

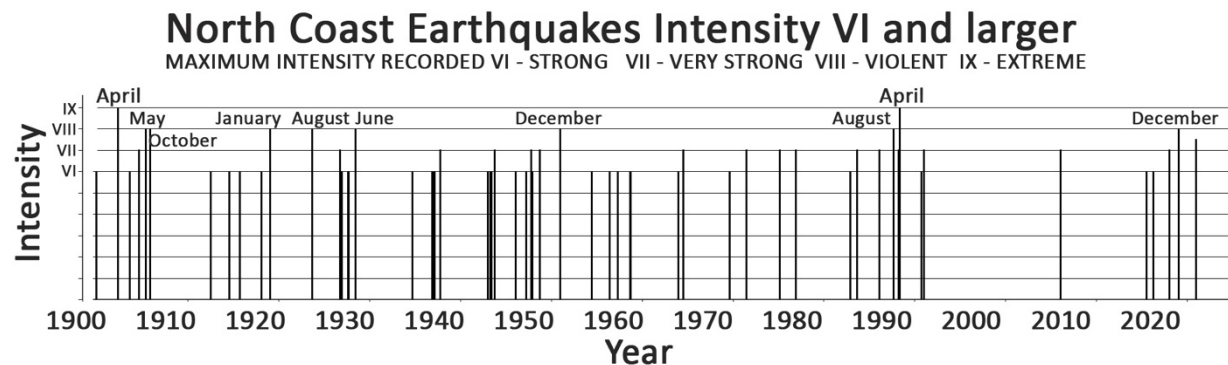
Times Standard

Not My Fault: It's December – Are you ready for the next earthquake?

Lori Dengler for the Times-Standard

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Earthquakes since 1900 as a function of shaking strength (intensity). The Modified Mercalli Scale measures relative shaking strength based on damage and people's perceptions. Since 1900, 64 earthquakes have produced shaking of level VI or higher. The months of the strongest earthquakes, intensity VIII or IX, are noted (from Dengler et al 1992 and USGS data).

The last significant North Coast quake was just over a year ago. On December 5, 2024, a M7.0 earthquake struck offshore of Cape Mendocino. A little less than two years earlier, the December 20, 2023, M6.4 Ferndale earthquake ruptured beneath the southern Humboldt coast, causing over 90 million dollars in damages to Rio Dell and nearby communities. Exactly one year before the Ferndale quake, a pair of M6s struck the Mendocino triple junction area.

I've spent a lot of time studying the December 21, 1954, Fickle Hill earthquake (see Not My Fault 8/30/25). Why all these December earthquakes? It's enough to make one think that something unusual is tickling the ground at this time of year. Human perceptions can be easily swayed by recent experience. Let's take a closer look to see if there is anything to the "December quake trigger."

We have good data for earthquakes strong enough to cause some damage on the North Coast since the mid 1850s. As people of European decent began to settle around Humboldt Bay and in the Eel River Valley, journalists soon followed, and a number of newspapers were published on either a daily or weekly basis. By the turn of the century, these papers and other documents provide a record of any earthquake strong enough to cause damage.

I've put in my time combing through microfiche at the University of the papers published in our area looking for past quakes and their impacts. In 1992, Gary Carver, Bob McPherson and I published a summary of our regional seismicity, including source area and damage ([pdf link below](#)). I've kept that list going since then with USGS data and it now includes 75 earthquakes

that have caused some damage, confirming our reputation as the shakiest place in the lower forty-eight states.

The Modified Mercalli Intensity scale is a useful tool for describing earthquake impacts, what we call macroseismic data. It's a numerical scale often described by roman numerals to distinguish it from magnitude. The onset of damage is intensity VI where many items topple or are knocked from shelves and poorly built structures may suffer foundation damage. VII is the level when numerous brick chimneys are damaged. At VIII level, many homes are knocked off foundations, heavy furniture displaced or knocked over, and IX means some damage to structures designed to be earthquake resilient.

Intensity is not the same as magnitude. We've experienced a number of earthquakes in the upper magnitude 6 or low 7 range that don't make my list of damaging quakes. The June 2005 M7.2 quake produced only level IV to V shaking, most people outside didn't notice it at all. It was centered in the Gorda plate 95 miles west of Trinidad. The relatively modest M5.4 December 26, 1994, earthquake caused over \$2 million in damages as it was located just offshore of Eureka.

Is there any temporal pattern to our damaging quakes? Not really. As a strict average, about 2.5 years has intervened between temblors, but quakes don't recur on a regular time scale. We've had periods of intense quake activity such as the 1990s when eight damaging earthquakes occurred in a five-year window and gaps when few quakes struck the area. The longest gap was between 1994 and 2019 when only one earthquake disturbed our peace.

Time of year? Our two strongest quakes occurred in April. The 1906 San Francisco earthquake ruptured nearly 300 miles of the San Andreas fault from Santa Cruz to Cape Mendocino and produced a larger area of devastation on the North Coast as any earthquake centered closer to us. Our 1992 M7.2 didn't produce as much damage but did trigger the highest accelerations ever seen in a major earthquake. If I stretch our window back in time, it's likely that the January 26, 1700 earthquake on the Cascadia subduction zone outclassed both of these April quakes with a magnitude of about 9 and major damage throughout northern California and extending as far away as British Columbia.

Stepping down a notch to include intensity VIII quakes, two occurred in December and two in August and the remaining four scattered in other months. August and December again top the list if I look at all of the damaging quakes since 1853 with ten apiece, but there is no such thing as earthquake-free month. Are there any other possible physical triggers? Extremely high tides such as those we have experienced in the past few days don't show any correlation with shaking and as to weather, earthquakes don't care. Our quakes are centered miles beneath the surface where the daily or seasonal fluctuations of temperature never reach. Earthquakes happen on the most frigid days of winter, during heavy rain, drought, or on the clearest of days. All weather can be earthquake weather.

The December 2024 aftershock sequence now appears to be over. Aftershocks are smaller earthquakes in the rupture zone or closely adjacent to it that accommodate the stress changes caused by the main earthquake. In the first day after the earthquake, nearly 400 smaller earthquakes were recorded on the fault and areas on either end. The largest magnitude aftershock was a 5.3 nine days after the mainshock.

Since December 5th, over 900 aftershocks have been detected, 52 of which reported as felt on the USGS “Did You Feel It?” site. The most recent felt aftershock was in August when a handful of people from Whitethorn to Ferndale filed light shaking reports. The Mendocino fault always has a few earthquakes and for the year before last year’s M7, the typical background rate was two to three per week. We returned to that level in September. The USGS still posts an aftershock forecast for the December 5th quake, but it is nearly at pre-earthquake conditions with magnitude 3s a certainty and a 14% chance of a M5 over the next year.

If another intensity VI or larger quake occurs, it will almost certainly trigger the ShakeAlert system sending an alert to cell phones seconds after the earthquake rupture begins to people in the felt area. I’ve received seven alerts via the MyShake App since 2019 when ShakeAlert became operational for California, four for earthquakes that I’ve felt, two for quakes I didn’t feel that turned out to be smaller than first estimated and one when I was out of town. It’s a system still in development and doesn’t work perfectly, but I really like getting a few seconds heads up to prepare myself for shaking.

Last Thursday morning, many people in northern California received a ShakeAlert. It didn’t affect our area but millions of people in the San Francisco Bay Area, Sacramento, and eastern California received a cell phone alert to expect strong shaking. Nothing happened. The automated system had detected what it considered a 5.9 earthquake near Carson City Nevada. There was no earthquake and the USGS quickly canceled the alert a few minutes later after seismologists were able to review the records. The USGS has determined that the false alert was caused by glitches in the data transmission from a group of newly added seismic stations in western Nevada.

No harm was done by the faux alert and it was quickly rescinded. Many people receiving the alert ducked under tables and desks or took a moment to brace themselves for shaking developing the muscle memory to do the right thing when the next real shaking arrives. If nothing happens within a minute, you can safely assume it’s a non-event where you are.

I have no idea when the next damaging earthquake will occur. There are no reliable ways to predict earthquakes on the order of hours or days before they occur. When it comes to earthquakes, December is no different than any other month and we are all one day closer to the next quake than we were yesterday. Reducing hazards now and knowing what to do when and after the shaking starts is the best way to protect yourself and your loved ones.

Note: Our Sources of North Coast Seismicity paper is posted at <https://kamome.humboldt.edu/sites/default/files/Sources%20of%20North%20Coast%20Seismicity.pdf>

Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt, and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times--Standard’s. All Not My Fault columns are archived online at <https://kamome.humboldt.edu/taxonomy/term/5> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email Kamome@humboldt.edu for questions and comments about this column or to request copies of the preparedness magazine “Living on Shaky Ground.”