Jump to Navigation

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.

Fish Lake Valley fault zone, Oasis section (Class A) No. 49c

Last Review Date: 1994-06-01

Compiled in cooperation with the California Geological Survey

citation for this record: **Reheis, M.C., compiler, 1994, Fault number 49c, Fish Lake Valley fault zone, Oasis section, 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 03:08 PM.**

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:** Oasis section extends from Toler Creek in the north (7.3 km south of Dyer, NV) to where the Eureka Valley road enters into Willow Wash in the south. This usage (Machette and others, 2001 #4773) combines the Oasis and Horsethief Canyon sections of Brogan and others (1991 #298) whom define a boundary between these two sections near the mouth of Cottonwood Creek at a small west-striking reverse fault (Reheis and others, 1995 #3823), which does not apparently stop ruptures from propagating in either direction. Section as defined here also combines the eastern and western subzones of Sawyer (1990 #1633; 1991 #2384), who discussed the two parallel fault strands in this area separately. Section consists of two parallel sets of faults for most of its length. Sets of north-striking faults locally connect the two sets. They merge to the north in a complexly faulted area just south of Toler Creek, and also merge to the south into a single strand just north of Willow Wash. The eastern set is mostly NW-

	striking right-lateral faults, locally with significant vertical scarps, commonly with short left-stepping segments. The western set is mostly NNW-trending normal-fault segments with an unknown amount of right-lateral offset that are either left-stepping or connected by shorter NW-trending right-lateral segments (Reheis, 1992 #1605; 1995 #3823). The fault sets are intersected by W- to SW-striking faults mostly within bedrock of the White Mountains and Horsethief Hills. Two of these SW-striking faults south of Oasis are known to offset deposits of early middle Pleistocene age (Reheis, 1992 #1605) and two of the faults north of Oasis are associated with a prominent left step in the range front and a reverse fault in the alluvium (Reheis and others, 1995 #3823). NE-striking faults splay from the eastern fault set at the mouth of Furnace Creek, and one of these has offset late Pleistocene alluvium as much as 60 m. Also includes a few north-striking faults in alluvium of the valley floor east of the main fault sets between Willow Wash and Oasis. **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 INYO COUNTY, CALIFORNIA
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, 1992 #1605; 1995 #3823) were compiled at 1:100,000 by Reheis and Noller (1991 #1195) and subsequently at 1:250,000 scale by Piety (1995 #915). Some faults were transferred by inspection from 1:24,000 to 1:250,000 scales 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 36 km of a total fault length of 99 km.
Average strike	N26°W (for section) versus N15°W (for whole fault)

Sense of movement	Right lateral *Comments:* Includes traces with sinistral and thrust geometry.
Dip	50–90° NE. *Comments:* Measured dips of 50–80° NE. are all on faults of the western fault set; the lower dips of 50–60° are from inactive faults in a trench at the range front northwest of Oasis (Reheis, 1994 #3822). Faults exposed in two trenches that expose faults of the eastern set near Oasis and at Furnace Creek were nearly all vertical.
Paleoseismology studies	Six backhoe trenches (one very small) have been excavated along this fault section by Tom Sawyer and Marith Reheis. Reheis (1994 #3822) excavated two trenches (49-2, 49-3) about 12 km northwest of Oasis on faults of the eastern subset (trenches T93-2a and T93-2b, respectively), another trench (49-5) was excavated across a main trace of the fault in the western subset (trench T93-3) about 3.5 km west of Oasis, and the fourth trench (49-4) was excavated across a fault of the eastern subset about 3.5 km southeast of Oasis (Reheis and others, 1995 #3823, trench T93-1). Two additional backhoe trenches (sites 49-7, 49-8) were excavated on lineaments of the eastern fault set about 4.5 and 8 km southeast of Oasis (trenches T-4 and T-3, respectively) by Sawyer (Reheis, 1992 #1605). Reheis (1994 #2581; 1994 #3822) found evidence (based on radiocarbon dates) for 4–5 events in the past 5,000 yr in one trench on the eastern fault set near Oasis, and for at least 5–6 events in the past 7,200 yr in another trench near Furnace Creek. A trench on the western fault set yielded no datable material but colluvial-wedge stratigraphy indicated a minimum of 5–6 events in the Holocene and 4 events in the past 5,000 yr. Sawyer (1990 #1633) found evidence of probable late Holocene offset in his two trenches southeast of Oasis—in one trench, deposits deeper than 25 cm depth were faulted; in the other trench, the sediment was fractured to the surface, but no offset was apparent (perhaps due to lateral slip).
Geomorphic expression	Shutter ridges, ponded and offset drainages, and large scarps are all common along the eastern fault set; the western fault set is characterized mostly by relatively small scarps in alluvium and on

	bedrock. South of Oasis, the eastern fault set consists of long lineaments and cracks with little or no topographic expression (Sawyer, 1990 #1633; Reheis, 1992 #1605; Reheis and others, 1995 #3823).
Age of faulted surficial deposits	Holocene (20 percent); late Pleistocene (40 percent); middle and early Pleistocene (20 percent); Miocene (5 percent); Mesozoic and Paleozoic (15 percent).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* For the eastern fault set, the last event occurred between about 1160 and 830 cal yr BP based on radiocarbon samples from trench near Oasis, and just before 1600 14C yr BP from trench near Furnace Creek. Both mapping and trenching indicate that this event did not rupture the northern part of the Oasis segment, along a 15-km-long reach between Indian Garden Creek and Toler Creek. For the western fault set, the last event may have occurred between 1000 and 500 yr ago based on soil-stratigraphic relations.
Recurrence interval	500–1000 yr *Comments:* Assumed to be the same as or shorter than the Leidy Creek section [49a], which is thought to be 500–1500 yr.
Slip-rate category	Greater than 5.0 mm/yr *Comments:* A shutter ridge at the mouth of Furnace Creek, composed of alluvium thought to be between 760 and 600 ka, has been offset 4.5–7 km, which suggests a horizontal displacement rate greater than 5 mm/yr. A debris flow channel on the surface of 50–130 ka deposits has been offset a minimum of 111 m and a maximum of 336 m, suggesting lower late Quaternary lateral rate of slip; the preferred estimate is 4–7 mm/yr (Reheis, 1994 #2581, 1994 #3822; Reheis and others, 1995 #3823). The amount of vertical displacement is much less than the lateral component, which results in lower vertical displacement rates, from 0.1 to 0.7 mm/yr for the late Pleistocene and a maximum of 0.7 mm/yr since 760 ka; a post-11-Ma slip rate is about 0.05 to 0.11 mm/yr (Reheis and McKee, 1991 #1609). Although reported rates for the Oasis section fall within the two highest slip-rate categories, we

	assign the highest slip-rate category based on evidence pointing to higher rates of activity on this section.
Date and Compiler(s)	1994 Marith C. Reheis, U.S. Geological Survey, Emeritus
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. #2845 dePolo, C.M., 1998, A reconnaissance technique for estimating the slip rate of normal-slip faults in the Great Basin, and application to faults in Nevada, U.S.A.: Reno, University of Nevada, unpublished Ph.D. dissertation, 199 p. #2878 Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000. #4773 Machette, M.N., Klinger, R.E., Knott, J.R., Wills, C.J., Bryant, W.A., and Reheis, M.C., 2001, A proposed nomenclature for the Death Valley fault system, *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. J173-J183. #1574 McKee, E.H., 1968, Age and rate of movement of the northern part of the Death Valley-Furnace Creek fault zone, California: Geological Society of America Bulletin, v. 79, p. 509-512. #3821 Oldow, J.S., 1992, Late Cenozoic displacement partitioning in the northwestern Great Basin, *in* Craig, S.D., ed., Structure, tectonics, and mineralization of the Walker Lane: Geological Society of Nevada, Proceedings of the Walker Lane symposium, p. 17-52. #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.

#1605 Reheis, M.C., 1992, Geologic map of late Cenozoic deposits and faults in parts of the Soldier Pass and Magruder Mountain 15' quadrangles, Inyo and Mono Counties, California, and Esmeralda County, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-2268, 1 sheet, scale 1:24,000.

#2581 Reheis, M.C., 1994, Holocene faulting along the central Fish Lake Valley fault zone, California and Nevada: Geological Society of America Abstracts with Programs, v. 26, no. 2, p. 83.

#3822 Reheis, M.C., 1994, Logs of trenches across the central part of the Fish Lake Valley fault zone, Mono County, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2266.

#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.