

BACKGROUND

Eighty-five percent of the Susquehanna River Basin is underlain by large reserves of natural gas located in sedimentary rock (shale) deposited over 350 million years ago in an inland sea located where the Appalachian Mountains now stand. The best known of these formations, the organic-rich black Marcellus Shale, holds one of the richest deposits of natural gas in the lower 48 states. Other gas-bearing formations underlying portions of the Basin include the Utica, Antes, Burket, Geneseo, Mandata, Middlesex, Needmore and Rhinestreet.

Extracting commercial quantities of gas from these unconventional sources is technically feasible due to advances in horizontal drilling and high volume hydraulic fracturing. The hydraulic fracturing process pumps large volumes of water mixed with sand and chemicals into the shale under very high pressure to shatter the formation, creating millions of fractures that allow the release and collection of trapped gas.

The shale gas development by the natural gas industry in the Basin began in earnest in 2008 when natural gas prices hit near record highs and finally made development of the Marcellus Shale economically attractive. At that time, the Commonwealth of Pennsylvania allowed natural gas development activities within its borders; however, New York State and Maryland placed moratoriums on unconventional drilling until additional studies could be conducted. After more than seven years of study, New York State banned hydrofracturing in June 2015. Maryland released new draft regulations about hydrofracturing in western Maryland in September 2016.



KEY WATER ISSUES

The potential impacts of hydraulic fracturing on public water supplies and on the integrity of surface and groundwater is cause for concern, both from a water quantity and water quality perspective. Key water-related issues include:

1. impact of water withdrawals on small, remote forested streams, often home to wild trout and other sensitive species;
2. potential for water contamination resulting from poor casing or inadequate grouting of well bores, or from flooded or leaking waste holding pits;



3. runoff from well pad sites, pipelines and unpaved roads;
4. natural gas migration into streams and nearby water wells;
5. the handling and disposal of fluids that return to the surface after hydraulic fracturing (flowback);
6. disturbance of sensitive lands adjacent to water bodies; and
7. spills.

In Pennsylvania, the PA Department of Environmental Protection has a regulatory role in many of the issues listed above.

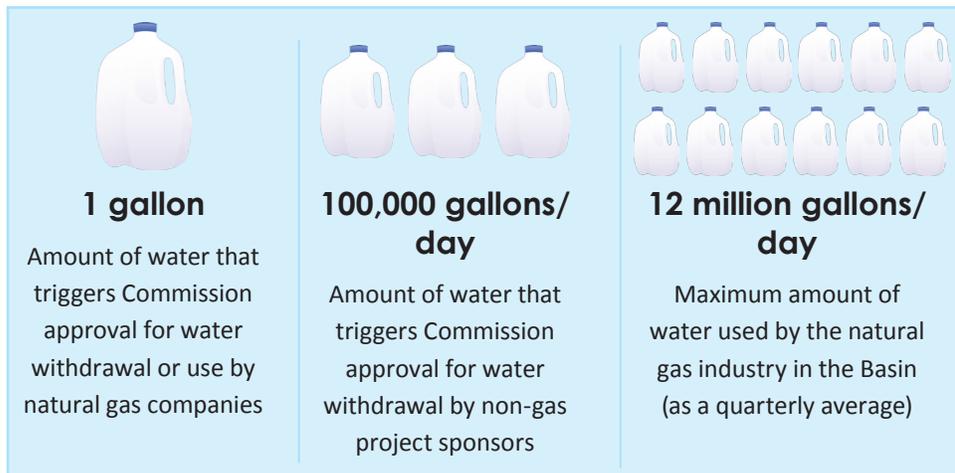
THE COMMISSION'S MANAGEMENT ROLE

While its member states regulate oil and gas development and issue drilling permits, the Commission regulates all water withdrawals and consumptive water uses for natural gas development in the Basin. The industry is challenged to find adequate water where supplies are limited or already stressed due to other uses or low flow conditions, as well as facing high transportation costs if water must be trucked or piped considerable distances to the drilling site.

Natural gas development projects differ from more traditional brick and mortar water use projects in several respects:

1. the use occurs on drilling pads while the withdrawal takes place elsewhere;
2. many water withdrawals are requested from relatively small watersheds on the Appalachian Plateau to minimize transport distances; and
3. intermittent and short-term withdrawals at many sites may be necessary to accumulate the water needed for a single hydraulic fracture.

The Commission evaluates how proposed withdrawals might impact other water uses, fish, wildlife habitat, recreation and water flows in streams. Protective conditions are often part of withdrawal approvals. Known as passby flows, a prescribed quantity of stream flow must be allowed to pass a specific point downstream from a water withdrawal intake at any time a withdrawal is occurring. The intent of the passby flow requirement is to protect streams during low flow condition.



REPORT

WATER USE ASSOCIATED WITH NATURAL GAS DEVELOPMENT IN THE SUSQUEHANNA RIVER BASIN

In March 2016, the Commission released a new report that examines its activities surrounding its management of water use by the natural gas industry from 2008-2013. Following the initial development phase of the industry, the Commission considered it important to review and assess its activities from a water management perspective.

For a copy of the full report or the report summary, visit www.srb.com/pubinfo/techdocs/NaturalGasReport/.

HYDRAULIC FRACTURING FACTS



The Commission considers all freshwater used in hydraulic fracturing to be consumptive (lost to the hydrologic system).

The long-term average water consumption for each well fracturing event is 4.3 million gallons.

Of the 4.3 million gallons of water used during an average hydraulic fracturing event, 3.6 million gallons (or 84 percent) was comprised of fresh water and 0.7 million gallons (16 percent) was comprised of reused flowback fluids.

Natural gas companies have reported to the Commission that on average, 10 percent of the total water injected into a natural gas well flows back to the surface within 30 days after the pressure is released.

Fluid used in hydraulic fracturing is typically comprised of 98 percent water and 2 percent sand with minor amounts of chemical additives.

Depth of potable groundwater in the Basin is highly variable and typically occurs within 1,000 feet from the surface of the ground. Shale gas formations are typically vertically separated from freshwater aquifers by at least 4,000 feet of sandstones and shales of moderate to low permeability.