Scientists tie Colorado River flooding to San Andreas quakes

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Researchers believe Colorado River damming projects that followed the creation of the Salton Sea could be one reason why Southern California is overdue for a major earthquake.

In a new study led by the Scripps Institution of Oceanography, scientists found that the floodwaters that periodically flowed through faults helped trigger earthquakes in the area, including several large ones along the mighty San Andreas.

The modern Salton Sea came to life nearly a century ago when record floodwaters from the Colorado River overwhelmed barriers, and during the course of two years created the massive body of water in a desert sink. Dams and other irrigation barriers were eventually built to stop the flow of water into the sea and end the periodic flooding that had long plagued the area.

But scientists wonder whether the creation of the Salton Sea tweaked the seismic dynamics of the area, which is crisscrossed by numerous fault lines that feed into the San Andreas.

The study's lead author, Daniel Brothers, a marine geophysicist for the U.S. Geological Survey, said that in the past the weight of the flowing floodwaters bent the Earth's crust, causing some sections of the faults to bow and others to bulge. In addition, floodwaters percolated into voids in the rock, exerting an outward pressure on the faults. All this helped trigger quakes, he said.

The research offers an intriguing theory in answer to a question seismologists have been asking for decades: Why has the southern end of the San Andreas fault gone for so long without a major earthquake?

A landmark study out of the University of California, Irvine, and Arizona State University last year found that earthquakes have occurred along the San Andreas far more frequently than previously believed - as often as every 45 to 144 years. The last major earthquake on that part of the fault was in 1857.

The Scripps researchers used sound waves to probe lake bed sediment that recorded past flooding, going back thousands of years. They discovered that the smaller faults that feed into the San Andreas had ruptured as a result of historic flooding. On a few occasions, that triggered a much larger quake on the southern San Andreas.

Sediment records strongly suggest that a huge earthquake on the San Andreas in the 10th century followed flood-induced ruptures on the nearby faults. That may also be the case with a large San Andreas quake that happened between the late 13th and mid-14th centuries, Brothers said. There are older earthquake events that may also have sprung from massive flooding, but the records are incomplete, he said

The Salton Sea is a much smaller and shallower remnant of the ancient Lake Cahuilla, which dramatically ebbed and grew depending on the Colorado River. In the early 20th century, a variety of water management projects brought an end to the severe flooding.

"There's a lot of things that can alter the state of stress" on the faults, Brothers said, "and flooding is one of them."

Joann Stock, a professor of geology and geophysics at Caltech who was not involved in the study, said this would be far from the first instance in

which man-made activities have influenced seismic activities. The creation and filling of reservoirs has been known to trigger mostly small earthquakes. Earlier this year, two gas companies agreed to temporarily stop injecting water into underground wells in central Arkansas after the area experienced more than 800 small earthquakes.

About eight years ago, Clear Lake in Northern California saw an increase in small quakes that some residents believe was caused by a company generating electric power from steam heated by magma underneath the area.

The San Andreas fault is considered one of the most dangerous in Southern California, partly because it is so long that its southern section is capable of producing a temblor as large as magnitude-8.1. By contrast, the destructive 1994 Northridge quake, which occurred on a different fault, was only a magnitude-6.7.

The 1857 temblor, with an estimated magnitude of 7.9, is known as the Fort Tejon quake, but that's a bit of a misnomer because it is thought to have started farther north, way up in Parkfield in Monterey County. The quake then barreled south on the San Andreas for about 200 miles, through Fort Tejon near the northern edge of what is now Los Angeles County, then east toward the Cajon Pass in San Bernardino County, near what is now the 15 Freeway. The quake was so powerful that the soil liquefied, causing trees as far away as Stockton to sink. Trees were also uprooted west of Fort Tejon.

Experts stressed that not enough is known about how the San Andreas works to say for sure what causes its active and dormant periods. Susan Hough, a seismologist for the U.S. Geological Survey, said it makes sense that huge inflows and outflows of floodwater could affect seismic activity. But she said it's hard to know whether a lack of flooding is delaying the next "Big One" on the San Andreas.

"The one thing we know is that part of the fault is going to produce a big earthquake one day," she said.