

Inactive fault may trigger big quake after all

David Perlman, San Francisco Chronicle, 7-11-10

A seismic fault in the Sierra Nevada, believed to have been quiet for more than 3 million years, is active after all and capable of triggering strong quakes with magnitudes of 6 or even 7, scientists say.

The Kern Canyon Fault, stretching for nearly 90 miles from north to south above the San Joaquin Valley east of Bakersfield, cuts beneath a major flood control dam on the Kern River.

For a half-dozen years those who oversee the 57-year-old Isabella flood control dam above Bakersfield, as well as California Institute of Technology geologists, have been studying the fault closely.

"It came as a surprise to see that a long-inactive fault can produce significant quakes," said geologist Elisabeth Nadin of Caltech, who has hiked the sparsely populated rugged terrain and mapped where evidence showed the fault ruptured violently at least 3,300 years ago.

Geologists working for the Army Corps of Engineers have also studied the fault's potential for rupturing and are surveying the dam to determine whether it needs strengthening against future large quakes.

The fault emerged some 86 million years ago when the immense granite mass of the Sierra was uplifting, said Nadin, who has found the evidence of past violence in the rocks around it.

For millions of years, the mountains around the fault rose and subsided again. Volcanic activity continued, and a pulse of volcanism about 3.5 million years ago left a lava flow at the fault's northern end, she said. Nadin said, "Seismic activity on the fault continues today."

Nadin, who just received her doctorate from Caltech, and her former Caltech adviser, Jason B. Saleeby who has also studied the fault, are publishing results of their findings in the September issue of the Bulletin of the Geological Society of America.

Typical of the evidence for recent temblors that Nadin cited are a series of "fault scarps" - small jagged cliffs 6 feet or more high - that run along the west side of the fault and indicate where the land was abruptly lifted up by the force of a quake. Those scarps, she said, show little evidence of erosion - a sign that they were uplifted relatively recently.

During her field explorations along the fault, Nadin said, she also found scores of rounded boulders - deposits from a period of intense glaciation some 12,000 years ago - that had been lifted up from deep beneath the surface by much more recent earthquake activity.

Ronn S. Rose, the dam safety program manager for the Army Engineers in Sacramento, and Keith I. Kelson, senior geologist at the earthquake consulting firm of Fugro William Lettis & Associates in Walnut Creek, are among a group of specialists surveying the fault because of potential hazard to the dam.

They have also studied evidence of recent seismic slip along the fault with a series of six deep trenches, isotope studies and drilling to reveal the ages of past quakes there.

Rose, Kelson and other geologists working for the Corps of Engineers said in a recent report that their evidence suggests that the Kern Canyon Fault could generate earthquakes with magnitudes "from 6.5 to perhaps 7.5."

Kelson said in an interview that the two-unit dam is considered a "critical facility" because the fault runs directly beneath one abutment of the dam's auxiliary unit.

"It would likely cost hundreds of millions of dollars to replace it in the event of complete failure," he said.

Although there is good evidence to determine the "slip rate" of recent movement along the fault, Rose said, it appears to be moving far more slowly than the annual slip rate along the San Andreas Fault - "a hundred times slower," he said in an interview.

The Isabella dam was built in 1953, primarily for flood control along the Kern River and to provide irrigation water for major Kern County farms around Bakersfield.

In her study, Nadin noted that many active faults lie in the region, notably the Garlock and White Wolf faults.

Whether those two have links deep underground to the Kern Canyon Fault is unknown, she said. The White Wolf Fault is considered potentially dangerous today because it ruptured violently in 1952 with a magnitude 7.3 quake that killed 12 in the tiny town of Tehachapi.