

FRACKING IN CALIFORNIA Water Use and Sources

LAWMAKERS, ENVIRONMENTALISTS, AND RESIDENTS in California have expressed concern about the amount of water used by hydraulic fracturing, or “fracking”. Some worry that the widespread use of fracking by the oil industry could worsen the state’s ongoing drought, or compete with other water users, such as cities, farms, and ranches. However, until recently there was insufficient public information available to evaluate this risk. A new state law passed in 2013 requires oil and gas companies to report information about the amount and source of water they use for fracking and other types of well stimulation. This new information shows that, unless extraction technologies change dramatically, fracking will continue to make up a relatively small proportion of the water use in most areas of the state. This issue brief presents information and data on water use for fracking in California, comparing it to water use for other oil and gas activities, and to water use for fracking in other parts of the country.

WATER USE FOR FRACKING

The amount of water used for fracking in California is relatively small compared to other local water uses. Over the last five years, water use for fracking in California averaged 210 to 290 million gallons (640 to 900 acre-feet) per year ([CCST and LBNL 2015a](#)).¹ Fracking is concentrated in western Kern County, and even in that area, accounts for only 0.19% of total water use ([CCST and LBNL 2015a](#)). Water use for fracking in other areas is even lower, averaging 0.0004% of total water use.

Additionally, the water intensity of fracking in California is much less than in other parts of the United States. In California, each fracking operation



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uses an average of 140,000 gallons.² By comparison, in Texas’ Eagle Ford Shale formation, each operation uses 30 times as much water, or 4.25 million gallons of water ([CCST and LBNL 2015b](#)). Less water is used in California because fracking occurs at shallower

¹ Matrix acidizing and acid stimulation are much less frequently practiced in California, although both use water, mixed with acid, to dissolve some of the rock and increase permeability. In addition, another form of low-volume fracturing, referred to as “frack-packing”, is performed to allow oil to flow more freely in the zone immediately around the well. This process typically uses about 1/10th the volume of fluid and sand as a regular fracking operation.

² New York’s ban on high-volume fracking applies to fracking jobs using more than 300,000 gallons of water. Thus, if California adopted the same standard as New York, 90% of the fracking practiced in the state would not be affected ([CCST and LBNL 2015a](#)).



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depths, in naturally fractured rocks. This means that California drillers need less pressure to create fractures in underground rocks, and treatment occurs over much shorter depths than in the long, horizontal wells common elsewhere. Moreover, most fracking in California uses thicker, gel-based fluids that require less fluid than the “slickwater” that is typically used in other states. Note that while gel-based fluids require less water, they have a higher concentration of chemicals than other types of fracking fluids.

State law (SB4 of 2013) requires oil and gas companies to report how much water they use for fracking and other types of well stimulation, as well as the source of that water. Since reporting began, we have learned that the vast majority of water used for well stimulation in California is freshwater. Oil companies prefer freshwater for fracking fluid because salty water can interfere with chemicals in the fracking fluid and cause corrosion and other problems in pumps and pipelines. In 2014, 68% of the nearly 45 million gallons of water for well stimulation was purchased from nearby irrigation districts (Table 1).³

³ “Well stimulation” includes techniques that increase or improve the flow of oil and natural gas into the wellbore. Fracking is one kind of well stimulation, but there are others such as matrix acidizing and acid fracturing. The data and information in the CCST and LBNL study typically address well stimulation generally. Although it’s not possible to give specific figures for fracking, it is still by far the most common technique used in California.

Thirteen percent of water used for well stimulation was “produced water”, or recycled wastewater from oil and gas production. Another 13% came from the company’s own groundwater wells. About 4% of water for stimulation came from municipal water suppliers and 1% came from a private landowner.

Table 1.
Water used for well stimulation in California in 2014, by source.

Water source	Number of well stimulations	Million gallons of water used	Percent of water used
Irrigation district	399	31	68%
Produced water	43	6.0	13%
Own well	28	5.8	13%
Municipal water supplier	9	1.9	4%
Private landowner	1	0.5	1%
Total	480	45	100%

Source: [CCST and LBNL \(2015b\)](#)

Note: Numbers may not sum to total due to rounding.

WATER USE FOR ENHANCED OIL RECOVERY

Fracking is just one way the oil industry uses water. Water is used throughout the oil and gas exploration, drilling, and production process. One of the largest uses of water in petroleum production is for “enhanced oil recovery” (EOR). In California, the most common EOR technique is steam flooding, where millions of gallons of steam and hot water are injected into the ground to increase the temperature and pressure in the reservoir. Steam reduces the viscosity of the oil and the condensed hot water pushes the oil to production wells.

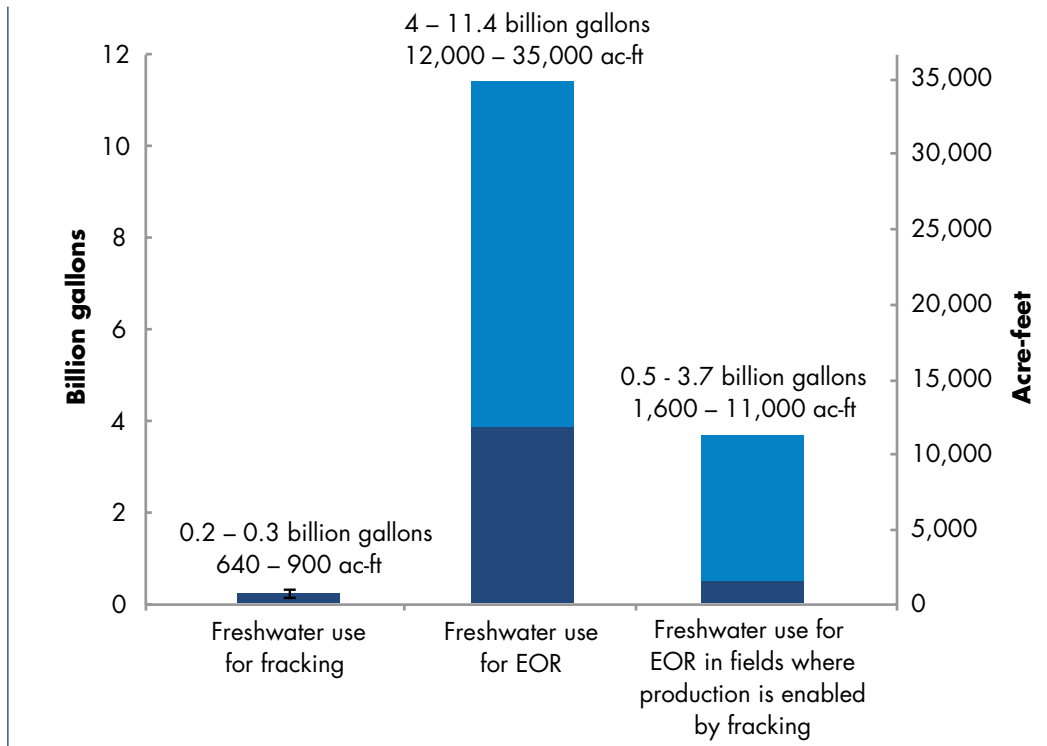
In 2013, freshwater only accounted for about one-third of the water injected for EOR. In the same year, California oil and gas companies used between 4 and 11 billion gallons of freshwater for enhanced

Figure 1.

Annual freshwater use for well stimulation compared to water use for enhanced oil recovery (EOR). 🔍

- Possibly freshwater
- Reported freshwater

Source: [CCST and LBNL \(2015a\)](#)



oil recovery (Figure 1) ([CCST and LBNL 2015a](#)).⁴ In addition, two-thirds was produced water, or water that is pumped to the surface along with oil and gas. Therefore, oil and gas companies are reducing their demand for freshwater and reusing water that would otherwise be a waste stream in need of disposal.

Oil companies use up to ten times more freshwater for EOR than they use for fracking; however, a significant fraction of the oil industries’ freshwater use for EOR is linked to fracking. As much as a third of the industry’s freshwater use in 2013 was for “fracking-enabled fields”; that is, for use in oil and gas fields where wells had been fracked. Fracking has allowed oil production to expand into new areas where oil production would likely not be profitable without it. The development of new oil fields creates new demand for water, particularly after the well

has been drilled and producers begin using EOR methods which use far more water than fracking. In these cases, fracking indirectly contributes to increased water use for EOR by the oil industry.

Oil companies obtained water for EOR from a variety of sources. Sources of freshwater included municipal water suppliers (72%), groundwater wells (25%), and wastewater from industrial facilities (1.6%). In a few cases, companies did not report the water source (1.4%) or reported the source as “another source or combination of the above sources” (0.1%). When EOR is compared to fracking, oil companies rely much more heavily on recycled water from their own operations. After this, they purchase a higher percentage of water from municipal suppliers or nearby cities.

THE FUTURE OF WATER USE FOR FRACKING IN CALIFORNIA

Fracking in California uses relatively little water compared to other local uses of water, and unless extraction technologies change dramatically, it will

⁴ The estimated range of freshwater use for enhanced oil recovery is so large because of ambiguity in the reporting categories in DOGGR’s database, which includes categories that may be composed partly or entirely of freshwater, including “water combined with chemicals such as polymers”, “another kind of water”, and “not reported”.

continue to make up a relatively small proportion of local water use. Indeed, far more water is used for enhanced oil recovery (CCST and LBNL 2015a), suggesting that focusing on the water demands of fracking may ignore the larger issue of other water uses for oil and gas extraction.

However, while water use for fracking is relatively minor, most of the fracking activity in California is concentrated in the San Joaquin Valley, where surface water is diverted from faraway rivers and groundwater has been over-drafted by agriculture for more than 80 years. In addition, farmers and communities in

the San Joaquin Valley depend on imported water delivered by canals, deliveries of which have been unreliable in recent years due to drought. New or increased demand from fracking operations may further exacerbate water scarcity concerns in these areas, particularly in the face of reoccurring drought. Oil and gas companies should take steps to reduce or eliminate their use of freshwater that could otherwise be put to agricultural or municipal uses. Companies can do this by increasing the amount of water that they treat and recycle onsite, or by using recycled wastewater from cities or other industries.

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Acknowledgements

This work was made possible by support from the Kindling Foundation.



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