



Bundesanstalt für  
Geowissenschaften  
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## Umweltverträgliches Fracking ?

- Geologische Potenziale und technische Herausforderungen -  
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John H. Williams received a MS in Geosciences from the Pennsylvania State University in 1980 and has worked for the U.S. Geological Survey since that time. John has participated in groundwater and borehole geophysical investigations throughout the United States in cooperation with numerous Federal and State agencies. John's recent research has been focused on the geohydrologic characterization of deep coreholes above the Marcellus shale play. He has made invited presentations and provided technical advice on shale-gas development and water resources to the U.S. Environmental Protection Agency, Department of Energy, National Ground Water Association, Pennsylvania Department of Environmental Protection, New York State Department of Environmental Conservation, Empire State Water Well Drillers Association, New York State Assembly and Office of the Attorney General, and New York City Council.



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## Shale-gas development and water-resource issues in the United States with a focus on the Marcellus play

Horizontal drilling and high-volume hydraulic fracturing are being used to develop natural gas from organic-rich shale and other tight formations in the United States. Water-resource issues associated with the development of these unconventional reservoirs include the impacts of the water withdrawals for hydraulic fracturing, surface spills of hydraulic-fracturing fluids and flowback, disposal of drill cuttings and flowback, and stray gas migration. Concerns over the potential impacts to drinking water aquifers are paramount, and has led to moratoriums on hydraulic-fracturing activities in several States.

The status of Federal investigations on the environmental impacts of shale-gas development will be summarized including an update of the U.S. Environmental Protection Agency's drinking water study. National and regional research proposals under development by the U. S. Department of the Interior, Department of Energy, and Environmental Protection Agency also will be briefly described.

Since 2008, the Marcellus Shale play has been extensively developed in north-central Pennsylvania, a region where towns and the rural population are largely dependent on water wells that tap glacial-drift and fractured-bedrock aquifers. The impact of Marcellus gas development on the water resources has not been systematically evaluated but information and data from the industry, Pennsylvania Department of Environmental Protection, Susquehanna River Basin Commission, and U.S. Geological Survey provides some insights and lessons learned. The most widely publicized water-resource impacts in the region are due to stray gas migration. The occurrence of elevated methane concentrations in water wells appears to be associated with pre-existing aquifer conditions or, in some cases, surface casing and cement seals in gas wells that do not properly isolate the freshwater aquifer from underlying shallow gas zones.

Best practices currently applied during development of the Marcellus play to help mitigate water-resource impacts include: 1) geophysical logging of one topset hole per multi-well drill pad to help define the base of the freshwater aquifer, 2) surface and intermediate casing and cement seals to better isolate freshwater and shallow gas, 3) offsite disposal of drill cuttings, 4) low-flow assessment of surface-water withdrawals, 5) onsite storage of hydraulic-fracturing fluids and flowback in tanks, 6) recycling of flowback, and 7) water-quality monitoring of water wells within 1,220 meters of multi-well drill pads.