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Quaternary Fault and Fold Database of the United States

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Elsinore fault zone, Laguna Salada section (Class A) No. 126g

Last Review Date: 1998-12-01

citation for this record: Treiman, J.A., compiler, 1998, Fault number 126g, Elsinore fault zone, Laguna Salada 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 02:16 PM.

Synopsis	**General:** A major dextral strike-slip fault zone that is part of the San Andreas fault system. Research studies have been done to assess faulting on most of the sections, and have documented Holocene activity for the length of the fault zone with a slip rate around 4–5 mm/yr. Multiple events have only been dated on the Whittier fault and Glen Ivy North fault strand, so interaction between faults and adjacent sections is not well-known. Multiple strands within several sections mean that the studies are not always fully representative of the whole section. Numerous consulting reports (not summarized herein) that have addressed location and recency of faulting are on file with the State of California, California Geological Survey, as part of the records of their Alquist-Priolo Earthquake Fault Zoning Program. **Sections:** This fault has 7 sections. Sections are selected

	following the segmentation from Working Group on California Earthquake Probabilities (1995 #4945) from north to south: Whittier section [126a], Chino section [126b], Glen Ivy section [126c], Temecula section [126d], Julian section [126e], Coyote Mountain section [126f], with addition of Laguna Salada section [126g] as used by Petersen and others (1996 #4860) and Chino fault (paired with the Whittier fault by Rockwell and others, 1992 #6431).Anderson and others (1989 #6372) also identified same segments, with addition of Chupamiertos and Sierra Mayor segments in Baja California (not included in this summary); Wesnousky (1986 #5305) defined four segments, combining the Whittier, Chino and Glen Ivy into his segment A, Temecula into segment B, Julian into segment C, and the Coyote Mountain and Laguna Salada sections into segment D.
Name comments	**General:** **Section:** Includes Laguna Salada fault (#511) of Jennings (1994 #2878); southern limit of fault is at right-step along the northeast-trending Canon Rojo fault in Baja California. **Fault ID:** Refers to numbers 431 (Chino fault), 444 (Whittier fault), 446 (Fresno, Tin Mine and Main Street faults), 460 (Wildomar fault), 461 (Glen Ivy North fault), 462 (Glen Ivy South fault), 467 (Willard fault), 469 (Wolf Valley fault), 470 (unnamed faults flanking Agua Tibia Mountain), 482 (Earthquake Valley), 483 & 496 (Elsinore fault), and 511 (Laguna Salada fault) of Jennings (1994 #2878); and numbers 10 (Chino fault), 12 (Whittier fault), 13 (Main Street fault), 14 (Fresno-Eagle fault), 15 (Tin Mine fault), 16 (Glen Ivy North fault), 17 (Glen Ivy South fault), 18 (Wildomar fault), 19 (Willard fault), 20 (Wolf Valley fault) of Ziony and Yerkes (1985 #5931).
County(s) and State(s)	IMPERIAL COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Poor Compiled at 1:750,000 scale. *Comments:* Location of trace taken largely from 1:750,000-scale map of Jennings (1994 #2878).
Geologic setting	The Elsinore fault zone is a major dextral shear system, parallel to

	the southern San Andreas fault [1], that accommodates about 5 mm/yr of the Pacific-North American Plate boundary slip. The northern elements of the fault zone, the Chino and Whittier faults, bound the Puente Hills, an uplifted block of Tertiary sediments. The Glen Ivy section forms the northeast boundary of the Santa Ana Mountains, and, together with the Temecula section, forms the Elsinore trough. To the southeast the fault zone (Temecula, Julian, and Coyote Mountain sections) cuts diagonally across various Peninsular Range batholithic and pre-batholithic metamorphic terrain until it reaches the southwestern margin of the Salton Trough as the Laguna Salada fault. Total strike-slip is reported to be as much as 40 km but is more likely only 10–15 km, and total vertical separation is about 200 m (Hull and Nicholson, 1992 #6416).
Length (km)	This section is 61 km of a total fault length of 306 km.
Average strike	N40°W (for section) versus N51°W (for whole fault)
Sense of movement	Normal *Comments:* Dextral displacement in last event is not documented by field evidence, but offset drainages record the dextral component of previous displacements; ratio of vertical to dextral movement is estimated at 1:1 by Mueller and Rockwell (1995 #6425).
Dip	55–70° SW. *Comments:* dip of fault reported by Mueller and Rockwell (1995 #6425).
Paleoseismology studies	Site 126-10, Laguna Salada: studies by Mueller and Rockwell (1995 #6425) recorded surface evidence of Holocene and probably historic surface rupture.
Geomorphic expression	Scarps on alluvium and bedrock, beheaded streams, deflected and offset drainages.
Age of faulted surficial deposits	Holocene alluvium
Historic	

earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Early historic earthquake of 1892 is inferred to be cause of abundant free-face scarps (Mueller and Rockwell, 1995 #6425) and penultimate event believed to be at 0.2–2 ka.
Recurrence interval	about 1.2 ka *Comments:* Average recurrence for large displacements from Mueller and Rockwell (1995 #6425).
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* 2–3 mm/yr dextral and vertical deformation rate reported by Mueller and Rockwell (Mueller and Rockwell, 1995 #6425). Slip rate assigned by Petersen and others (1996 #4860) for probabilistic seismic hazard assessment for the State of California was 3.5 mm/yr (with minimum and maximum assigned slip rates of 2.0 mm/yr and 5.0 mm/yr, respectively.
Date and Compiler(s)	1998 Jerome A. Treiman, California Geological Survey
References	#6372 Anderson, J.G., Rockwell, T.K., and Agnew, D.C., 1989, Past and possible future earthquakes of significance to the San Diego region: Earthquake Spectra, v. 5, no. 2, p. 299-333. #6416 Hull, A.G., and Nicholson, C., 1992, Seismotectonics of the northern Elsinore fault zone, southern California: Bulletin of the Seismological Society of America, v. 82, p. 800-818. #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. #4969 Lawson, A.C., chairman, 1908, The California earthquake of April 18, 1906—Report of the State Earthquake Investigation Commission: Washington, D.C., Carnegie Institution of Washington Publication 87. #6425 Mueller, K.J., and Rockwell, T.K., 1995, Late Quaternary activity of the Laguna Salada fault in northern Baja California, Mexico: Geological Society of America Bulletin, v. 107, p. 8-18.

#4860 Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic seismic hazard assessment for the State of California: California Department of Conservation, Division of Mines and Geology Open-File Report 96-08 (also U.S. Geological Open-File Report 96-706), 33 p.

#6431 Rockwell, T.K., Gath, E.M., and Gonzalez, T., 1992, Sense and rate of slip on the Whittier fault zone, eastern Los Angeles basin, California [abs.]: Association of Engineering Geologists, 35th Annual meeting, Proceedings, p. 679.

#5305 Wesnousky, S.G., 1986, Earthquakes, Quaternary faults, and seismic hazards in California: Journal of Geophysical Research, v. 91, no. B12, p. 12,587-12,631.

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