

Review finds need for more water quality data in the Marcellus shale region

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(Phys.org) —What to do with Marcellus shale wastewater is one of the biggest concerns in Pennsylvania, and few published studies have evaluated such wastewater effects on regional waters, according to a review co-authored by professors at the University of Pittsburgh and Penn State.

Published online today (May 17) in the journal *Science*, the review stresses the need for scientific data on [water pollution](#) caused by [hydraulic fracturing](#) and cites a lack of monitoring stations and requirements concerning confidentiality as potential causes.

Susan Brantley, Distinguished Professor of [Geosciences](#) at Penn State and co-author of the review, said the findings highlight the need for more thorough and consistent [water quality monitoring](#) and more information about [risk factors](#) associated with the different parts of the region where deep horizontal drilling is taking place.

"Natural gas migration is a well-known [natural phenomenon](#) in many areas of Pennsylvania even before gas well drilling," Brantley said.

"When [gas wells](#) are drilled, sometimes the gas migrates around the well and into the groundwater. Though this is not common, more information is needed about the site-specific risk factors that contribute to those problems. Geological conditions can vary from one [gas drilling](#) site to another, and without that information it will be difficult to definitively answer the question of whether [gas extraction](#) through hydraulic fracturing is having an impact on water resources."

Intensive extraction of gas inside of the [Marcellus shale](#) began in the eastern United States in 2005 and the Marcellus has quickly become one of the top five unconventional [gas reservoirs](#) in the country. Previous studies have estimated this area could yield 489 trillion cubic feet of natural gas—an amount requiring high volumes of water used for what is often referred to as "slickwater fracturing."

Major concerns for the public have been whether stray methane can contaminate water supplies and whether the chemicals in the fluid used during the hydraulic fracturing process pose a threat to drinking water aquifers. The U.S. Environmental Protection Agency is currently studying the risks to groundwater from hydraulic fracturing.

"While stray gas can be minor and easily remedied, there has been one case attributed to a Marcellus shale well in which stray gas accumulation in a private water well was associated with an explosion that blew a concrete lid off the well," said Brantley, director of Penn State's Earth and Environmental Systems Institute.

The main cause of stray gas in private water wells is not having an adequate cement seal around the well and to a sufficient depth, which can allow the natural gas to migrate up into the groundwater.

"However, there is no evidence for widespread increase in methane concentration in Pennsylvania groundwater," Brantley said. "Instead, levels are similar to those recorded in New York, which has a moratorium on large-volume hydraulic fracturing."

On average, about 10 percent of water injected during hydraulic fracturing is recovered over several weeks, while the remaining 90 percent is not. Radisav Vidic, lead author of the review and William Kepler Whiteford Professor and chair at Pitt's Swanson School of Engineering's Department of Civil and Environmental Engineering, said

that observation indicates the importance of documenting potential transport pathways and the ultimate disposition of the water that does return to the surface. In addition, "stray gas" or gas leakage is a concern for the region.

"Since the advent of hydraulic fracturing, more than one million treatments have been conducted with perhaps only one documented case of direct groundwater pollution resulting from the injection of chemicals," Vidic said. "There is no evidence of groundwater contamination—even if it does exist."

Vidic cited state regulations as a possible cause.

"This gaping hole is likely there because Pennsylvania is one of only two states in the entire United States that doesn't require monitoring for water quality in individual well supplies," he said.

Provided by Pennsylvania State University

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