Named by Sawyer (1990 #1633) and subsequently adopted in maps by Reheis and others (1993 #648; 1995 #3823). Previously referred to as the northern part of the Furnace Creek fault zone of the northern part of the Death Valley-Furnace Creek fault zone or fault system (*e.g.*, McKee, 1968 #1574; Stewart, 1988 #1654; Brogan and others, 1991 #298; Oldow, 1992 #3821). Extends from Chiatovich Creek in the north to about 12 km south of Last Chance Canyon in northern Death Valley (Machette, 2001 #4773]. Joins Northern Death Valley fault zone [141] at Little Sand Springs within northern part of Death Valley National Park. **Section:** Named for Leidy Creek as suggested by Reheis for article by Machette and others (2001 #4773). Extends from just north of Chiatovich Creek in the north, south to Busher Creek (4 km northwest of Dyer, NV). Same as Chiatovich Creek section of Brogan and others (1991 #298) and "northern subzone" of Sawyer (1990 #1633; 1991 #2384). Obvious faults occur in a zone ranging in width from 1 km to 6 km, but subtle scarps and vegetation lineaments indicate that zone probably extends across entire northern valley floor to the Emigrant Peak fault zone [1022] at the front of the Silver Peak Range. Includes: (1) NW-to NNW-striking faults with right-oblique offset near range from locally serving as range-bounding faults, (2) N- to NE-striking faults with normal offset, mostly on the floor of Fish Lake Valley; and (3) NW-striking faults, mostly inactive, within the White Mountains north of Indian Creek.

	Fault ID: Refers to fault 211 of Jennings (1994 #2878) and faults DV-1a, -1b, and -1c of dePolo (1998 #2845).
County(s) and State(s)	MONO COUNTY, CALIFORNIA ESMERALDA COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location of most faults on 1:24,000-scale maps (Reheis and others, 1993 #648; 1995 #3823) were compiled at 1:100,000 by Reheis and Noller (1991 #1195) and subsequently at 1:250,000 by Piety (1995 #915). Some faults were transferred by inspection from 1:24,000 to 1:250,000 by the compiler
Geologic setting	High-angle, right-oblique, down-to-east fault zone in Fish Lake Valley, bounding east side of White Mountains and the east side of the Horsethief Hills (informal name, Reheis, 1992 #1605) between Eureka and Fish Lake valleys.
Length (km)	This section is 30 km of a total fault length of 99 km.
Average strike	N6°E (for section) versus N15°W (for whole fault)
Sense of movement	Right lateral, Normal *Comments:* For late Pleistocene deposits, ratio of right-lateral (dextral) to normal offset ranges from 4:1 to 10:1 in this segment (Sawyer, 1990 #1633).
Dip Direction	V; NE *Comments:* In two small trenches on the active NNW-striking fault, Sawyer (1990 #1633; 1991 #2384) found vertical faults. Parallel faults in bedrock south of Indian Creek are also very high-angle (Reheis and others, 1993 #648).
Paleoseismology studies	Two small trenches were excavated by hand on the main active strike-slip fault (Sawyer, 1990 #1633; 1991 #2384), T-2 excavated south of Marble Creek (site 49-1) and T-1 excavated south of Indian Creek (49a-2). Two late Holocene events were identified in both trenches and appear to be the same events; a third relatively small event was tentatively identified in the Indian

	Creek trench. Units in the Marble Creek trench were dated using 14C on buried logs and tephrochronology; the Indian Creek trench yielded no datable material. From dated material in and near the trenches and from dates on the same stratigraphic units elsewhere in Fish Lake Valley (Reheis and others, 1995 #3823). The first (principal) event occurred after 3.8 ka and before 1.5 ka, and the second event occurred after 1.5 ka and before 0.6 ka as determined from dated material in and near the trenches and from dates on the same stratigraphic units elsewhere in Fish Lake Valley (Reheis and others, 1995 #3823). Vertical separations of sediments were similar for both events: about 15–20 cm in the Marble Creek trench and about 25–30 cm in the Indian Creek trench. The third event may have occurred after about 1.0 ka and before 0.6 ka, and caused vertical separation of only 6–8 cm.
Geomorphic expression	Prominent scarps as much as 40 m high on alluvial-fan surfaces. Large complex grabens disrupt the surfaces of the Leidy Creek, Indian Creek, and Chiatovich Creek fans (Sawyer, 1990 #1633; 1991 #2384; Reheis and others, 1993 #648; 1995 #3823). Right-lateral offsets as much as 90–120 m of debris-flow levees are prominent on the Leidy Creek and Indian Creek fans.
Age of faulted surficial deposits	Holocene (10 percent), late Pleistocene (65 percent), middle to early Pleistocene (5 percent), Pliocene (10 percent), Miocene (5 percent), Mesozoic and Paleozoic (5 percent).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Most recent faulting event on the entire section occurred between about 1.5 and 0.6 ka; a minor event may have ruptured the northernmost part later on, but before 0.6 ka (Sawyer, 1990 #1633; 1991 #2384).
Recurrence interval	500–1500 years *Comments:* Estimated from most probable ages of events in Sawyer (1990 #1633; 1991 #2384).
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Late Pleistocene horizontal displacement rates of 0.4–1.7 mm/yr were estimated by Sawyer (1991 #2384) using offset

	debris-flow channels on the surface of a late Pleistocene unit thought to be 100–200 ka, but more recent ages for this unit indicate it is likely about 50–130 ka (Reheis and others, 1995 #3823); thus possible horizontal displacement rate is between 0.6 and 3.3 mm/yr. This agrees well with a long-term estimate of 1–6 mm/yr based on separation across northern Fish Lake Valley (Reheis, 1993 #1606); a minimum vertical displacement rate of 0.1-0.3 mm/yr is based on offset of a 3-Ma basalt in the northern White Mountains (Reheis and McKee, 1991 #1609). A maximum late Pleistocene vertical displacement rate of 1.2–3.2 mm/yr is based on measured displacement across the Indian Creek fan (data of Sawyer, 1991 #2384, recalculated using younger ages for late Pleistocene unit), but may be much less because the original fan slope is not known.
Date and Compiler(s)	1994 Marith C. Reheis, U.S. Geological Survey, Emeritus
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#1609 Reheis, M.C., and McKee, E.H., 1991, Late Cenozoic history of slip on the Fish Lake Valley fault zone, Nevada and California, *in* Late Cenozoic stratigraphy and tectonics of Fish Lake Valley, Nevada and California—Road log and contributions to the field trip guidebook, 1991 Pacific Cell, Friends of the Pleistocene: U.S. Geological Survey Open-File Report 91-290, p. 26-45.

#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.

	#648 Reheis, M.C., Sawyer, T.L., Slate, J.L., and Gillespie, A.R., 1993, Geologic map of late Cenozoic deposits and faults in the southern part of the Davis Mountain 15' quadrangle, Esmeralda County, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-2342, 1 sheet, scale 1:24,000. #3823 Reheis, M.C., Slate, J.L., and Sawyer, T.L., 1995, Geologic map of late Cenozoic deposits and faults in parts of the Mt. Barcroft, Piper Peak, and Soldier Pass 15' quadrangles, Esmeralda County, Nevada, and Mono County, California: U.S. Geological Survey Miscellaneous Investigations Map I-2464, 2 sheets. #1633 Sawyer, T.L., 1990, Quaternary geology and neotectonic activity along the Fish Lake Valley fault zone, Nevada and California: Reno, University of Nevada, unpublished M.S. thesis, 379 p., 6 pls. #2384 Sawyer, T.L., 1991, Quaternary faulting and Holocene paleoseismicity of the northern Fish Lake Valley fault zone, Nevada and California, *in* Field trip to Fish Lake Valley, California-Nevada:, Friends of the Pleistocene, Pacific Cell, May 31-June 2, 1991, Guidebook, p. 114-138. #1654 Stewart, J.H., 1988, Tectonics of the Walker Lane belt, western Great Basin—Mesozoic and Cenozoic deformation in a zone of shear, *in* Ernst, W.G., ed., Metamorphism and crustal evolution of the western United States, Ruby Volume VII: Englewood Cliffs, New Jersey, Prentice Hall, p. 683-713.