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Quaternary Fault and Fold Database of the United States

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Southern Sierra Nevada fault zone, Independence section (Class A) No. 65a

Last Review Date: 1995-10-01

citation for this record: **Sawyer, T.L., compiler, 1995, Fault number 65a, Southern Sierra Nevada fault zone, Independence 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 02:03 PM.**

Synopsis	**General:** This range-front fault zone is poorly understood, and no detailed studies involving trenching have been completed. Neither the Independence fault nor the Haiwee Reservoir section has been trenched and only limited large-scale mapping has been published. **Sections:** This fault has 2 sections. Further subdivision of the Sierra Nevada fault zone may be warranted based on small-scale mapping, in particular the Haiwee Reservoir section.
Name comments	**General:** The Southern Sierra Nevada fault zone is comprised of several normal faults that form the eastern front of the southern Sierra Nevada including (from north to south) the Birch Creek fault of Clark (referred to as the Tinemaha scarp by Bateman, 1965 #5587; and Birch Mountain fault in Jennings, 1994 #2878)

	the Independence fault-Haiwee Reservoir "segment", the Sierra Nevada fault of Ross (1990 #5631), and the Cliff Canyon fault of Samsel (1962 #5632). The structure also has been referred to as the Sierra Nevada Frontal fault zone. Knopf (1918 #5616) was the first to map traces of the Independence fault, although he did not name the fault. **Section:** The Independence section extends from the northern end of the Birch Creek (Birch Mountain) fault south-southeast along the southern Sierra Nevada range front to the southern end of the Independence fault. **Fault ID:** Refers to fault numbers 249 (Sierra Nevada fault zone, Haiwee Reservoir area), and 266 (Sierra Nevada fault, Inyokern area) of Jennings (1994 #2878) and fault SNV of Piety (1995 #915).
County(s) and State(s)	INYO COUNTY, CALIFORNIA
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS BASIN AND RANGE
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Moore (1963 #5629; 1981 #5630) and Bryant (1989 #5625) at 1:62,500 scales.
Geologic setting	The Sierra Nevada fault zone is a zone of high-angle normal faults that bound the eastern front of the southern Sierra Nevada from Owens Valley to the southern end of the range, north of the Garlock fault [69]. The northernmost fault in this zone is the Independence fault, which has a cumulative vertical displacement of approximately 1,800 m (Gillespie, 1982 #5626), which accounts for approximately half of the subsidence of Owens Valley (Bryant, 1989 #5625).
Length (km)	This section is 71 km of a total fault length of 203 km.
Average strike	N19°W (for section) versus N6°W (for whole fault)
Sense of movement	Normal *Comments:* Gillespie (1982 #5626) estimated that the

	Independence fault has about 1,800 m of down-to-the-east displacement.
Dip Direction	E
Paleoseismology studies	
Geomorphic expression	Forms a steep concave-to-east escarpment with faceted spurs and "wine-glass" shaped canyons (Bryant, 1989 #5625) that is 2,400 m high along the eastern flank of Mount Whitney. The fault is moderately to well defined and forms steep (about 25?) scarps and vertically offsets drainages.
Age of faulted surficial deposits	Latest Pleistocene and Holocene alluvium, talus, and colluvium; late Pleistocene (Tioga, 13 ka; Tenya(?); Tahoe) glacial deposits and middle Wisconsin (30-40 ka) alluvial-fan deposits (Gillespie, 1982 #5626; Clark and others, 1984 #2876; Bryant, 1989 #5625).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Time of most recent paleoevent is based on the presence of scarps on late Tioga outwash (13 ka) terraces and Holocene talus and alluvial and colluvial deposits.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Gillespie (1982 #5626) concluded that late Quaternary slip rates have varied along the Independence fault and reported an average slip rate of 0.35 mm/yr. However, at Independence Creek the rate is 0.12 mm/yr based on 1.4 m of vertical offset of a late Tioga-aged terrace, and at Sawmill Creek the rate is 0.5 mm/yr based on offset Pleistocene lava flows (Bryant, 1989 #5625). At Independence Creek, Clark and others (1984 #2876) reported a preferred rate of 0.1 mm/yr (0.08-0.19 mm/yr) based on 2.3-3.1 m offset of a Tenaya or early Tioga outwash deposits (20-35 k.y.) and a preferred rate of 0.1 mm/yr (0.05-0.12 mm/yr) based on 6.0-7.6 m offset of a Tahoe moraine (65-130 k.y.).
Date and	1995

Compiler(s)	Thomas L. Sawyer, Piedmont Geosciences, Inc.
References	#5587 Bateman, P.C., 1965, Geology and tungsten mineralization of the Bishop district, California: U.S. Geological Survey Professional Paper 470, 208 p., scale 1:62,500. #5625 Bryant, W.A., 1989, Independence fault zone and related faults, western Inyo County, California: California Division of Mines and Geology Fault Evaluation Report FER-203, microfiche copy in California Division of Mines and Geology Open-File Report 90-14, 13 p., scale 1:24,000. #2876 Clark, M.M., Harms, K.H., Lienkaemper, J.J., Harwood, D.S., Lajoie, K.R., Matti, J.C., Perkins, J.A., Rymer, M.J., Sarna-Wojcicki, A.M., Sharp, R.V., Sims, J.D., Tinsley, J.C., III, and Ziony, J.I., 1984, Preliminary slip rate table and map of late Quaternary faults of California: U.S. Geological Survey Open-File Report 84-106, 12 p., 5 plates, scale 1:1,000,000. #5626 Gillespie, A.R., 1982, Quaternary glaciation and tectonism in the southeastern Sierra Nevada, Inyo County, California: Pasadena, California Institute of Technology, unpublished Ph.D. dissertation, 695 p., scale 1:62,500. #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. #5616 Knopf, A., 1918, A geologic reconnaissance of the Inyo Range and eastern slope of the southern Sierra Nevada, California, with a section on the stratigraphy of the Inyo Range by Edwin Kirk: U.S. Geological Survey Professional Paper 110, 130 p. #5629 Moore, J.G., 1963, Geology of the Mount Pinchot quadrangle, southern Sierra Nevada, California: U.S. Geological Survey Bulletin 1130, 152 p., scale 1:62,500. #5630 Moore, J.G., 1981, Geologic map of the Mount Whitney quadrangle, Inyo and Tulare Counties, California: scale 1:62,500. #4860 Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A.,

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