

Earthquakes of the East Bay

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If you live in the East Bay you can run but you can't hide. The San Francisco Bay Area occupies the boundary zone between the Pacific and North American plates, which slide past each other in this region at ~40 mm/yr. This plate boundary slip is currently distributed on the major faults including the San Andreas and San Gregorio west of the bay, and the Hayward–Rodgers Creek, northern Calaveras, Greenville, Mount Diablo, and Concord–Green Valley faults in the East Bay. The East Bay faults accommodate about 50 percent of the total plate motion across a zone 45–50 km wide.

Historically, the 1868 Hayward earthquake remains the largest East Bay earthquake with an estimated magnitude of $M \sim 6.8$. To the east of the East Bay Hills, the largest historical events are: the 1861 $M \sim 6(?)$ Calaveras earthquake south of San Ramon that may be associated with surface rupture; the 1954 $M 5.5$ Concord fault earthquake; the 1980 $M 5.8$ Greenville fault event, which is associated with small coseismic surface slip and afterslip (afterslip also occurred on the conjugate Las Positas fault); and the 1986 $M 5.7$ Mount Lewis sequence, which may be part of a broad zone of N-S shear between the Calaveras and Greenville faults. With the exception of consistent microseismicity along the East Bay's creeping faults, seismicity is broadly distributed with magnitudes on the small side (commonly $M 1-3$) and with typical shallow crustal depths of $\leq 10 \pm 2$ km; however, a 25-km-long NW-trending zone of diffuse seismicity east of Mount Diablo is characterized by small events occurring at depths of 14–19 km, reflecting a thicker crust associated with Mount Diablo folding. Additionally, the San Ramon Valley is unique in the Bay Area as the home to earthquake swarms, with seven occurring since 1970. These swarms may be a response to stresses in a complex structural zone between the NW-striking right-lateral Calaveras and west-verging compressional structures of Mount Diablo and associated with the eastward stepping of plate boundary slip from the Calaveras to the Concord–Green Valley fault. Some small amount of Calaveras slip may also extend north and drive earthquake occurrence along the West Napa fault zone.

Biography: David Schwartz is a leading earthquake geologist. He received his BA and MA from Queens College, City University of New York, and his Ph.D. from the State University of New York, Binghamton. After 33 years at the U.S. Geological Survey he retired from his fulltime position in October 2017 but remains an active voice in Bay Area earthquake hazard circles as an Emeritus Scientist with the Survey. He is credited with having pushed forward the fields of earthquake geology and paleoseismology (the study of prehistorical seismic events). One of his major contributions is the characteristic earthquake recurrence model, which has become a cornerstone of many seismic hazard analyses. He headed the San Francisco Bay Area Earthquake Hazards Project, co-chaired the Working Group on California Earthquake Probabilities that issued

the first major Bay Area 30-year earthquake forecast, and was as a member of the Science Review Panels for the 2008 and 2013 Uniform California Earthquake Rupture Forecasts and the most recent (2014) earthquake probability estimate for the Bay Area. In addition, he twice served as the Northern California Regional Coordinator for the USGS National Earthquake Hazard Program. He has traveled extensively outside the U.S. studying faults that have produced large, historical earthquakes including Mongolia, Tierra del Fuego, northern Peru, Italy, Guatemala, and central Alaska. His current research remains focused on active faults and seismic hazards in the Bay Area, Alaska, and the Intermountain West.