

# Bigger wells, but more water

By Jennifer Hiller | January 20, 2018 | Updated: January 21, 2018 8:04am

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Photo: William Luther / San Antonio Express-News

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leading to wells that make more oil, but also require more resources, according to a San Antonio Express-News analysis of the data drillers have reported to the industry website FracFocus for the past seven years.

The amount of water used per well in 2016 averaged 9.7 million gallons in South Texas' Eagle Ford Shale oil field, up from 4.5 million gallons in 2013.

In the Permian Basin in West Texas, it took an average of 10.5 million gallons in 2016 to make a well, up from 2.7 million gallons in 2014 and 5.4 million gallons in 2015.

Those bigger, more water-intense wells are helping push Texas and the U.S. toward what's expected to be record oil production this year.

The Eagle Ford pumps 1.2 million barrels of crude oil per day, and the Permian Basin this month will reach 2.8 million barrels per day, according to the U.S. Energy Information Administration.

Both regions are helping propel the U.S. toward what's expected to be historically high oil production — in 2018, U.S. crude oil output is expected to average 10 million barrels per day, which would surpass the 1970 record of 9.6 million barrels per day.

## Oil production and water use in Texas fracking

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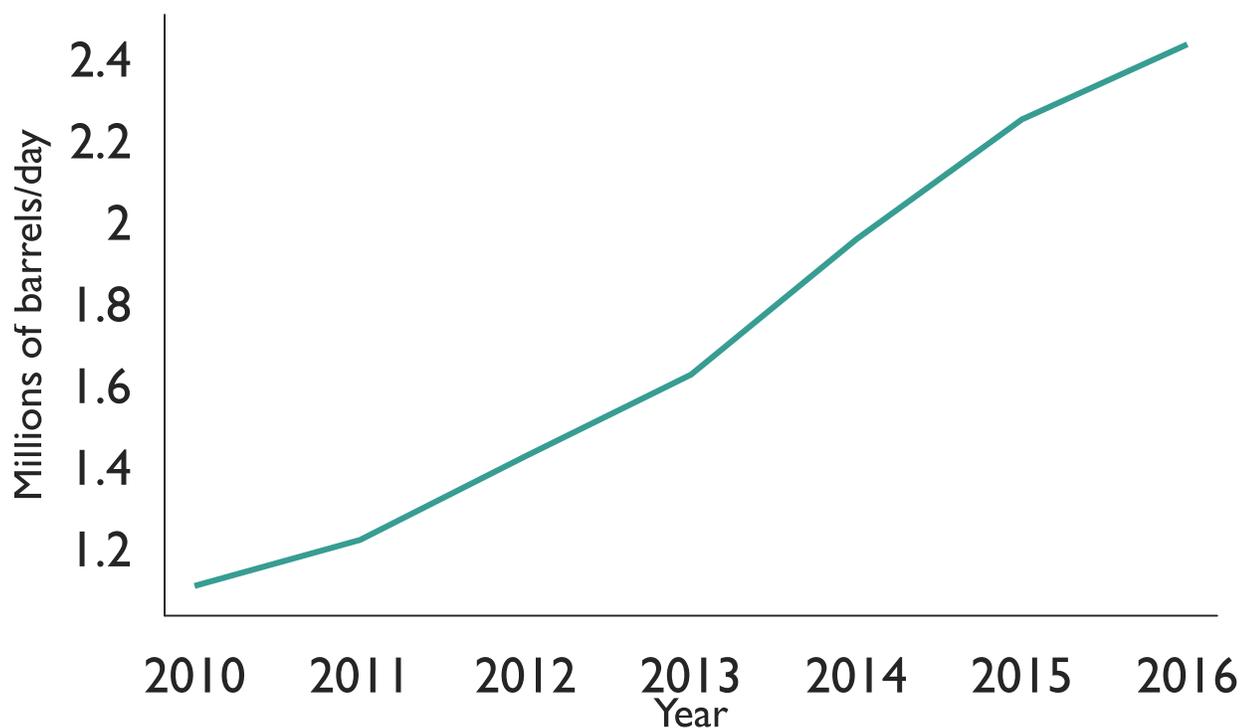
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Source: FracFocus Chemical Disclosure Registry, U.S. Energy Information Administration

Allen Gilmer, co-founder of the research firm Drillinginfo, said today’s wells are a different breed than ones from a few years ago.

“In the Permian Basin today, the wells relative to 2013 are twice as good,” Gilmer said. “In the Eagle Ford they’re 50 percent better.”

The drilling is happening in the driest parts of the state. And it coincided with one of the worst droughts in the state’s history.

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cycle,” said Marilu Hastings, vice president of sustainability programs for the Mitchell Foundation. “The current frameworks aren’t adequate for managing groundwater.”

The Mitchell Foundation was founded by the late George Mitchell, known as the “father of fracking.” His company was the first to figure out how to wed horizontal drilling techniques with hydraulic fracturing — the process of using water, chemicals and sand at high pressure to break tight rock and prop open the cracks, releasing oil and gas. Mitchell unleashed a new era in the industry.

“Because of technological developments, we’re finding more and more oil, and finding it in places that aren’t the ideal places for oil and gas development if water is a key input to production,” Hastings said. “In the western part of the Permian we’re really in the thick of the Chihuahuan Desert. There is no surface water. Mercifully, we have a lot of brackish groundwater.”

Water use in the oil field is a complex issue. Fifteen swimming pools per well is a lot of water, but it’s also used to make a lot of oil.

Water use hasn’t been on a steady climb in the oil industry, either. The multiyear oil price bust, which started in late 2014, shelved projects and laid off tens of thousands of workers, and water use dipped. In 2016, the industry in Texas used 39.7 billion gallons of water to drill wells, down from 55.7 billion gallons in 2014, an analysis of FracFocus data shows.

## The source

Danny Reible, a chemical engineering professor at Texas Tech University, said the issue isn’t the intensity of the wells — wells that require a bunch of water may be so productive that fewer wells need to get drilled.

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## Average Water Use Per Frac Job - Permian Basin

Permian Basin

Eagle Ford

Barnett Shale

In 2016, the average Permian Basin frac job used **10,496,987.86** gallons of water.

That's enough to fill **15.90** Olympic swimming pools.



Source: *FracFocus Chemical Disclosure Registry.*

“You have to monitor not just total water use, but what sort of water,” Reible said

Researchers at the University of Texas at Austin estimate about a fifth of oil-field water used comes from a nonfresh source, including brackish aquifers. Some operators reuse the water that returns after hydraulic fracturing, called flowback water, and the water that comes out of the rock formation itself alongside oil and gas — production water. Others purchase municipal wastewater from cities. Some do all of that.

Reible served on the shale task force of the Academy of Medicine, Engineering and Science of Texas, a conglomerate of Texas research scientists that spent two years reviewing the impacts of shale development on earthquakes, wildlife, air quality, water, transportation and residents.

The task force report was released last year and said that as much as 90 percent of total water use in some sparsely populated counties might be associated with fracking. Groundwater declines of as much as 100 to 200 feet have been recorded in parts of the Eagle Ford and Permian.

Statewide, overall water use by the oil and gas industry is small — 1 percent. It pales in comparison to use

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Apache Corp. wa

and to recycle its own wastewater to reuse in the next frac job.

“It also has the added benefit of reducing disposal and transportation needs as well,” spokeswoman Castlen Kennedy said.

In College Station and in Canada, Apache used treated municipal wastewater to complete wells. In West Texas, it tapped brackish water from the Santa Rosa sandstone.

In the Alpine High field near Balmorhea in West Texas, Apache’s newest oil and gas discovery, it built five water recycling facilities that can store 3 million barrels of wastewater, around 126 million gallons, and has recycled 80 percent of its wastewater so far.

“We are implementing this process throughout Alpine High wherever landowner agreements do not require Apache to utilize their water resources,” Kennedy said, highlighting something that’s a common stumbling block to recycling in Texas — oil and gas leases often require oil companies buy water from ranchers because it’s a source of revenue. (And most ranchers would rather have an oil company drill a new fresh water well on their land than a brackish well — when drilling is done, they have a useful well).

In the Eagle Ford Houston-based Cenozoic Phillips says deep aquifers that landowners own’t using. The compa the Texas Water I Texas and the U.S

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Examples of creative water sourcing or recycling are plentiful, but Reible noted that there's also the bottom line. Oil is a business, water is a cost and no one makes companies do this.

"The reality is water is cheap," said Reible. "It becomes really difficult to bother with an alternative source."

## Better wells

Texas laws give drillers the right to use the well water they need to to complete wells, but operators don't use more water just because they can.

Pushing more sand and more water into wells definitely has led to better results across the Eagle Ford, Jennifer Jacobs, an evaluations engineer with BMO Capital Markets, said when she spoke at the DUG Eagle Ford Conference in November in San Antonio.

"There probably is a tipping point on that," Jacobs said.

Some companies have started to cut back on the amount of sand and fluid, she said, in an attempt to see if they can save money without sacrificing well results, she said.

Patrick Oenbring, CEO of Hawkwood Energy, who also spoke at the conference, detailed the resources required in the latest generation of oil wells. It starts with 100 rail cars of sand for each well.

"So we run basically 50 trucks a day 24 hours a day for two weeks, with each truck hauling 20 to 25 tons of sand," Oenbring said.

The amount of water pumped to carry that sand is about equal to what the company hopes the well will produce in oil over its life, "and maybe the life is 20 years. A lot of fluid goes in in the first couple of

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Oenbring ticked (Subscriber Login

produced — its wells make 30 percent to 40 percent water, the rest oil.

In the Permian Basin, it's another story. Companies produce far more water than oil there.

“All those guys ... (in the Permian) are essentially water disposal experts,” Gilmer of Drillinginfo said, as it's the one spot in Texas where water recycling often is cheaper than disposal.

Bob Watson, chief executive of San Antonio-based Abraxas Petroleum, said finding water and then figuring out what to do with it is a key challenge to working in West Texas.

“If you get a well that's 35 percent oil, you're doing good. That's after you get your frac water back,” Watson said.

Abraxas wells are returning about 35 percent water and 65 percent oil in the Permian.

## The future

Drillers traditionally have gotten rid of their contaminated water by taking it to a saltwater disposal well, where it gets pumped into a depleted oil and gas reservoir.

Colin Leyden, a senior manager at the Environmental Defense Fund, said it's hard to change a longstanding industry practice.

“I think what they're struggling with is it all comes down to disposal wells are the classic, cheapest way to deal with it,” Leyden said. “The water is only good to you while you're drilling. After that it's a waste product.”

Disposal wells are common across the state, but they've been linked to an upswing of earthquakes in so

Recycling oil field

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In rural Gonzales County, Challenger Water Solutions is recycling oil field water. Water goes in brownish-gray and comes out clear, and Clint Layman said the company can do it at a price that's on par with traditional methods of sourcing and disposing of water.

It's still a tough sell.

“The real trick to it is getting the operators to use it,” Layman said. “Those guys don't like to deviate from the normal thing.”

Because there's so much skepticism about oil field water recycling, Layman invited companies to try the service, as well as scientists from UT Arlington's Collaborative Laboratories for Environmental Analysis and Remediation to study their process. The university group is characterizing thousands of organic, inorganic and biological constituents after each step of Challenger's process and will publish results independently.

Layman said he thinks the company has a chance to succeed — many water recyclers have come and gone — because it's cost competitive.

“That way you don't have everyone pulling water out of aquifers, and you don't have all the seismic issues,” he said.

## Average water use per frac job in Texas

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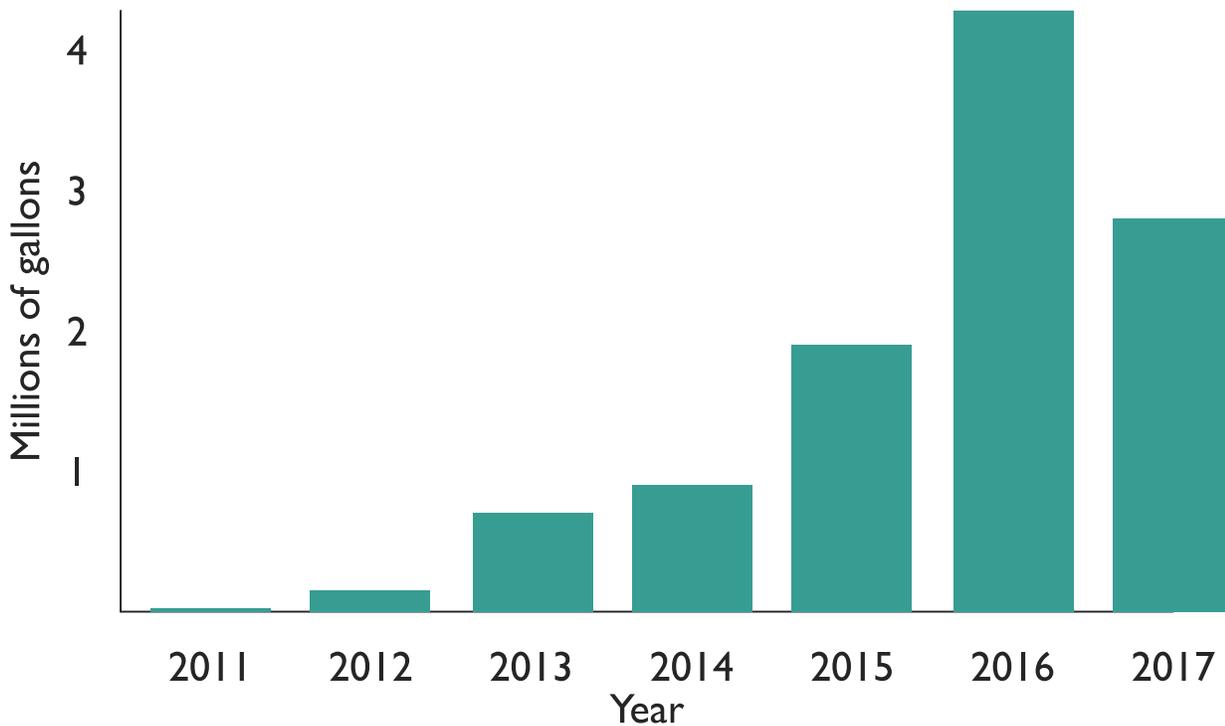
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Source: FracFocus Chemical Disclosure Registry. Data was not available for all counties in all years. 2017 data calculated through July 15.

Hastings, of the Mitchell Foundation, said the industry is moving toward more recycling and brackish water use.

“The desert is only going to get drier and you have water constraints,” Hastings said.

Water demand could keep growing, and locking down a supply is key for oil companies.

Executives at Permian-focused Pioneer Natural Resources have called their water program “a linchpin to our success.”

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