

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](#).

San Gabriel fault zone, San Gabriel River section (Class A) No. 89d

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Synopsis

General: Quaternary to late Quaternary active dextral normal fault zone that locally exhibits evidence of Holocene displacement. The fault zone extends for about 135 km from the Frazier Mountain area southeast to the Saugus/Castaic area where the fault's strike changes to an east-west trend through the southern San Gabriel Mountains. The fault apparently either dies out or is truncated by the San Antonio fault [328] in the eastern San Gabriel Mountains (Ehlig, 1973 #7867; Weber, 1982 #7881, 1986 #7882; Powell, 1993 #5753; Matti and Morton, 1993 #5737).

Sections: This fault has 5 sections. There is insufficient data to delineate seismogenic segments. Weber (1982 #7881) described 5 segments that delineate the San Gabriel fault zone, and his nomenclature is adopted in this compilation, although section

boundaries are slightly modified. From north to south they included the Palomas [89a], Honor Rancho [89b], Newhall [89c], San Gabriel River [89d], and Big Tujunga [89e] sections. Crowell (1982 #7857) suggested that dextral offset on the San Gabriel fault began in late Miocene (about 10 Ma) and mostly ceased by the end of Miocene time and concluded that dextral slip within the San Andreas transform system switched from the San Gabriel to the San Andreas fault [1] about 5 Ma. Weber (1982 #7881), however, questioned this interpretation, and noted that Pliocene Hungry Valley Formation is disrupted by the San Gabriel fault and that a few kilometers of dextral offset occurred after deposition of the Hungry Valley Formation. Weber (1982 #7881) presented geomorphic and stratigraphic evidence of late Quaternary dextral normal offset. Cotton (1986 #7848, 1987 #7854) documented evidence of Holocene strike-slip displacement along the Honor Rancho section [89b] of the San Gabriel fault at the Rye Canyon [89-1a] and Trench A [89-1b] paleoseismic sites. Alluvial package mismatches across faults exposed at the Rye Canyon site [89-1a] indicate significant strike-slip offset. Cotton (1986 #7848, 1987 #7854) reported a preliminary Holocene dextral slip rate of about 0.6 mm/yr, based on dextrally offset paleochannel and fold axis exposed at the Trench A site [89-1b]. Uncertainty values were not reported in Cotton (1987 #7854).

**Name
comments**

General: Fault first mapped and named by Kew (1924 #6014) for northwest striking fault extending from Tujunga Canyon northwest to the vicinity of Holser Canyon. Kew (1924 #6014) named the fault based on exposures in the western San Gabriel Mountains. Additional named faults forming the San Gabriel fault zone include: Canton, Castaic Valley, Daisy, De Mille, Dillon, Gold Creek, Piru, Placerita, and Ybarra faults. The San Gabriel fault zone bifurcates near Big Tujunga Creek and strands here have been referred to as the Vasquez or Vasquez Creek fault (Miller, 1928 #5961; Jahns and Proctor, 1975 #6093, Crook and others, 1987 #5956), the Sierra Madre fault (Eckis, 1934 #6087; Ehlig, 1968 #7865), or the South Branch of the San Gabriel fault (Crowell, 1962 #7855, 1981 #7856; Ehlig, 1973 #7867, 1975 #7868, 1981 #7869, 1982 #7870; Weber, 1982 #7881).

Section: San Gabriel River section is based on the San Gabriel River segment described by Weber (1982 #7881). This section is characterized by more east-striking traces that extend from the vicinity of Big Tujunga Station eastward to where the San Antonio Canyon fault [328] apparently truncates the San Gabriel

	<p>fault. Named faults include San Gabriel and Daisy faults.</p> <p>Fault ID: Refers to numbers 316 (San Gabriel fault - Western Part) and 384 (San Gabriel fault – Eastern Part) of Jennings (1994 #2878), and number 63 (San Gabriel fault – Central part) of Ziony and Yerkes (1985 #5931).</p>
<p>County(s) and State(s)</p>	<p>LOS ANGELES COUNTY, CALIFORNIA</p>
<p>Physiographic province(s)</p>	<p>PACIFIC BORDER</p>
<p>Reliability of location</p>	<p>Good Compiled at 1:24,000 scale.</p> <p><i>Comments:</i> Location of fault from Qt_ft_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written communication to K.Haller, August 15, 2017) attributed to Dibblee (1998 #7859, 2002 #7860, 2002 #7861, 2002 #7862, 2002 #7863), Weber (1982 #7881), and Morton and others (1991 #5745), Morton and Matti (2001 #8211), and Morton and Miller (2003 #8213).</p>
<p>Geologic setting</p>	<p>San Gabriel fault zone is one of the principal structural elements of the Transverse Ranges. The San Gabriel fault zone consists of steeply dipping faults that extend for about 135 km from the eastern San Gabriel Mountains along a generally east-west strike, through the Saugus/Castaic area where the fault zone is characterized by a northwest strike. Near Big Tujunga Canyon the South Branch San Gabriel fault branches off southeast of the east-striking San Gabriel fault. The South Branch San Gabriel (Vasquez Creek) fault may have up to 5 km of cumulative dextral displacement as reported by Powell (1993 #5753), but other workers interpret 22–38 km of dextral offset (Matti and Morton, 1993 #5737; Ehlig, 1968 #7866). Beyer and others (2009#7849) suggested that as much as 12.2 km of post Miocene dextral separation. Farther southeast the South Branch San Gabriel fault dips to the northeast at a shallow angle and is characterized by an unknown amount of reverse or thrust displacement (Smith, 1986 #7880). Northwest of the Saugus area the fault zone forms the southwestern edge of the Ridge basin and terminates near Frazier Mountain (Yeats and others, 1994 #7883). Principal sense of displacement is dextral strike-slip, although there is a down-to-north component of normal stratigraphic separation (Yeats and</p>

	<p>others, 1994 #6114; Powell, 1993 #7883). Maximum cumulative dextral displacement is controversial—estimates range from 0–5 km (Weber, 1982 #7881, 1986 #7882), to a maximum of 70 km (Ehlert, 1982 #7864). Most estimates fall in the 30–45 km range. The reader is referred to Powell (1993 #5753) and Yeats and others (1994 #6114) for summaries of previous estimates of displacement along the San Gabriel fault zone.</p>
Length (km)	km.
Average strike	
Sense of movement	<p>Right lateral, Normal</p> <p><i>Comments:</i> Sense of offset not well constrained on San Gabriel River section. Ehlig (1968 #7866, 1981 #7869) reported 22 to 23 km of dextral displacement based on reconstruction of basement terrane. Whereas, Weber (1982 #7881) reported both dextrally and sinistrally deflected drainages, indicating that late Quaternary dextral offset may be minimal. Dibblee (1998 #7859, 2002 #7860, 2002 #7861, 2002 #7862, 2002 #7863) showed a sinistral strike-slip component. All workers reported a down-to-north vertical component.</p>
Dip	<p>55°–75° N.</p> <p><i>Comments:</i> Poorly constrained dips based on surface outcrops mapped by Weber (1982 #7881) and Dibblee (2002 #6985).</p>
Paleoseismology studies	
Geomorphic expression	<p>The San Gabriel River section is principally delineated by fault line geomorphic features such as linear canyons, creeks, and gullies. Stream drainages that cross the fault are deflected in both a dextral and sinistral sense, suggesting that erosion and stream capture occur at much higher rates than surface rupturing earthquakes. Weber (1982 #7881) noted that terrain south of the San Gabriel River section generally appears to have been uplifted relative to the north side, indicating a down-to-north component of displacement. Gath (2010 #7878) reported that an approximately 17 km long trace of the San Gabriel fault in the vicinity of Cogswell Reservoir east to at least the San Gabriel River canyon is delineated by exceptionally youthful geomorphic expression, including uphill (north) facing scarps, linear</p>

	vegetation contrasts, and dextrally deflected drainages.
Age of faulted surficial deposits	Western end of San Gabriel River section offsets late Quaternary terrace deposit near Clear Creek (Weber, 1982 #7881). Farther east, the fault deforms terraces greater than about 0.5 Ma, but apparently do not deform younger terraces (Bull and others, 1979 #7852).
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) <i>Comments:</i> Timing of the most recent paleoevent is unconstrained. Weber (1982 #7881) reported a scarp in a late Quaternary terrace surface along the western end of the section, but most traces to the east do not offset late Quaternary and Holocene alluvium and terrace deposits (Weber, 1982 #7881; Dibblee, 1998 #7859, 2002 #7860, 2002 #7861, 2002 #7862, 2002 #7863). Gath (2010 #7878) suggested that the trace of the San Gabriel fault between Cogswell Reservoir and the San Gabriel River may have displaced the surface in late Holocene time.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr
Date and Compiler(s)	2017 William A. Bryant, California Geological Survey
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