



Strategic Water Quality Monitoring Needed to Support Transparent Shale Gas Development in the Susquehanna River Basin

Hydraulic fracturing and shale gas development in the Marcellus shale of Pennsylvania has taken off in the past decade. The number of unconventional wells grew from less than 200 in 2007 to more than 9,300 as of August, 2015. Along with this new growth comes concern about potential water quality impacts of the relatively new technique of high-volume hydraulic fracturing (HVHF) and the cumulative shale gas development activities that have moved into minimally developed areas, especially in the headwaters of the Susquehanna River Basin.

A lack of information on water quality before and after development has fueled worries about contamination of surface water and groundwater that could result from shale gas development. While some citizens fully support hydraulic fracturing and economic development it brings, others have called for an outright ban on the practice, such as the HVHF ban in New York that was finalized in December, 2014. These opinions often pit neighbor against neighbor and conflict is fueled by a lack of information about water quality. Consequently, the availability of appropriate water quality data is critical to understanding the risks associated with hydraulic fracturing and how to adequately protect water resources during shale gas development.



Hydraulic fracturing in progress. Photo credit: USGS.

Do shale gas development activities contaminate surface water or groundwater?

This policy question was the subject of a study by the Northeast-Midwest Institute evaluating available water data to answer urgent water policy questions. The study found that, even after 8 years of intense shale gas development in the Susquehanna River Basin, current water quality monitoring is inadequate for detecting potential surface water or groundwater quality impacts of shale gas development activities in the basin. Historical monitoring sites are not located near hydraulic fracturing well pads, and more recent monitoring programs lack the frequency needed to detect water quality change to support timely decision making.

The study presents important findings regarding existing water data in the Susquehanna River Basin:

- The existing surface water data are insufficient to detect water quality change related to shale gas development. Out of approximately 14,700 surface water monitoring sites in the Susquehanna River Basin, only 10 monitoring sites have enough barium data (an indicator associated with HVHF development) for a water quality trend analysis, and none of these sites are located in watersheds with a substantial number of active HVHF wells; few of the 26 recommended surface water monitoring parameters are available for monitoring sites with a long-term data record.
- Recent targeted monitoring programs through the Susquehanna River Basin Commission and Pennsylvania Department of Environmental Protection are monitoring in appropriate locations, but additional sampling frequency, parameters, and streamflow data are needed before water quality trends can begin to be detected.
- The publicly available groundwater quality data in the Susquehanna River Basin are not sufficient to identify water quality change related to shale gas development and are not adequate to serve as the foundation of a new monitoring program.

The study also presents recommendations for immediate action:

- Increase sampling frequency at a subset of targeted surface water monitoring sites and maintain long-term monitoring, collecting the full suite of priority surface-water parameters and streamflow at each monitoring site. The incremental cost estimates for increased surface water monitoring and data analysis range from \$720,000 to \$1.7 million per year, a small percentage of the value of these water resources to the region.
- Design and implement a systematic, long-term groundwater monitoring program for detecting groundwater quality change related to shale gas development in the Susquehanna River Basin, building on data collected by shale gas development companies if appropriate. The cost estimates for implementing this groundwater monitoring program, including data analysis, range from \$362,000 to \$524,000 per year for the Susquehanna River Basin.
- Establish a coordinating entity to develop and implement surface water and groundwater monitoring plans in the Susquehanna River Basin, with representation from water monitoring organizations, shale gas industry, domestic well owners, and citizens.

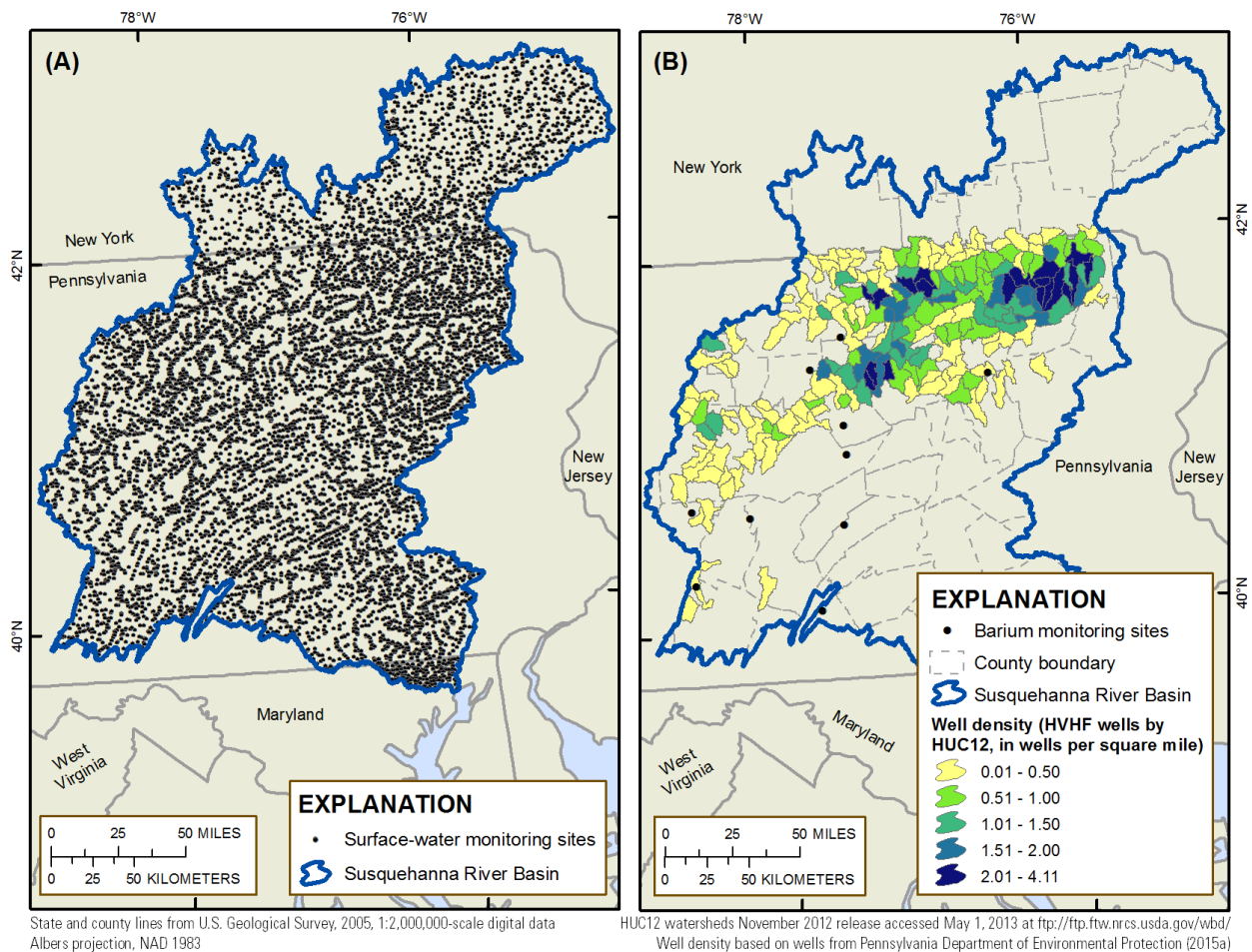


Figure (A) All the surface water monitoring sites (14,730) with data for at least one of the parameters associated with HVHF development in the Susquehanna River Basin, and **(B)** the 10 surface water monitoring sites with enough existing barium data (an indicator closely associated with HVHF development) for a water quality trend analysis. None of the 10 monitoring sites are located in a watershed with a high density of HVHF wells.

The study is summarized in a report prepared by Elin A. Betanzo, Eric R. Hagen, John T. Wilson, Kenneth H. Reckhow, Laura Hayes, Denise M. Argue, and Allegra A. Cangelosi. The complete study report can be found at www.nemw.org.