

An Investigation of California Earthquakes

U.S. Geological Survey; California Earthquake History 1769-Present.
(Data includes California, Baja California, and Nevada events).

DIRECTIONS:

Using a map of California (which includes portions of Baja California and Nevada) plot the location of each major earthquake. Use a different color pencil and slightly larger dot to represent each magnitude.

DATE		TIME(GMT)	LATITUDE	LONGITUDE	MAG	LOCATION
year	mth dy	hr min	(N)	(W)		
1769	7 28	0 0	34 0.00	118 0.00	6.0	Los Angeles Basin
1800	11 22	2130	33 0.	117 18.00	6.5	San Diego region
1808	6	24 0 0	37 48.00	122 30.00	6.0	San Francisco region
1812	12 8	15 0	34 22.00	117 39.00	7.0	Wrightwood
1812	12 21	19 0	34 12.00	119 54.00	7.0	Santa Barbara Channel
1827	9 24	4 0	34 0.	119 0.	5.5	Los Angeles region
1836	6 10	1530	37 48.00	122 12.00	6.75	Hayward Valley
1838	6 0	0 0	37 36.00	122 24.00	7.0	San Francisco Peninsula
1852	11 29	20 0	32 30.00	115 0.	6.5	Volcano Lake, B.C.
1855	7 11	415	34 6.00	118 6.00	6.0	Los Angeles region
1856	2 15	1325	37 30.00	122 18.00	5.5	San Francisco Peninsula
1857	1 9	16 0	35 42.00	120 18.00	8.25	Great Fort Tejon earthquake
1857	9 3	3 5	39 18.00	120 0.	6.25	W. Nevada or E. Sierra Nevada
1858	11 26	835	37 30.00	121 54.00	6.25	San Jose region
1858	12 16	10 0	34 0.	117 30.00	6.0	San Bernardino region
1860	3 15	19 0	39 30.00	119 30.00	6.5	Carson City, Nevada region
1861	7 4	011	37 48.00	122 0.	5.75	San Ramon Valley
1862	5 27	20 0	32 42.00	117 12.00	6.0	San Diego region
1864	2 26	1347	37 6.00	121 42.00	6.0	S. Santa Cruz Mountains
1864	3 5	1649	37 42.00	122 0.	5.75	E. of San Francisco Bay
1865	10 8	2046	37 0.00	122 00.00	6.5	S. Santa Cruz Mountains
1866	7 15	0630	37 30.00	121 18.00	6.0	W. San Joaquin Valley
1868	5 30	510	39 18.00	119 42.00	6.0	Virginia City, Nevada
1868	10 21	1553	37 42.00	122 6.00	7.0	Hayward fault
1869	12 27	155	39 24.00	119 42.00	6.25	Olinghouse fault, Nevada
1869	12 27	10 0	39 6.00	119 48.00	6.0	Carson City, Nevada region
1870	2 17	2012	37 12.00	122 6.00	6.0	Los Gatos
1871	3 2	21 5	40 24.00	124 12.00	6.0	Cape Mendocino
1872	3 26	1030	36 42.00	118 6.00	7.6	Owens Valley
1872	3 26	14 6	36 54.00	118 12.00	6.75	Owens Valley
1872	4 3	1215	37 0.	118 12.00	6.25	Owens Valley
1872	4 11	19 0	37 30.00	118 30.00	6.75	Owens Valley
1872	5 3	1 0	33 0.	115 0.	5.75	Imperial Valley (?)
1872	11 12	0 0	39 0.	117 0.	6.0	Austin, Nevada region (?)
1873	11 23	5 0	42 0.	124 0.	6.75	Crescent City
1875	1 24	1200	40 42.	120 30.	6.0	Honey Lake
1875	11 15	2230	32 30.00	115 30.00	6.25	Imperial Vly to Colorado R. delta
1878	5 9	425	40 6.00	124 0.	6.0	Punta Gorda region
1881	2 2	011	36 0.	120 30.00	5.75	Parkfield
1881	4 10	10 0	37 24.00	121 24.00	6.0	W. San Joaquin Valley

1882	3 6	2145	36 54.	121 12.	5.75	Hollister
1883	9 5	1230	34 12.00	119 54.00	6.25	Santa Barbara Channel
1884	1 28	730	41 6.	123 36.	5.75	Klamath Mountains
1884	3 26	40	37 6.	122 12.	6.0	Santa Cruz Mountains
1885	1 31	545	40 24.	120 36.	5.75	Susanville
1885	4 12	4 5	36 24.00	121 0.	6.25	S. Diablo Range
1887	6 3	1048	39 12.00	119 48.00	6.5	Carson City, Nevada region
1888	4 29	448	39 42.00	120 42.00	6.0	Mohawk Valley
1889	5 19	1110	38 0.	121 54.00	6.25	Antioch
1889	6 20	6 0	40 30.00	120 42.00	6.0	Susanville
1889	9 30	520	37 12.	118 42.	5.75	Bishop region
1890	2 9	12 6	33 24.00	116 18.00	6.5	San Jacinto or Elsinore fault region
1890	4 24	1136	36 54.00	121 36.00	6.25	Pajaro Gap
1890	7 26	940	40 30.00	124 12.00	6.25	Cape Mendocino
1891	7 30	1410	32 0.	115 0.	6.0	Colorado R. delta region
1892	2 24	720	32 33.00	115 38.00	7.0	Laguna Salada, B.C.
1892	4 19	1050	38 24.00	122 0.	6.5	Vacaville
1892	4 21	1743	38 30.00	121 54.00	6.25	Winters
1892	5 28	1115	33 12.00	116 12.00	6.5	San Jacinto or Elsinore fault region
1892	11 13	1245	36 48.00	121 30.00	5.75	Hollister
1893	5 19	035	34 6.00	119 24.00	5.75	Pico Canyon
1894	7 30	512	34 18.00	117 36.00	6.0	Lytle Creek region
1894	9 30	1736	40 18.	123 42.	6.0	Cape Mendocino region
1894	10 23	23 3	32 48.00	116 48.00	5.75	E. of San Diego
1896	8 17	1130	36 42.00	118 18.00	6.0	SE Sierra Nevada
1897	6 20	2014	37 0.	121 30.00	6.25	Gilroy
1898	3 31	743	38 12.00	122 24.00	6.5	Mare Island
1898	4 15	7 7	39 12.00	123 48.00	6.5	Mendocino
1899	4 16	1340	41 0.	126 0.	7.0	W. of Eureka
1899	7 6	2010	37 12.	121 30.	5.75	Morgan Hill
1899	7 22	2032	34 18.00	117 30.00	5.75	Lytle Creek region
1899	12 25	1225	33 48.00	117 0.	6.4	San Jacinto and Hemet
1901	3 3	745	36 0.	120 30.00	6.4	Parkfield
1903	1 24	527	31 30.00	115 0.00	6.6	Colorado R. delta region
1903	6 11	1312	37 24.00	121 54.00	5.5	San Jose
1903	8 3	649	37 18.00	121 48.00	5.5	San Jose
1906	4 18	1312	37 42.00	122 30.00	8.25	Great 1906 earthquake
1906	4 19	030	32 54.00	115 30.00	6.2	Imperial Valley
1906	4 23	910	41 0.	124 0.	6.4	Arcata
1907	9 20	154	34 12.00	117 6.00	5.3	San Bernardino region
1908	11 4	837	36 0.	117 0.	6.0	Death Valley region
1909	10 29	645	40 30.00	124 12.00	5.8	Cape Mendocino
1910	3 11	652	36 54.00	121 48.00	5.8	Watsonville
1910	3 19	011	40 0.	125 0.	6.0	W. of Cape Mendocino
1910	5 15	1547	33 42.00	117 24.00	5.5	Glen Ivy Hot Springs
1910	8 5	131	42 0.	127 0.	6.6	W. of Crescent City
1911	7 1	22 0	37 15.00	121 45.00	6.5	Calaveras fault
1914	2 18	1817	39 30.00	119 48.00	5.5	Truckee region
1914	4 24	834	39 30.00	119 48.00	6.0	Truckee region
1915	5 6	12 9	40 0.00	126 0.	6.2	W. of Cape Mendocino

1915	6 23	359	32 48.00	115 30.00	6.0	Imperial Valley
1915	6 23	456	32 48.00	115 30.00	5.9	Imperial Valley
1915	10 3	652	40 30.00	117 30.00	7.3	Pleasant Valley, Nevada
1915	11 21	013	32 0.	115 0.	7.1	Volcano Lake, B.C.
1915	3 1	1220	41 0.	126 0.	6.5	W. of Eureka
1916	2 3	5 3	41 0.	117 48.00	5.9	N. of Pleasant Valley, Nevada
1916	10 23	244	34 54.00	118 54.00	5.3	Tejon Pass region
1916	11 10	911	35 30.00	116 0.	6.1	S. of Death Valley
1918	4 21	2232	33 48.00	117 0.	6.9	San Jacinto
1918	7 15	023	41 0.	125 0.	6.5	W. of Eureka
1922	1 26	931	41 0.	126 0.	6.0	W. of Eureka
1922	1 31	1317	41 0.	125 30.00	7.3	W. of Eureka
1922	3 10	1121	36 0.	120 30.00	6.3	Parkfield
1923	1 22	9 4	40 30.00	124 30.00	7.2	Cape Mendocino
1923	7 23	730	34 0.	117 18.00	6.0	San Bernardino region
1925	6 4	12 2	41 30.00	125 0.	6.0	W. of Eureka
1925	6 29	1442	34 18.00	119 48.00	6.3	Santa Barbara
1926	10 22	1235	36 37.00	122 21.00	6.1	Monterey Bay
1926	10 22	1335	36 33.00	122 11.00	6.1	Monterey Bay
1926	12 10	838	40 45.00	126 0.	6.0	W. of Cape Mendocino
1927	9 18	2 7	37 30.00	118 45.00	6.0	Bishop region
1927	11 4	1350	34 42.00	120 48.00	7.3	SW of Lompoc
1932	6 6	844	40 45.00	124 30.00	6.4	Eureka
1932	12 21	610	38 45.00	118 0.	7.2	Cedar Mountain, Nevada
1933	1 5	651	38 46.00	117 44.00	5.9	Cedar Mountain, Nevada
1933	3 11	154	33 37.00	117 58.00	6.3	Long Beach
1933	6 25	2045	39 4.00	119 20.00	6.1	Yerington, Nevada
1934	1 30	2016	38 18.00	118 24.00	6.3	Excelsior Mountain, Nevada
1934	6 8	447	36 0.	120 30.00	6.0	Parkfield
1934	7 6	2248	41 15.00	125 45.00	6.5	W. of Eureka
1934	12 30	1352	32 15.00	115 30.00	6.5	Laguna Salada, B.C.
1934	12 31	1845	32 0.	114 45.00	7.0	Colorado R. delta
1935	2 24	145	31 59.00	115 12.00	5.3	Colorado R. delta
1936	6 3	915	40 0.	125 30.00	5.9	W. of Cape Mendocino
1937	3 25	1649	33 24.00	116 16.00	6.0	Buck Ridge
1940	2 8	8 5	39 45.00	121 15.00	6.0	Chico
1940	5 19	436	32 44.00	115 30.00	7.1	Imperial Valley
1940	12 7	2216	31 40.00	115 5.00	5.5	Colorado R. delta
1941	2 9	944	40 42.00	125 24.00	6.6	W. of Cape Mendocino
1941	4 9	1708	31 0.00	114 0.00	5.3	Gulf of California
1941	5 13	16 1	40 18.00	126 24.00	6.0	W. of Cape Mendocino
1941	7 1	750	34 22.00	119 35.00	5.9	Carpenteria
1941	9 14	1643	37 34.00	118 44.00	5.8	Tom's Place
1941	9 14	1839	37 34.00	118 44.00	6.0	Tom's Place
1941	10 3	1613	40 24.00	124 48.00	6.4	W. of Cape Mendocino
1942	10 21	1622	33 3.00	116 5.	6.5	Fish Creek Mountains
1942	12 3	944	39 42.00	119 18.00	5.9	N. of Wadsworth, Nevada
1945	5 19	15 7	40 24.00	126 54.00	6.2	W. of Cape Mendocino
1945	9 28	2224	41 54.00	126 42.00	6.0	W. of Crescent City
1946	3 15	1349	35 44.00	118 3.00	6.3	Walker Pass

1947	4 10	1558	34 59.00	116 33.00	6.4	Manix
1948	12 4	2343	33 56.00	116 23.00	6.5	Desert Hot Springs
1948	12 29	1253	39 33.00	120 5.00	6.0	Verdi, Nevada
1949	3 25	456	41 18.00	126 0.	6.2	W. of Eureka
1949	5 2	1125	34 1.	115 41.00	5.9	Pinto Mountain
1951	10 8	410	40 15.00	124 30.00	6.0	W. Of Cape Mendocino
1951	12 26	046	32 48.00	118 18.00	5.9	San Clemente Island
1952	7 21	1152	35 0.	119 1.00	7.7	Kern County earthquake
1952	7 21	12 5	35 0.	119 0.	6.4	Kern County
1952	23	038	35 22.00	118 35.00	6.1	Kern County
1952	7 29	7 3	35 23.00	118 51.00	6.1	Bakersfield
1952	11 22	746	35 44.00	121 12.00	6.0	Bryson
1954	1 12	2333	35 0.	119 1.00	5.9	W. of Wheeler Ridge
1954	19	954	33 17.00	116 11.00	6.2	Arroyo Salada
1954	7 6	1113	39 25.00	118 32.00	6.6	Rainbow Mountain, Nevada
1954	7 6	22 7	39 18.00	118 30.00	6.4	Rainbow Mountain, Nevada
1954	8 24	551	39 35.00	118 27.00	6.8	Stillwater, Nevada
1954	8 31	2220	39 30.00	118 30.00	6.3	Stillwater, Nevada
1954	10 24	944	31 30.00	116 0.	6.0	W. of Santo Tomas, B.C.
1954	11 12	1226	31 30.00	116 0.	6.3	W. of Santo Tomas, B.C.
1954	11 25	1116	40 16.00	125 38.00	6.5	W. of Cape Mendocino
1954	12 16	11 7	39 19.00	118 12.00	7.1	Fairview Peak, Nevada
1954	12 16	1111	39 30.00	118 0.	6.8	Dixie Valley, Nevada
1954	12 21	1956	40 56.00	123 47.00	6.6	E. of Arcata
1956	2 9	1432	31 45.00	115 55.00	6.8	San Miguel, B.C.
1956	2 9	1524	31 45.00	115 55.00	6.1	San Miguel, B.C.
1956	2 14	1833	31 30.00	115 30.00	6.3	San Miguel, B.C.
1956	2 15	120	31 30.00	115 30.00	6.4	San Miguel, B.C.
1956	10 11	1648	40 40.00	125 46.00	6.0	W. of Cape Mendocino
1956	12 13	1315	31 0.	115 0.	6.0	W. shore, Gulf of California
1959	3 23	710	39 36.00	118 1.00	6.3	Dixie Valley, Nevada
1959	6 23	1435	39 5.00	118 49.00	6.1	Schurz, Nevada
1960	8 9	739	40 19.00	127 4.00	6.2	W. of Cape Mendocino
1966	6 28	426	36 0.	120 30.00	6.0	Parkfield
1966	8 7	1736	31 48.00	114 30.00	6.3	Gulf of California
1966	9 12	1641	39 25.00	120 9.00	6.0	Truckee
1968	4 9	228	33 11.00	116 8.00	6.5	Borrego Mountain
1968	6 26	142	40 14.00	124 16.00	5.4	Punta Gorda
1971	2 9	14 0	34 25.00	118 24.00	6.5	San Fernando
1973	2 21	1445	34 4.00	119 2.00	5.2	Point Mugu
1976	11 26	1119	41 18.00	125 42.00	6.3	W. of Orick
1979	8 6	17 5	37 7.00	121 31.00	5.7	Coyote Lake
1979	10 15	2316	32 36.00	115 18.00	6.5	Imperial Valley
1980	01 24	1900	37 50.00	121 47.00	5.8	Livermore
1980	5 25	1633	37 36.00	118 50.00	6.1	Mammoth Lakes
1980	5 25	1649	37 39.00	118.54.00	5.9	Mammoth Lakes
1980	25	1944	37 33.00	118 49.00	5.8	Mammoth Lakes
1980	5 27	1450	37 29.00	118 48.00	6.0	Mammoth Lakes
1980	6 9	328	32 12.00	115 5.00	6.4	Victoria, B.C.
1980	11 8	1027	41 7.00	124 40.00	7.2	W. of Eureka

1981	4 26	1209	33 8.00	115 39.00	6.0	Westmorland
1981	6 4	1550	33 40.00	119 7.00	5.9	N. of Santa Barbara Island
1981	9 30	1153	37 35.00	118 52.00	5.8	Mammoth Lakes
1983	5 2	2342	36 14.00	120 19.00	6.5	Coalinga
1983	7 22	239	36 14.00	120 25.00	5.7	Coalinga
1984	4 24	2115	37 19.00	121 39.00	6.1	Morgan Hill
1984	9 10	314	40 23.00	127 9.00	6.7	Mendocino Fracture Zone
1984	11 23	18 8	37 27.00	118 36.00	5.7	Round Valley
1985	8 4	12 1	36 8.00	120 10.00	5.9	North Kettleman Hills
1986	7 8	920	34 0.	116 36.00	6.0	North Palm Springs
1986	7 20	1429	37 34.00	118 26.00	5.6	Chalfant Valley
1986	7 21	1442	37 32.00	118 26.00	6.2	Chalfant Valley
1986	7 31	722	37 28.00	118 22.00	5.2	Chalfant Valley
1987	10 1	1442	34 3.00	118 5.00	5.8	Whittier Narrows
1987	11 24	153	33 4.00	115 47.00	6.2	Elmore Ranch fault
1987	11 24	1316	33 1.00	115 51.00	6.6	Superstition Hills
1989	10 18	0004	37 2.19	121 52.98	7.1	Loma Prieta
1991	8 16	2226	41 38.00	125 52.00	6.3	W. of Crescent City
1991	8 17	1929	40 17.00	124 14.00	6.2	Punta Gorda
1991	8 17	2217	41 41.00	126 3.00	7.1	W. of Crescent City
1992	4 23	450	33 58.00	116 19.00	6.1	Joshua Tree
1992	4 25	1806	40 20.00	124 14.00	7.2	Cape Mendocino
1992	4 26	741	40 26.00	124 36.00	6.5	Cape Mendocino
1992	4 26	1118	40 23.00	124 35.00	6.6	Cape Mendocino
1992	6 28	1157	34 12.00	116 26.00	7.3	Landers
1992	6 28	1505	34 12.00	116 50.00	6.2	Big Bear
1993	5 17	2320	37 9.00	117 50.00	6.1	Big Pine
1994	1 17	1230	34 13.00	118 32.00	6.7	Northridge
1994	9 01	1515	40 27.00	125 54.00	6.9	Mendocino Fracture Zone
1994	6 12	1223	38 49.00	119 37.00	6.0	Carter's Station, Nevada
1995	2 19	403	40 37.00	125 54.00	6.6	W. of Eureka
1995	9 20	2327	35 46.00	117 38.00	5.5	Ridgecrest

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Magnitude reported is "summary magnitude" for comparison which is the adjusted intensity magnitude for most events prior to 1898, and is the surface wave magnitude for events after 1898. In the future, we will adjust some of these magnitudes to reflect the best measure of the earthquake and label the type of magnitude being reported.

Source:

Ellsworth, William L., "Earthquake History, 1769-1989" in USGS Professional Paper 1515, Robert E. Wallace, ed., 1990; William Ellsworth, personal communication; and USGS earthquake catalogs.

ANALYSIS OF DATA:

1- Looking at your map, are the major earthquakes distributed equally or at random across the map, or is there a pattern to their distribution ? Describe.

2- In general, where did most of the major earthquakes in California happen ?

3- Can any lines be drawn on you map when the distribution of major earthquakes have been plotted ? Describe.

4- Looking at the data chart, how often will California experience a major earthquake ?

5- What is the maximum historic number of major earthquakes in a single year? When?

6- From the raw data included in this investigation, count the number of major earthquakes that occur in each five year interval. On a piece of your own graph paper, plot a line graph showing the five year time intervals on the horizontal axis and number of major earthquakes on the vertical.

7- (a) Summarize what this graph shows. (b) Describe any pattern in the frequency of major earthquakes. (c) Based on this graph, when should the next "big one" hit ?

8- Do you personally remember any of the major earthquakes listed? What was it like for you? Did your family or friends suffer any injuries or property damage?

9- What magnitude and where was the largest major earthquake to hit California? How did the magnitude of the one you remembered in #8 compare to the magnitude of the largest 'quake on the list?

EXTENDED ANALYSIS:

Plot a graph and discuss the patterns of earthquake distribution by month, day, or time of day.

CALIFORNIA EARTHQUAKES INVESTIGATION

