Community-based Water-Quality Monitoring in the Marcellus Shale Gas-Drilling Areas in the Beech Creek Watershed

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ABSTRACT

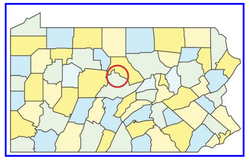
Extracting natural gas from the Marcellus Formation requires large volumes of water and significant quantities of chemical additives to stimulate production from this tight, Middle Devonian shale unit. Accidents or the mismanagement of any fluids involved in the drilling, hydrofracing, and production processes have the potential to threaten surface and ground-water quality in those portions of the Susquehanna River basin impacted by exploitation of this resource.

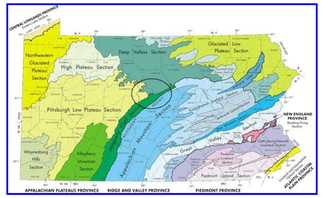
Early in 2010, representatives from Lock Haven University's Geology program, the Centre County Chapter of Pennsylvania Senior Environmental Corps, the Centre County Conservation District, and the Beech Creek Watershed Association forged a partnership to establish a baseline water-quality-monitoring program in the Beech Creek watershed (BCW) in Centre and Clinton counties, PA. Using GIS techniques to identify potentially impacted sub-watersheds within the BCW, the partners selected 12 sampling sites that lie upstream and downstream of gas-well drilling locations.

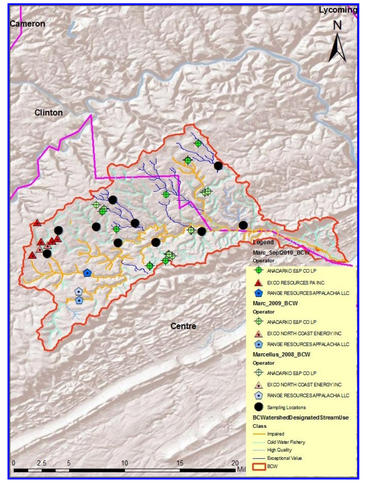
Along with assessing visual conditions of the streams and their watersheds, the volunteers collected field data including: temperature, pH, total dissolved solids, conductance, oxidation-reduction potential, dissolved oxygen, and flow rate. Laboratory testing yielded total suspended solids, barium, total iron, manganese, aluminum, calcium, magnesium, copper, arsenic, chloride, and sulfate data. This study ran from May 2010 to September 2011.

Preliminary results indicate no apparent adverse impact on water quality in sampled streams. Although this was a modest attempt to assess water quality throughout a portion of the basin, it is the intention of the partners to seek additional funding in order to continue this monitoring project and add more sample sites and parameters to this project.

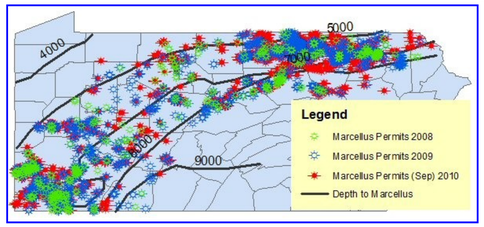
BEECH CREEK WATERSHED







MARCELLUS SHALE DRILLING

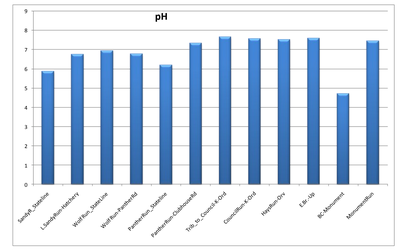


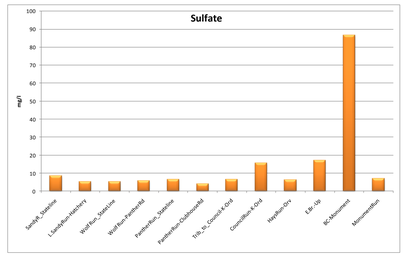
MARCELLUS ACTIVITY IN THE BEECH CREEK WATERSHED

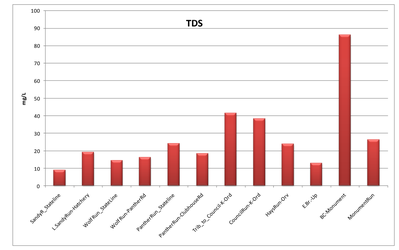
A "Christmas tree" —> (wellhead)

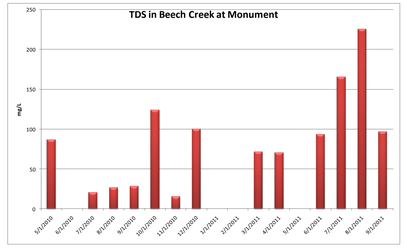
<— Two wells on Anardako's Marcellus W.W. Litre Pad A, Curtin Township, Centre County, PA.

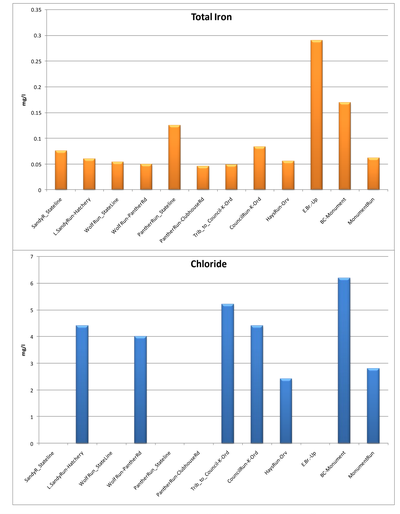
2010-11 GEOCHEMICAL DATA

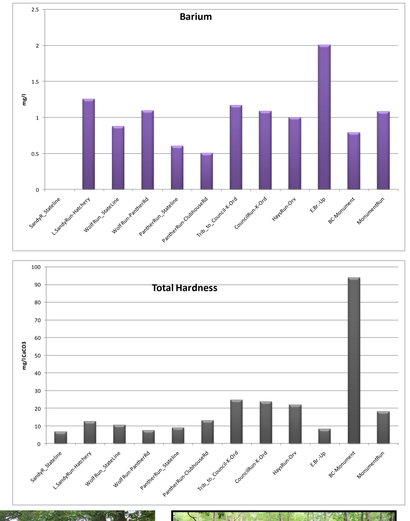












A PARTNERSHIP TAKES SHAPE

Initial planning meeting among the cooperating groups took place on April 9, 2010. Represented here are members of the PA Senior Environmental Corps based in State College, the Centre County Conservation District, Beech Creek Watershed Association, and Lock Haven University's Geology Program.

Drilling Rig

Lined pit for cuttings

Transmission line corridor

Compressor

SAMPLING IN THE WATERSHED

Volunteers monitor 10 streams in the watershed and collect water data from 12 sites. Sampling locations were selected based on permitted, spudded, and producing wells as of 2011. Drilling is currently limited to three companies in the watershed: Anadarko, Exco, and Range.

[1]Lock Haven University of PA, [2]Pennsylvania Senior Environmental Corps, [3]Centre County Conservation District. Our appreciation is extended to the Degenstein Foundation, Beech Creek Watershed Association, and Lock Haven University. Very special thanks go to H. W. Wieder, Jr., Geisinger Health System, for his continued support.