

States' efforts to curb fracking-related earthquakes appear to be paying off

By Jen Fifiield August 15

Stopping an earthquake before it starts? It sounds like a feat possible for only a superhero.

But policymakers in Kansas and Oklahoma are showing that insofar as humans are causing earthquakes, they can stop them, too. After restricting oil and natural gas operations in certain hot spots, Oklahoma is feeling an average of about two earthquakes a day, down from about six last summer, and Kansas is feeling about a quarter of the tremors it once did.

Using a growing body of research, along with trial and error, scientists and state regulators are getting closer to pinpointing the cause of the startling increase in earthquakes in the central and eastern parts of the country, and preventing them.

The general cause, scientists have found, is not drilling, but what happens after, when operators dispose of wastewater that comes up naturally during the oil and gas extraction process. The operators inject the wastewater into disposal wells that go thousands of feet underground, which can increase fluid pressures and sometimes cause faults to move.

Since March 2015, Kansas and Oklahoma have placed new restrictions on how much wastewater each operator in certain areas can dispose of at a given time.

About 7 million people in central and eastern states are now at risk of man-made shaking powerful enough to crack walls and knock items off shelves, according to a one-year [forecast](#) released by U.S. Geological Survey in March. The report outlined the risk from man-made earthquakes for the first time, listing the states with the highest risk as Oklahoma, Kansas, Texas, Colorado, New Mexico and Arkansas.

Political tensions

The tension below ground brought rise to political tension, too. Many of the epicenters are in rural towns in conservative states, which generally shy away from government regulations. The oil industry regulators in Oklahoma and Texas are elected officials, with campaigns often funded in part by contributions from the industry, said Cliff Frohlich, a seismologist with the University of Texas at Austin who has studied man-made quakes in Texas.

In Oklahoma, Gov. Mary Fallin (R) was at first hesitant to connect wastewater disposal with the quakes. Now, she's taking action. In January, she allotted \$1.4 million in emergency funds to the state's regulators and scientists to increase the monitoring and research.

"Like many other Oklahoma residents, I have felt my walls shake from earthquakes that have struck our state with increasing frequency over the past few years," Fallin wrote that month.

States in the central part of the country really weren't ready for earthquakes, because they didn't need to be. From 1973 to 2008, according to USGS, the region saw, on average, 24 earthquakes of magnitude 3 or larger each year. (These are quakes that can cause at least minor damage.)

The USGS tallied 1,010 earthquakes in the region last year, a number that had increased steadily from 318 in 2009. Parts of this region, including northern Oklahoma and southern Kansas, are now as seismically active as California.

"Every scientist working in the midcontinent of the U.S. is pretty confident that the vast majority of these earthquakes are induced," said Tandis Bidgoli, an assistant scientist and geologist for the Kansas Geological Survey.

The spike corresponds with the drastic increase in oil and gas operators' use of hydraulic fracturing, or fracking, a technique in which water, sand and chemicals are pumped at high pressures underground, fracturing rock and freeing trapped oil and gas. Fracking has allowed operators to drill in new places and get much more from each site. While fracking itself is rarely the cause of quakes, it is one reason there is so much more wastewater to dispose of, Bidgoli said.

Injection wells have been safely used for wastewater disposal for decades, with permission from the U.S. Environmental Protection Agency, which has directed operators to bury the water thousands of feet below ground to avoid surface contamination. But now the agency is looking for other options.

Meanwhile, scientists are trying to pin down answers: Is the wastewater being buried too deep, or is there too much being buried, or are large amounts being buried too quickly?

States' responses to the quakes have varied. Scientists and regulators say that's mostly a good thing, because the geology of each area varies.

Since 2008, Arkansas, Colorado, Ohio and Texas have placed new restrictions on the disposal of wastewater in injection wells, although those haven't affected operations as broadly as the new rules in Kansas and Oklahoma.

Kansas was studying the issue in 2014 when a magnitude-4.8 earthquake hit southwest of Wichita. That day, Gov. Sam Brownback (R) announced the expansion of the state's seismic monitoring system. In March 2015, the Kansas Corporation Commission began limiting wastewater disposal in five zones and two counties.

Fewer tremors

Since then, the state has felt fewer tremors. In the last six months of 2015, there were 39 quakes of magnitude 2.8 or larger, compared with 48 quakes during the last six months of 2014. In the first six months of 2016, only 11 were recorded by

USGS. This is probably a result of the new restrictions and the slowdown in oil and gas production, said Rex Buchanan, interim director of the Kansas Geological Survey. The number of oil and gas wells drilled in the state declined almost 64 percent, to 2,080, in 2015.

Oklahoma was slower to make sweeping changes, although it began regulating the wells in 2013. In spring 2015, the state took its first broad approach, asking all operators to prove they weren't drilling too deep. But when quakes continued to increase, the state decided that volume cutbacks were needed. In March, the Oklahoma Corporation Commission began restricting how much wastewater operators dispose of in about 600 of its 3,800 disposal wells, in certain hot spots.

Since the regulations took effect, Oklahoma operators have drilled a million barrels fewer each day, a decrease driven by both the new rules and low oil and gas prices, said Jeremy Boak, a geologist and director of the Oklahoma Geological Survey.

Oklahoma felt 619 earthquakes of magnitude of 2.8 or greater from January through June, compared with 701 during the same time last year, according to USGS data.

Regulators in Kansas and Oklahoma say oil and gas companies resisted the new rules at first, but the companies are now cooperative, even helpful, in providing information about their land and operations.

This is mostly because the companies are a part of the communities they work in, said Steve Everley, a spokesman for Energy in Depth, an advocacy branch of the industry-backed Independent Petroleum Association of America.

“At the end of the day, they just want the earthquakes to slow down and eventually stop,” Everley said. “If that means do this or do that, they are willing to do that.”

Scientists are worried about what will happen when production picks up again. If the business becomes more profitable, more people in larger areas may be at risk of quakes, Bidgoli said.

— Stateline

