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## West Texas sinkhole studies show more reasons for concern

**Officials say sinkholes are specific to certain area and questions remain about link to abandoned wells**

By Trevor Hawes, [thawes@mrt.com](mailto:thawes@mrt.com) Published 10:56 pm, Saturday, April 7, 2018



IMAGE 1 OF 3

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Two sinkholes between Wink and Kermit off I-20 west of Midland-Odessa.

A recently released geological study by a pair of Southern Methodist University researchers shook West Texas with news about what's happening underground — but earthquakes weren't the issue.

In 1980, a sinkhole northeast of Wink formed suddenly, and ground collapsed in 2002 just east of the West Texas town, making an even larger hole. The Wink Sinks, as they're called, are more than just geological curiosities. Several organizations have since researched areas around West Texas to see if sinkholes can happen in other

parts of the Permian Basin.

The latest study by SMU's Jim-Woo Kim and Zhong Lu — in only looking at an area of about 60 miles by 60 miles — has found six.

The pair of professors used public data from the European Space Agency's Sentinel-1A/B satellites, which feature interferometric synthetic aperture radar, or inSAR. In simple terms, the radar can capture very fine changes to the Earth's surface. What they found were areas of concern near Wink, Monahans, Grandfalls, Imperial and Pecos.

Of particular concern is an area just east of Wink Sink No. 2 — the larger one — at the intersection of county roads 201 and 204 in Winkler County. The area has seen subsidence of 40 centimeters per year since 2014. Fissures across the CR 201 are visible on Google Earth.

"That area is sinking at half a meter per year," Lu told the Reporter-Telegram. "I cannot predict when a hole will be produced in that area, but you can see cracks and fissures nearby. I haven't seen that amount of subsidence anywhere."

University of Texas Bureau of Economic Geology geoscientist Jeffrey Paine has studied the Wink Sinks for more than a decade. He's aware of the area east of Wink Sink No. 2.

"Some people call that Wink Sink No. 3 already," he said. "It just doesn't have steep walls like the sudden collapses at Wink No. 1 and Wink No. 2."

Paine noted that there has been a "huge amount" of subsidence at the site but said the SMU figure is probably the maximum rate. "We're seeing something on the order of a couple of centimeters per month from topographic comparisons sustained over several years. Those rates are what we saw in our earlier radar interferometry study, as well."

Not all areas in SMU's study are subsiding, however. A location west of Wink and one near Monahans are seeing uplifts, meaning the land is getting higher. The Wink spot is the site of a wastewater injection well. Near Monahans is a CO2 injection well. The

reason for the uplifts isn't known.

All of the areas in SMU's study and existing sinkholes — including one near Imperial that already has caused the Texas Department of Transportation to reroute Farm-to-Market 1053 — have a common factor: They're in a very specific area of the Permian Basin.

Odessa-based hydrologist Gil Van Deventer, who is working on resolving several subsidence issues near Imperial, said the areas being researched are all on the rim of the Delaware Basin, a subbasin of the Permian, which abuts the Central Basin Platform. Above the water-rich San Andres formation is the Salado formation, a salt evaporate deposit.

The water in the San Andres is under artesian pressure and can move up into the Salado by both natural and unnatural circumstances, eroding the salt in the Salado and causing voids that can lead to subsidence and sinkholes.

"When you look at Imperial, back in the 1940s through the 1960s, there were many well tests," Van Deventer said. "They were looking for oil in the San Andres formation, for instance. They didn't find oil, but in many cases they left those wells behind for the landowners because it had water. The unique thing down there is the water is artesian flowing; it's under pressure, so it flows to the surface without a pump. Those wells flow anywhere from 1,000 gallons per minute to 4,000 gallons per minute."

When wells lose their integrity, water from below can flow into the Salado. Abandoned wells that haven't been properly plugged can cause problems, especially when flowing unknown for decades.

"As a historical footnote, as the first flowing San Andres well in Pecos County near Imperial was drilled in 1926 by Carl Cromwell," Van Deventer said. "Cromwell was the infamous driller who drilled the Santa Rita No. 1 in Texon back in 1923. Sure enough, he drilled one of these wells down there, and it was left there to be used by whoever owned the property then. That well might actually still be flowing out there, not that it's being used."

The abandoned wells near Imperial yielded brackish water when drilled in the middle of

the last century in the hunt for oil. They were turned over to landowners and have since been orphaned. One such well corroded and has been spewing water for decades, creating a water feature known as Boehmer Lake, which is visible on satellite imagery.

The Railroad Commission has plans to plug 3,000 abandoned wells across Texas over the next few years; however, those that aren't on the books as oil and gas wells are excluded from the plugging program. The result is continued flowing water without a solution.

"The Railroad Commission will take action on any well to plug or repair it, when we have evidence the well is an abandoned oil or gas well," RRC spokeswoman Ramona Nye told the Texas Tribune in a 2016 article that featured Boehmer Lake. "If the well has been transferred over for use by a private landowner for irrigation or for a water supply well, the Railroad Commission no longer has jurisdiction or authority to plug the well."

Texas Commission on Environmental Quality spokesman Terry Clawson told the Tribune that his agency doesn't have any plugging responsibilities, water wells or otherwise.

No state agency has such a role. "That's the biggest problem we have," said Van Deventer told the Tribune. "No one wants to claim responsibility."

Research about the causes and the state of the ground underneath is also lacking. "(The rim of the Delaware Basin is) one area where there hasn't been as much research as there needs to be," Paine said. "What are the specific causes and settings where a sinkhole formation occurs?"

"Places like Wink have a favorable subsurface groundwater regime, and you have penetration through the salt by wells that allow water to get into the salt and dissolve it. But not every place is like that, and certainly not every penetration of salt has led to sinkhole formation. Conditions have to be uniquely suited for formation of something like that."

Analysis of the Bureau of Economic Geology's 2017 airborne lidar data has been shelved as the bureau works on areas affected Hurricane Harvey. "Right now, that's the

most pressing geologic hazard affecting the state of Texas."

Lu made clear to the Reporter-Telegram that even though his study tied wells to the areas where geological issues are occurring, he is not placing blame. "I don't want people to say we're pointing fingers toward the hydrocarbon industry." Analysis revealed wells at the sites, and research connected them with API numbers, but more research is necessary to find if and how the wells are affecting the areas.

For his work around Imperial, "I just want to go out and inventory all of those wells, categorize them and write a report so we have something on the shelf that identifies the well and its features," Van Deventer said. "Then we would take the next step of fixing the problem."

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## SMU STUDY AREAS

Here are where the areas where Southern Methodist University researchers have found areas of subsidence and uplift in the Delaware Basin:

Location	Lat/Lon	Basin	Period	Magnitude	Size	Cause	Seismicity
Wink, TX	N31.78° W103.31°	Delaware Basin	01/2016~07/2016	5 cm (uplift)	2.0 × 2.0 km	Wastewater injection	No
Monahans, TX	N31.51° W102.97°	Midland Basin	11/2014~01/2016	3 cm (uplift)	6 × 4 km	CO <sub>2</sub> injection	No
Grandfalls, TX	N31.27° W102.96°	Delaware Basin	11/2014~04/2017	23 cm (subsidence)	1.4 × 1.0 km	Salt/limestone dissolution	No
Imperial, TX	N31.21° W102.75°	Central Basin Platform	11/2014~04/2017	9 cm/yr (subsidence)	650 × 350 m	Impounded freshwater from abandoned wells	No
Wink, TX	N31.78° W103.12°	Delaware Basin	11/2014~04/2017	40 cm/yr (subsidence)	380 × 280 m	Salt dissolution	No
Pecos, TX	N31.35° W103.48°	Delaware Basin	01/2017~04/2017	4.5 cm (subsidence)	2.5 × 1.0 km	Hydrocarbon production	Yes

## LINKS

::: Read the latest SMU study: <https://www.nature.com/articles/s41598-018-23143-6>

::: Learn more about the Wink Sinks: <http://www.beg.utexas.edu/research/programs/near-surface-observatory/wink-sink>

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