About half of hydraulically fractured wells exist within 2 to 3 kilometers of domestic groundwater systems: study

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Hydraulically fractured wells in California's Central Valley. Credit: Debra Perrone

How safe is the water you drink? For the 45 million Americans who get their drinking water from private groundwater wells rather than a public utility, the answer is decidedly murky. The Environmental Protection Agency regulations that protect public drinking water systems don't

apply to privately owned wells, leaving owners responsible for ensuring their water is safe from contaminants.

In assessing how frequently hydraulic fracturing takes place close to a public water supply, a 2016 EPA report said that drinking water supplies located near hydraulic fracturing sites are more likely to be impacted should a contamination event occur. How many privately owned groundwater wells could face a similar fate is undetermined.

Motivated by the EPA study, UC Santa Barbara researchers Scott Jasechko and Debra Perrone sought to change that.

The investigators amassed a large database of private drinking water wells and compared their locations to hydraulic fracturing sites. Conducting a scientific analysis of data that spanned 15 years, from 2000 to 2014, and covered nearly 27,000 wells in 14 states, they found that about half of all hydraulically fractured wells stimulated in 2014 existed within 2 to 3 kilometers of a domestic groundwater well. Their results appear in the *Proceedings of the National Academy of Sciences*.

"This co-location emphasizes the need to determine the frequency that hydraulic fracturing activities impact groundwater well water quality. This knowledge is important to maintaining high-quality water in many domestic wells," said co-author Jasechko, an assistant professor at UCSB's Bren School of Environmental Science & Management. "Our results underscore the importance of increased water monitoring efforts near both hydraulically fractured and conventional oil and gas wells in ascertaining the risk of contamination and in protecting water well quality."

Jasechko and Perrone charted the data on a variety of maps, one of which tracked hotspots. "These hotspots are areas where, in light of potential contamination mechanisms, limited resources for assessing spill

frequency and well integrity could be used more effectively and efficiently," explained Perrone, an assistant professor in UCSB's environmental studies program.

Perrone noted that some hotspot areas include not only hydraulically fractured but also conventional oil and gas wells, which are more abundant. "We can use these hotspot analyses to focus resources, so that we can learn more about oil and gas contamination mechanisms: How often do they occur, and do they have an impact on groundwater?" she said.

"Our analysis underscores the need to increase monitoring efforts to maximize the probability that we can identify well waters that may be impacted, and do our best to remediate, contain and isolate potentially contaminated waters before they cause harm," Jasechko added. "We can consider stronger policies that include requirements for repeated groundwater quality testing of the many domestic self-supply wells that exist close to hydraulic fracturing."

Often, research can be limited by the amount of data available. In this case, the problem is a lack of consistent data across states as well as across industries. In fact, the scientists found vast differences in how states collect groundwater data.

"One policy recommendation would be to have a national standard for data collection on groundwater well construction," Perrone said. "On the energy side, a national standard for data collection for both unconventional and conventional oil and gas wells could provide opportunities for increased transparency across jurisdictional boundaries."

More information: Scott Jasechko el al., "Hydraulic fracturing near domestic groundwater wells," *PNAS* (2017).

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