

Experts puzzled over rare quake in Sacramento-San Joaquin Delta

Matt Weiser, Sacramento Bee, 10-27-10

It was a small earthquake, measuring just 3.1 on the Richter scale, but its location in the heart of the Sacramento-San Joaquin Delta has experts buzzing.

The Oct. 15 quake was centered 7 miles northwest of Lathrop, on Union Island. No faults are known to exist in that area, where earthquakes are rare.

The temblor could offer new insights on safety issues in the Delta, where concerns about flood protection and water quality during a major quake have been growing. It is also a reminder that many mysteries lurk below ground – even in California, a nucleus of earthquake research.

"It was a surprise to us," said Jack Boatwright, a geophysicist at the U.S. Geological Survey in Menlo Park who is studying the quake. "There's something down there that we don't know about."

Catie Marchini felt the quake when it struck at 4:04 a.m. She and her husband live on the western edge of Manteca, about 10 miles southeast of the epicenter.

"My husband I both woke up, because we heard the house creak and we didn't know what it was at first," said Marchini, 29. "It was kind of weird, because both my husband and I are pretty heavy sleepers."

Marchini grew up on a farm that sits on the quake's epicenter. Her parents still live there, in a house on Roberts Island, just across the river from Union Island.

They slept right through the quake.

"We live right by a levee on Middle River, but we're not too concerned about that," said her mother, Florence Drury.

She takes comfort in knowing that these levees have withstood numerous floods, as well as prior earthquakes.

Yet the risk may be greater than many Delta residents realize.

Recent studies estimate that one-third of the Delta's 70-some islands could flood in a magnitude 6.5 or greater earthquake due to levee failures. There is at least a 62 percent chance of such a quake striking the Bay-Delta region in the next 20 years, according to the geological survey.

This vulnerability is a statewide concern. Delta water diversions irrigate about 3 million acres of California farmland, and 25 million people depend on the estuary for at least some of their drinking water.

Widespread levee failures could contaminate that freshwater supply, perhaps for a year or longer.

It is not uncommon for quakes to occur where a fault has not been identified. In September 2000, for instance, a 5.0-magnitude quake struck in Napa on an unmapped fault, damaging a number of buildings.

A key difference in this case is that earthquakes of any sort are rare within the Delta. Like Sacramento, the Delta is considered seismically tame compared to the Bay Area.

About four years ago, USGS installed a network of seismic sensors in the Delta to better assess the risks. As a result, more information will be available about the Oct. 15 quake than any other in the Delta's history.

Those new sensors have already allowed another USGS geophysicist, Jon Fletcher, to draw some preliminary conclusions. He plans to publish a study later this year examining effects in the Delta from quakes that have occurred outside of it.

Fletcher found that ground motion in the Delta during a quake is as much as 10 times greater than areas outside the Delta. Basically, this means the Delta shakes more, likely because of the loose nature of the Delta's peat and sand soils. This could make its levees more vulnerable to collapse.

Most research on quake risk in the Delta has focused on the threat from faults outside the estuary, notably the Hayward fault. But the Oct. 15 quake is a reminder that the Delta has its own faults, about which relatively little is known.

All the mapped faults in the Delta are known as "blind" faults because they don't appear on the surface – likely because its peat and sand soils are deep and relatively fluid. The largest is the Midland fault, believed to be the cause of a 3.7-magnitude quake near Rio Vista in 2002.

Ken Verosub, a geologist at UC Davis, has been studying core samples of Delta soils. He believes there is a major north-south fault beneath the Delta that has yet to be mapped.

Verosub's core samples extend only about 26 feet deep. He said more samples reaching down 300 feet are needed to understand what's really happening beneath the Delta.

"I think the seismic risk in the Delta has been underestimated, and we don't understand it," said Verosub, currently a visiting scientist at USGS in Reston, Va. "There may well be older pockets of peat buried in the Delta, and those might increase the seismic shaking."

Unlike the notorious San Andreas Fault – a strike-slip fault in which plates of the Earth's crust scrape past each other – Verosub said the fault he's studying is probably a subduction fault, in which one plate slides under another. He believes some of the eastern portion of the Delta is dropping beneath the rest of it.

This would appear to match Catie Marchini's perception of the Oct. 15 quake.

"It was a lot different than other quakes I've felt before," she said. "It wasn't like a swaying motion. It was just one hard jolt in one direction."