

## NATURE NOTES:

### Faulting and Fracking: Exploring the History of Earthquakes in West Texas

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## Listen: Faulting and Fracking: Exploring the History of Earthquakes in West Texas

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### By Andrew Stuart

For this episode, Nature Notes is teaming up with “West Texas Wonders” – a new reporting series where listeners ask questions and Marfa Public Radio finds answers.

This question comes from listener Ken Richards.

“In Big Bend, you see all these fragments and features of this and that, and I assume some of that, a lot of that, moved around by earthquake,” Richards said. “But I’m wondering if it’s seismically active now.”

We don’t think “Texas” and “earthquakes.” But the answer to Richards’ question is yes: tectonic forces that shaped the mountainous Trans-Pecos landscape are still at work. And now there’s another factor: hydraulic fracturing, or fracking, is leading to small quakes from Monahans to the edges of the Davis and Guadalupe mountains. Scientists say these tectonic and human-made forces could interact, to intensify quakes here.

Texas’ largest recorded earthquake occurred in the Big Bend. The 1931 Valentine Earthquake was severe, a magnitude 6.5. No deaths were reported, but buildings from Van Horn to Alpine were damaged. There were landslides in the Chisos and Guadalupe mountains.

The Earth shook again, in an event long-time West Texans remember: the 1995 Alpine Earthquake.

Stephanie Elmore is a Sul Ross geology grad student.

“I didn’t know that there were earthquakes in Texas until I got this project,” Elmore said, “and now, seeing all the other small earthquakes we have, it’s pretty interesting. When you hear earthquakes, you think of California – but we’ve got a big one in Texas. It’s pretty cool.”

As an undergraduate, Elmore analyzed questionnaires the university had gathered after the ‘95 quake. She developed a “Mercalli Scale” – quantifying the intensity of the quake’s effects.

The epicenter was 20 miles east of Alpine – closer to Marathon, in fact. With a magnitude of 5.7, it struck the night of April 14.

“A lot of people thought it was a train derailment in Alpine,” Elmore said. “It made a loud noise. People ran outside and were like, ‘Oh, it’s a train derailment!’ Our judge from Brewster County, Judge Cano, said he’d felt it and thought it was a train derailment, too.”

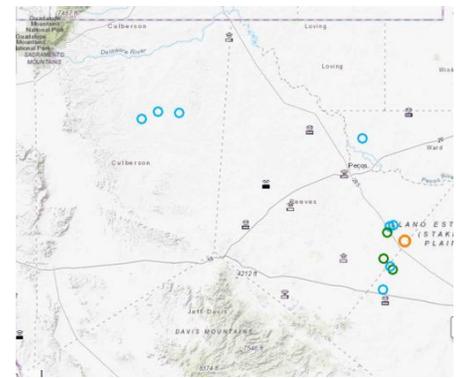
Chimneys collapsed in Alpine. Water pipes broke at Panther Junction. The tremor was felt as far away as Austin. A powerful aftershock followed the next morning.

The cause is a phenomenon known as the Rio Grande Rift. From southern Colorado to West Texas, tectonic forces are tearing a gash in the continent. It’s the route of the Rio Grande in New Mexico. Faulting from the rift has produced dramatic relief in West Texas – including the towering escarpment at the mouth of Santa Elena Canyon. And the “tearing” continues.

Then, there’s human activity.

During the last 15 years, fracking has opened up sprawling new oil plays here. Fracking includes the injection of wastewater deep into “basement” rocks. There’s scientific consensus those injections intensify seismic activity. In West Texas and eastern New Mexico, earthquakes measuring at least 2.5 tripled between 2017 and 2018 – to more than 60.

Many were in Pecos, Reeves and Culberson counties – where fracking in the Delaware Basin formation is booming. It’s likely the boom will continue. In December 2018, the U.S. Geological Survey said the Delaware Basin has among the largest petroleum reserves in the world.



An image from TexNet, the Bureau of Economic Geology's "earthquake catalog," shows the locations of a dozen earthquakes that occurred in Pecos, Reeves, Culberson and Ward counties between Dec. 10 and Dec. 22, 2018. The quakes ranged in magnitude from 2.0 to 3.7. (Bureau of Economic Geology, UT-Austin)

It was 60 years between the Valentine and Alpine quakes. But Elmore said that fracking might shorten that window – and make the next event more powerful.

“We’re on the Rio Grande Rift with the tectonics moving, and we have extensive drilling, so I’m pretty sure that if we have another one, it’s probably going to be bigger,” Elmore said. “It is on the radar, for another earthquake to happen, we just don’t know when.”

Recently, Elmore joined staff from UT’s Bureau of Economic Geology, as they installed a seismic machine in Alpine, on Hancock Hill. They’ve installed 50 across the state. The Texas legislature has tasked the Bureau with documenting earthquakes, and helping to prevent those that may be caused by human activity. Listeners can learn more about the program – called TexNet – and see a map of earthquake activity, at the Bureau’s website.

In addition to her studies, Elmore is Brewster County’s emergency management coordinator. Her geology background is proving useful. With other regional officials, she’s taking a closer look at earthquake risks, and earthquake preparedness.

It’s a surprising lesson: the West Texas landscape is hard, but that doesn’t mean it’s stable.

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