

Water-Quality Monitoring in the Marcellus Shale Gas-Drilling Area in the Beech Creek Watershed, Centre and Clinton Counties, PA

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ABSTRACT

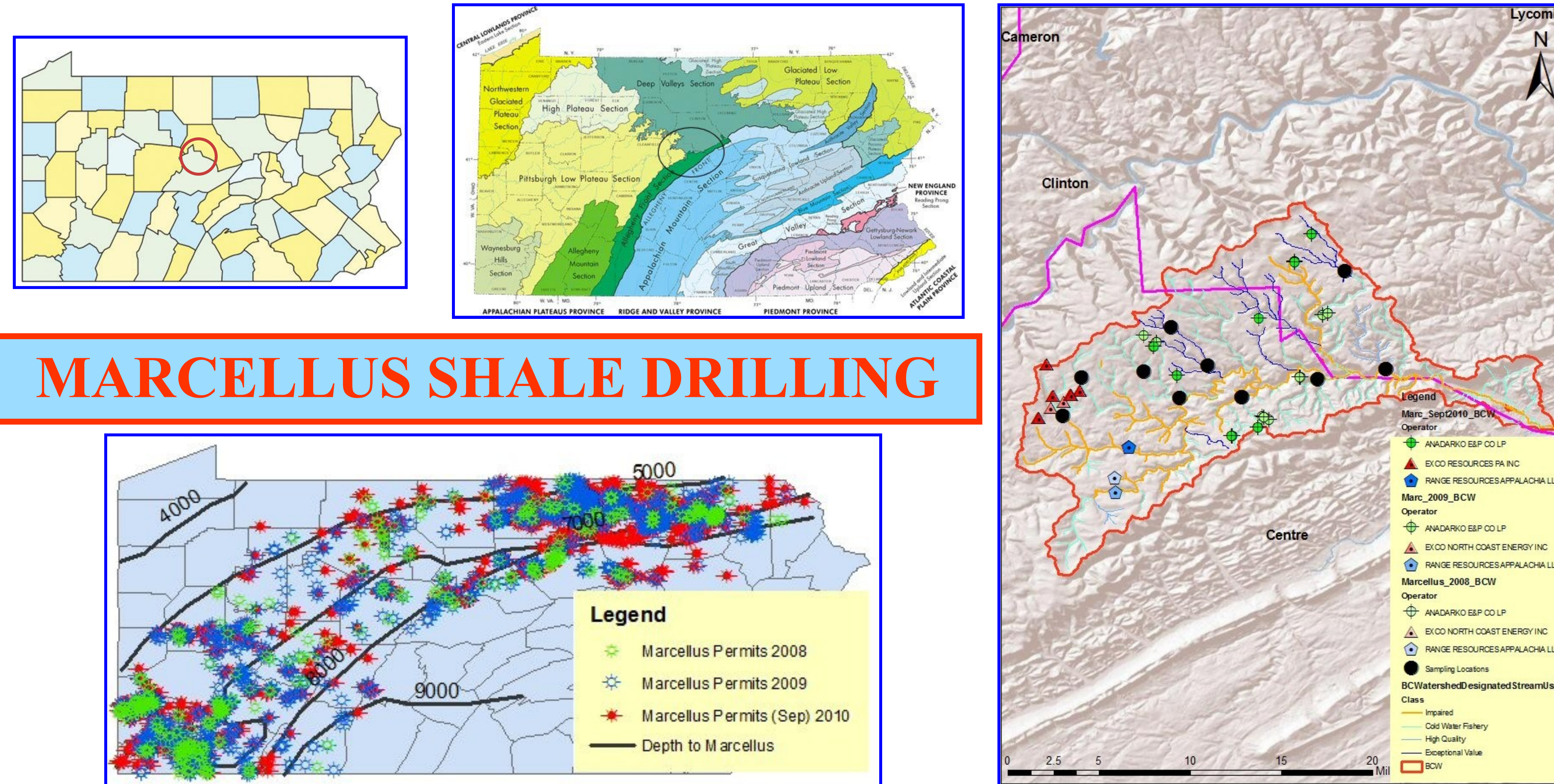
The extraction of natural gas from the Marcellus Formation requires large volumes of water and significant quantities of chemical additives to stimulate production from this tight shale unit. Accidents or the mismanagement of any fluids involved in the drilling and hydrofracing processes have the potential 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 in Centre and Clinton counties. This program's goals are twofold: (1) to identify streams where Marcellus Shale gas wells are permitted, spudded, or producing and locate sampling sites upstream and downstream of those deep wells, and (2) collect monthly field data and water samples for laboratory analyses from each of these sites in order to generate water-quality baseline data for each of these streams.

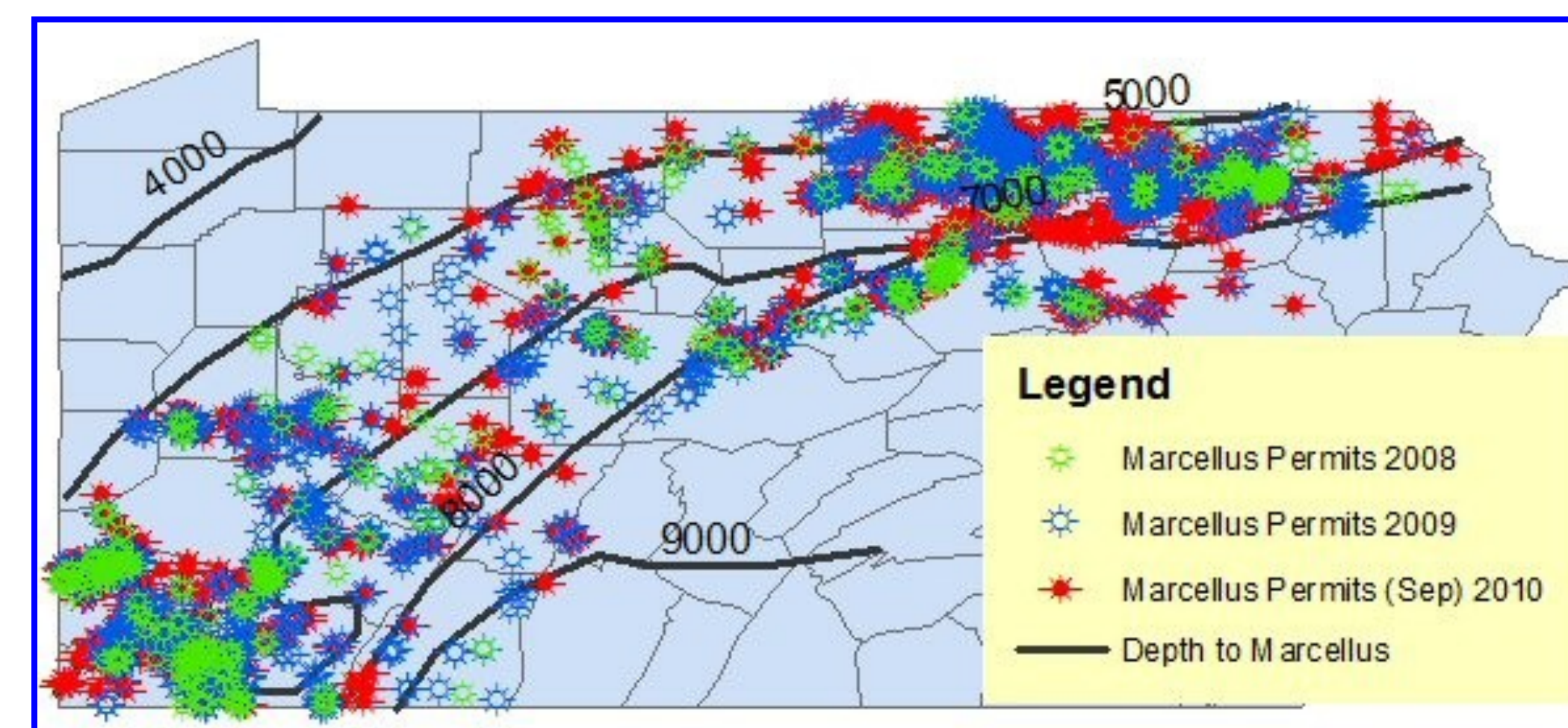
A total of 12 sampling sites meeting these criteria were selected. Recognizing that this watershed is heavily impacted by acidic mine drainage, chemical parameters were selected that would indicate any impact to the water quality by fracing or flowback fluids from Marcellus Shale gas production. Along with assessing visual conditions of the streams and their watersheds, field data included: temperature, pH, total dissolved solids (TDS), conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and flow rate. Laboratory testing yielded total suspended solids (TSS), barium, total iron, manganese, aluminum, calcium, magnesium, copper, arsenic, chloride, and sulfate data. This study was conducted from May 2010 to September 2010.

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

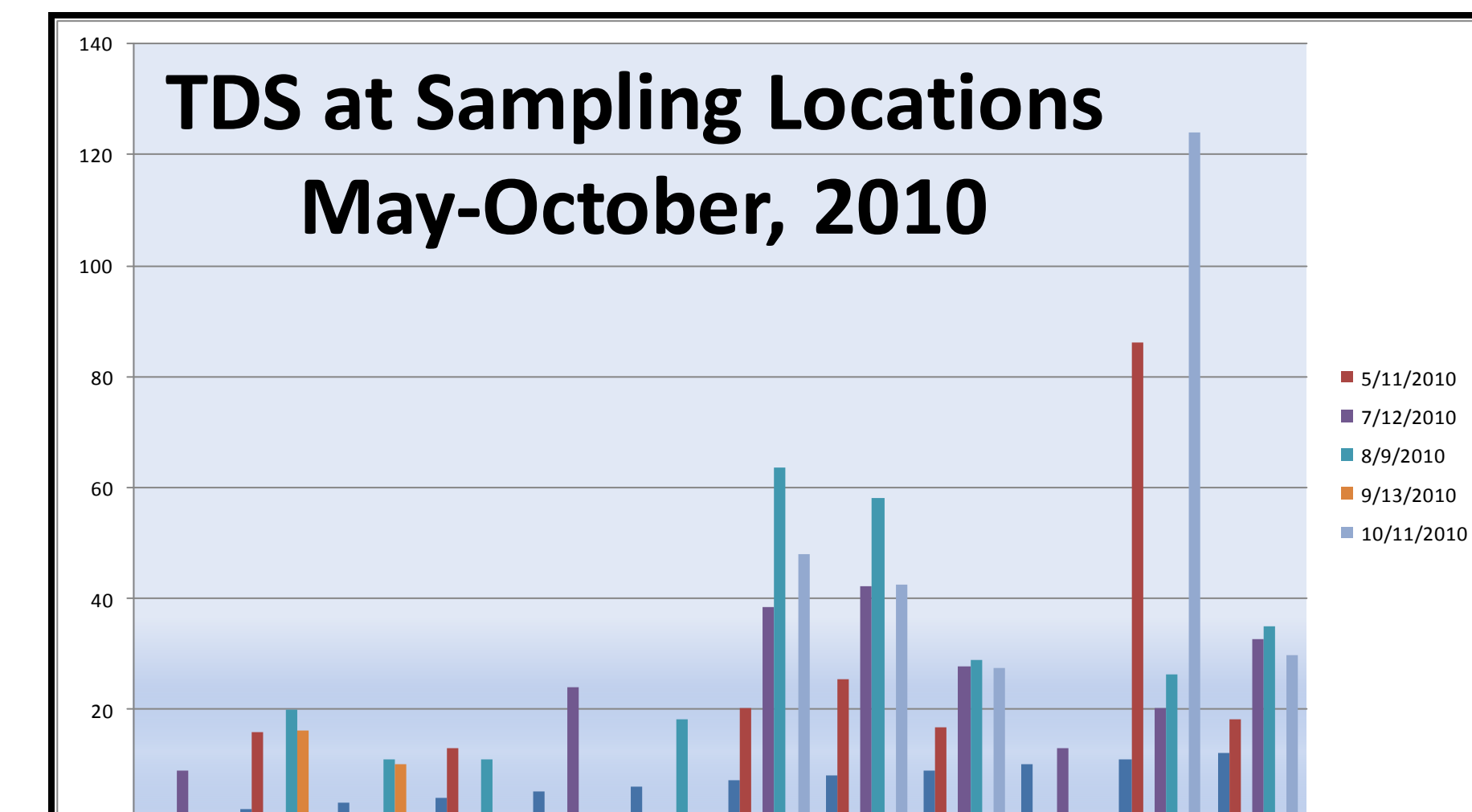
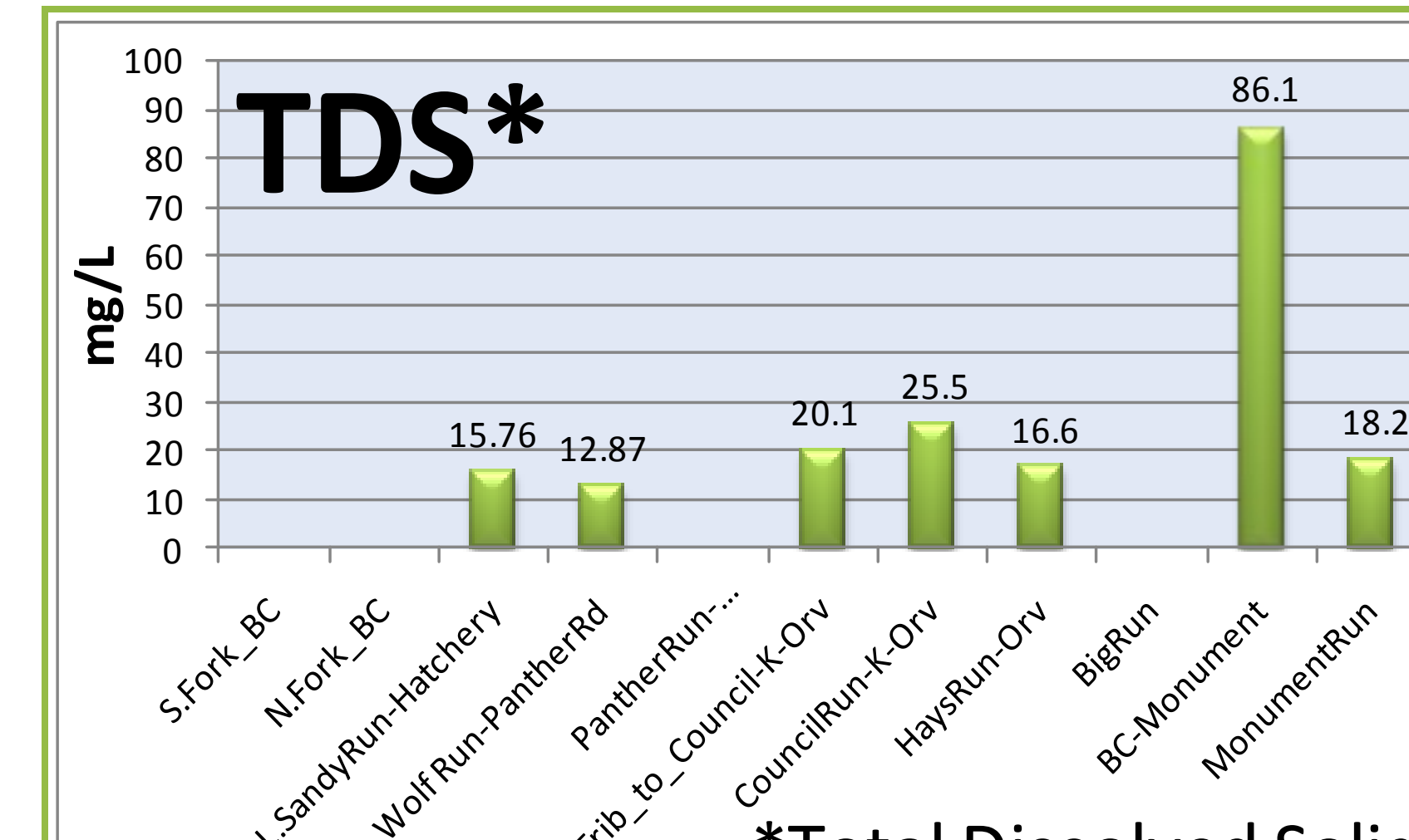
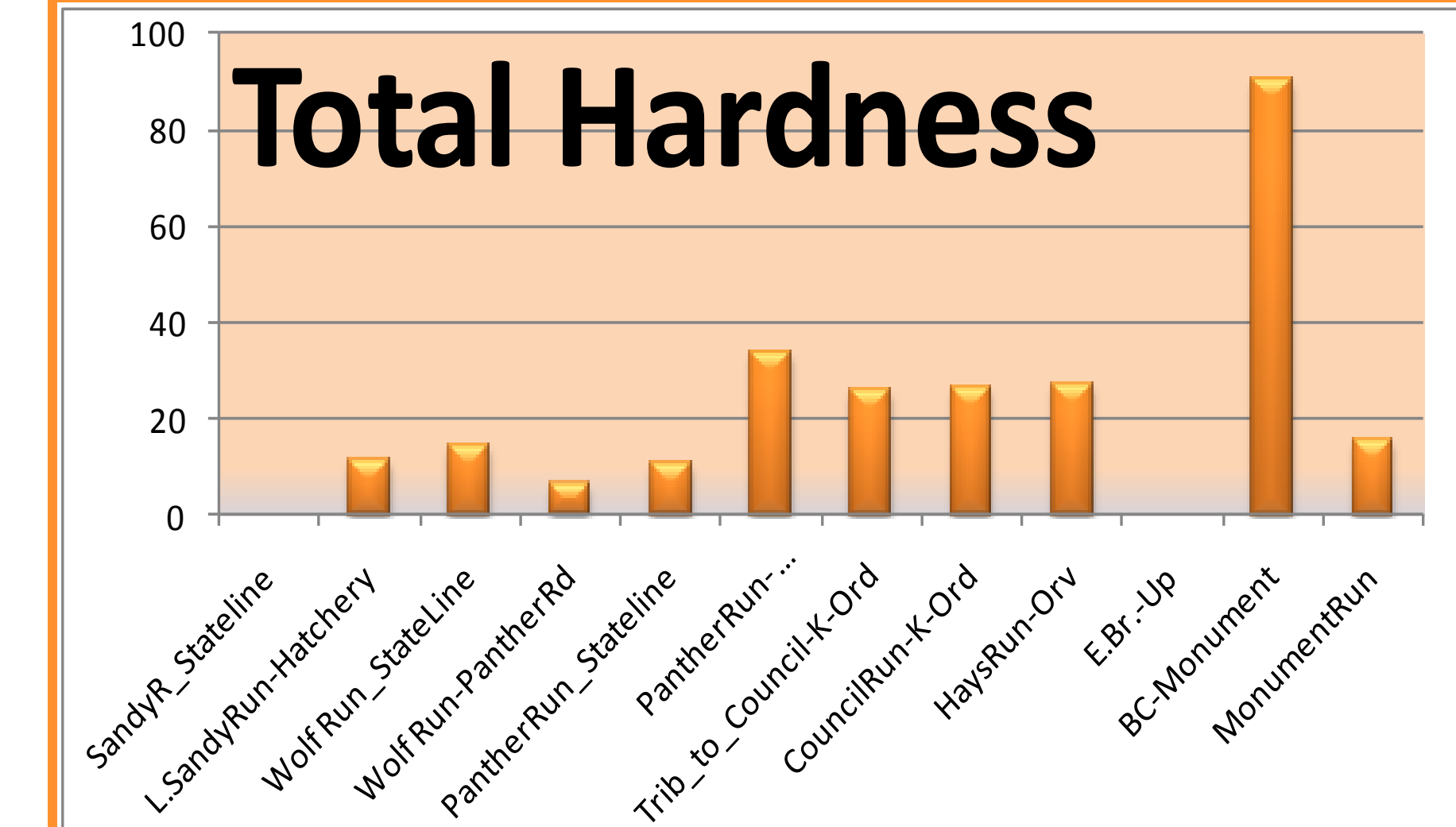
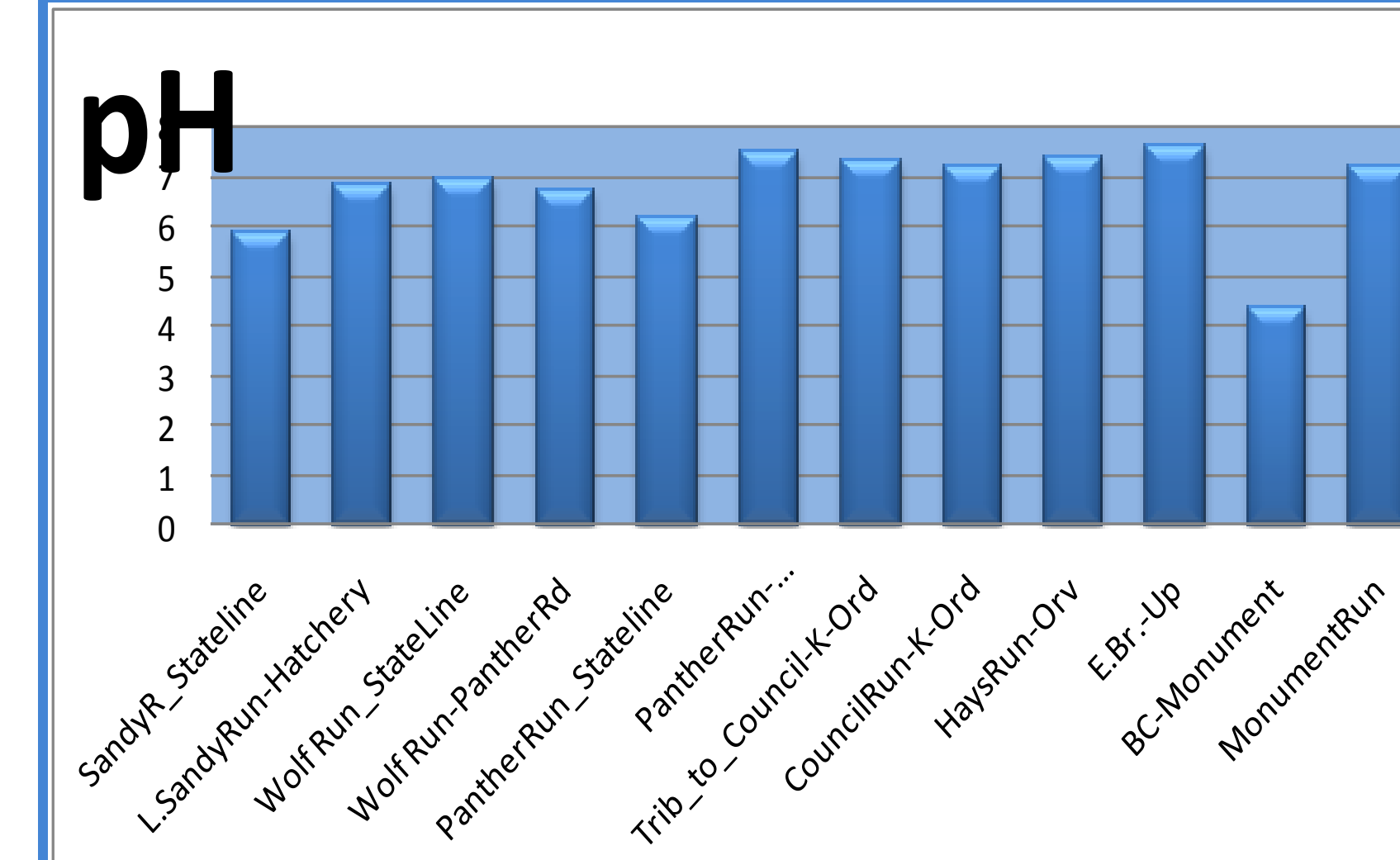
BEECH CREEK WATERSHED



MARCELLUS SHALE DRILLING



2010 GEOCHEMICAL DATA



A PARTNERSHIP TAKES SHAPE

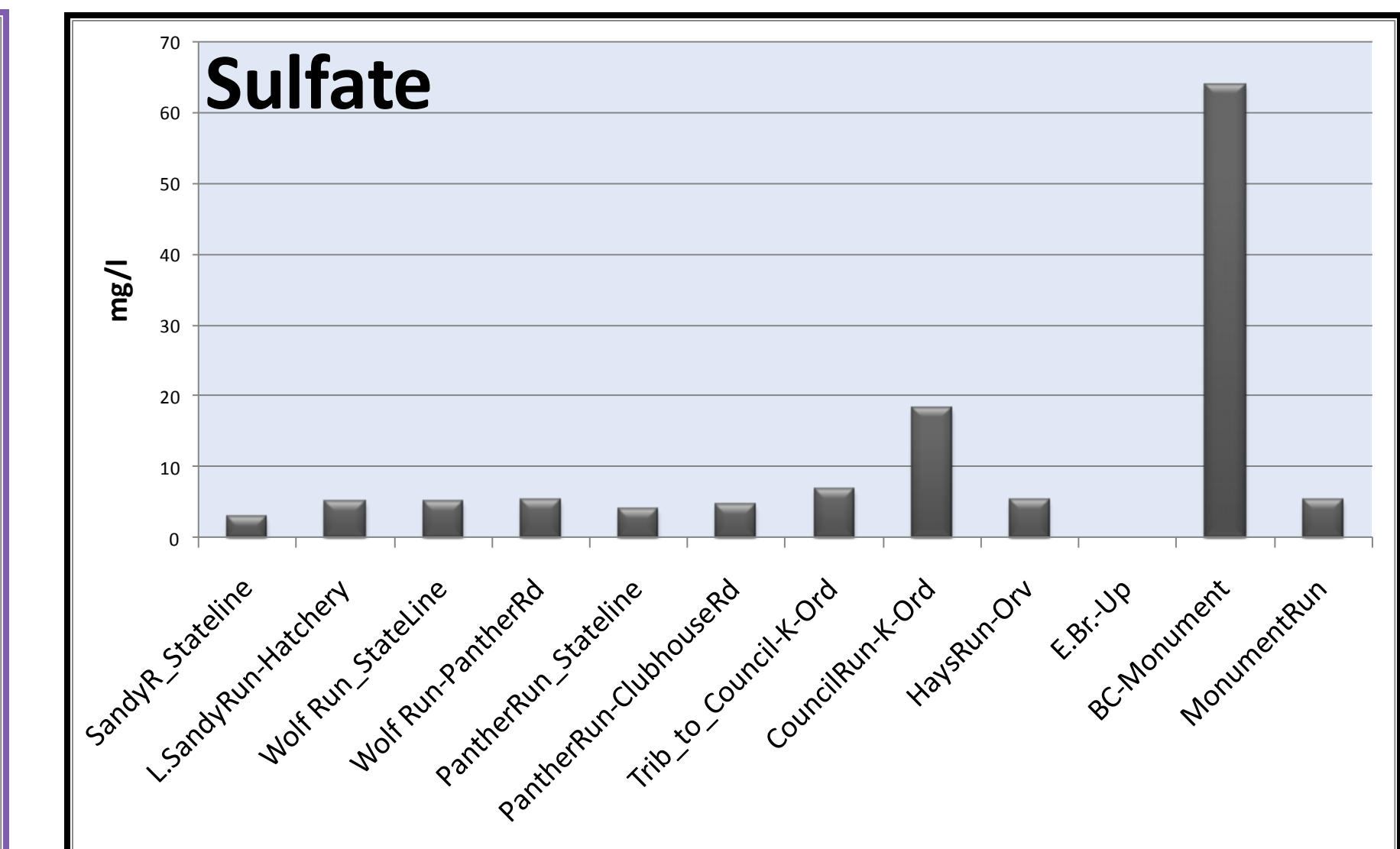
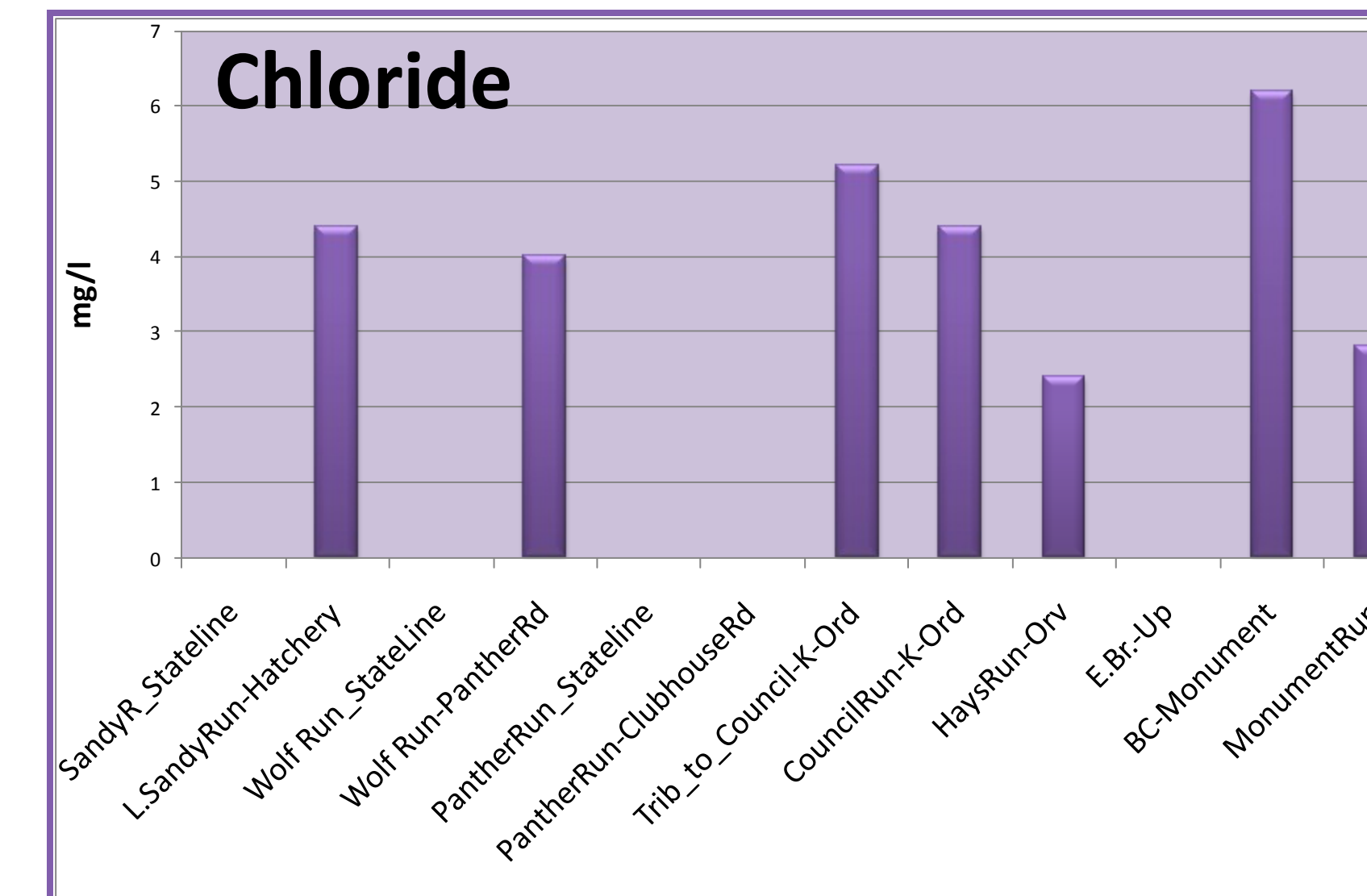
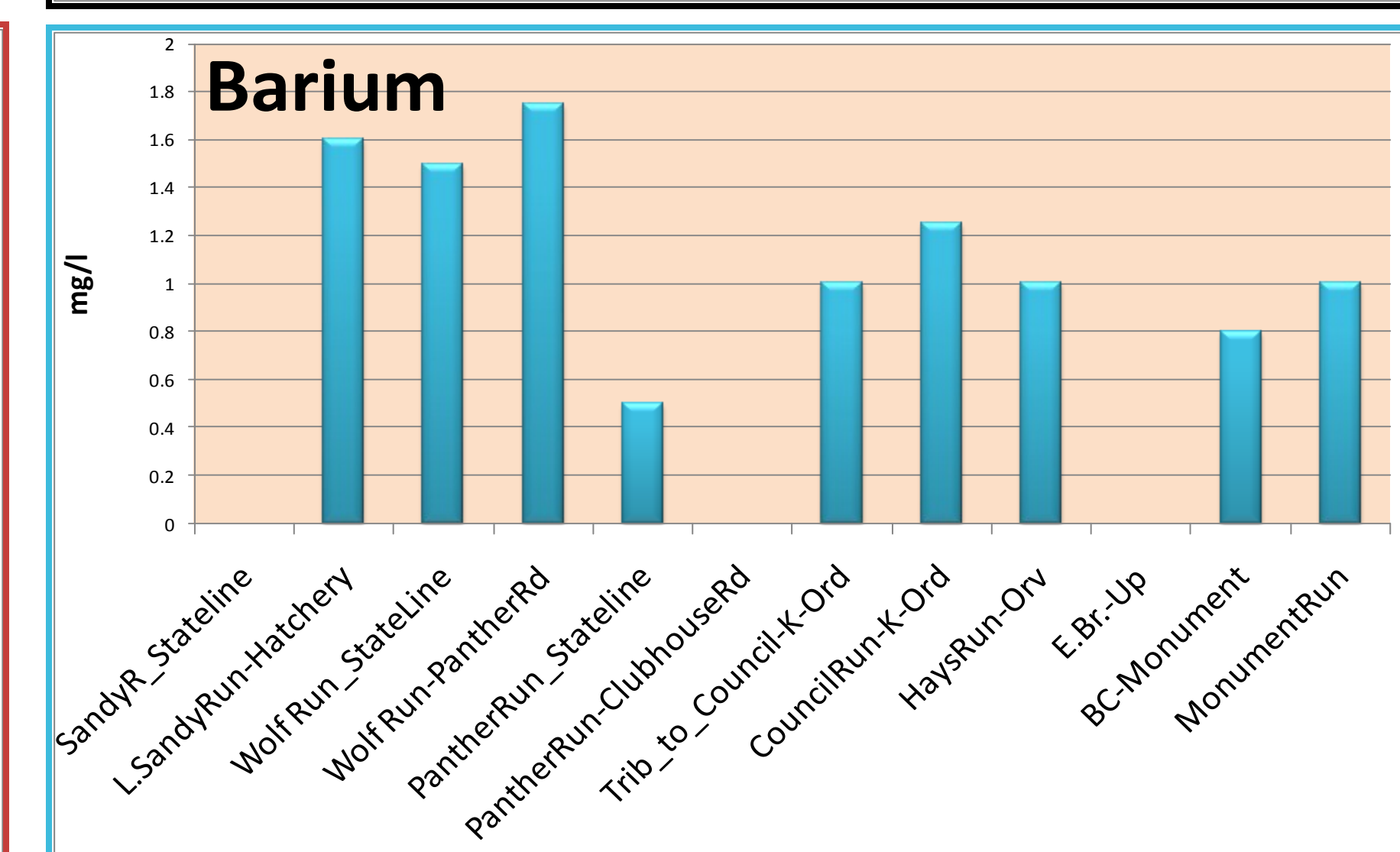
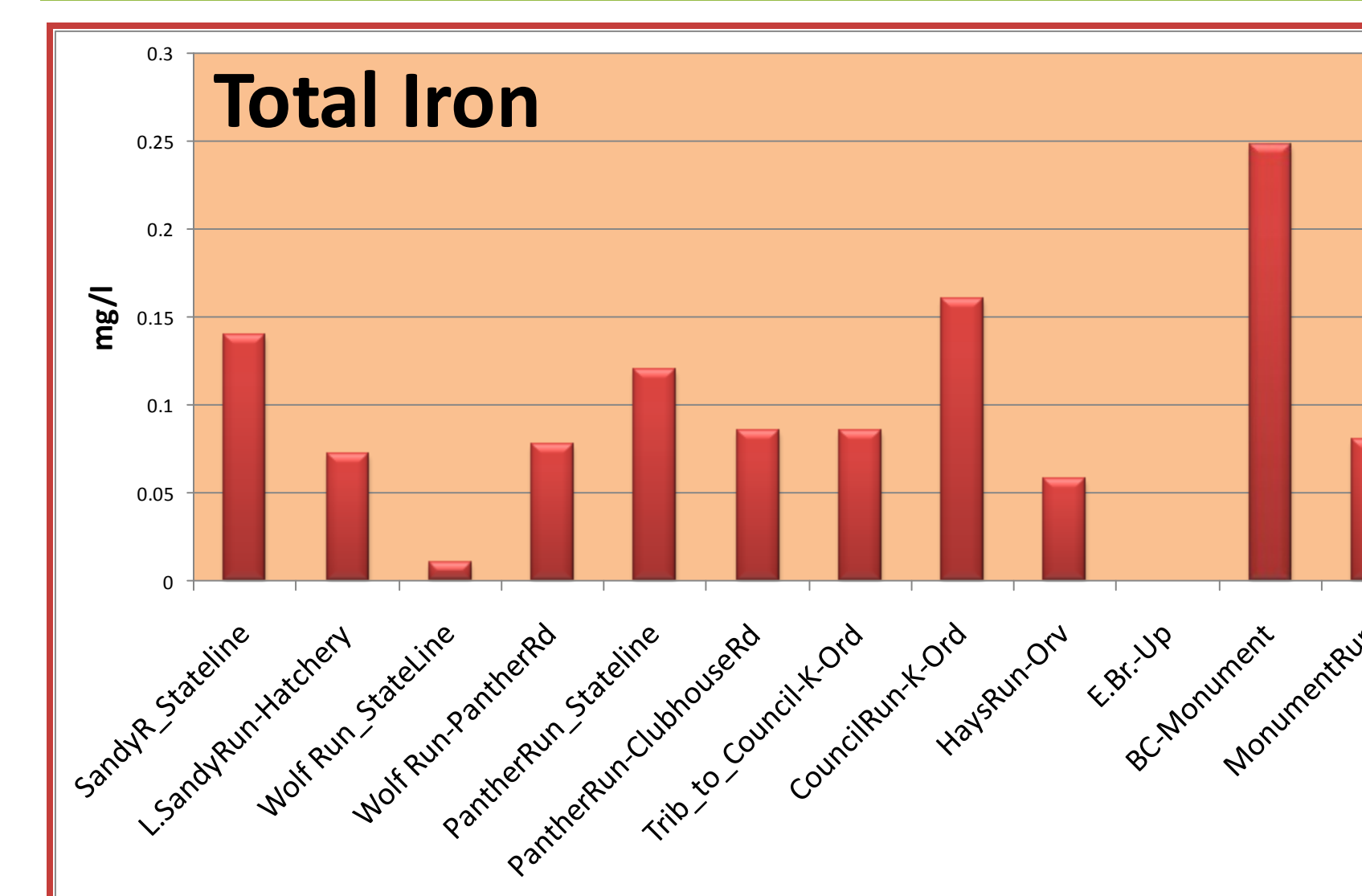
Initial planning meeting among the cooperating groups took place on April 9, 2010. Represented here are members of the PA Senior Environmental Corps based in State College, the Centre County Conservation District, Beech Creek Watershed Association, and Lock Haven University's Geology Program.



MARCELLUS ACTIVITY IN THE BEECH CREEK WATERSHED



A "Christmas tree" → (wellhead)
← Two wells on Anardako's Marcellus W.W. Lire Pad A, Curtin Township, Centre County, PA.



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 2010. Drilling is currently limited to three companies in the watershed: Anadarko, Exco, and Range.



Drilling Rig



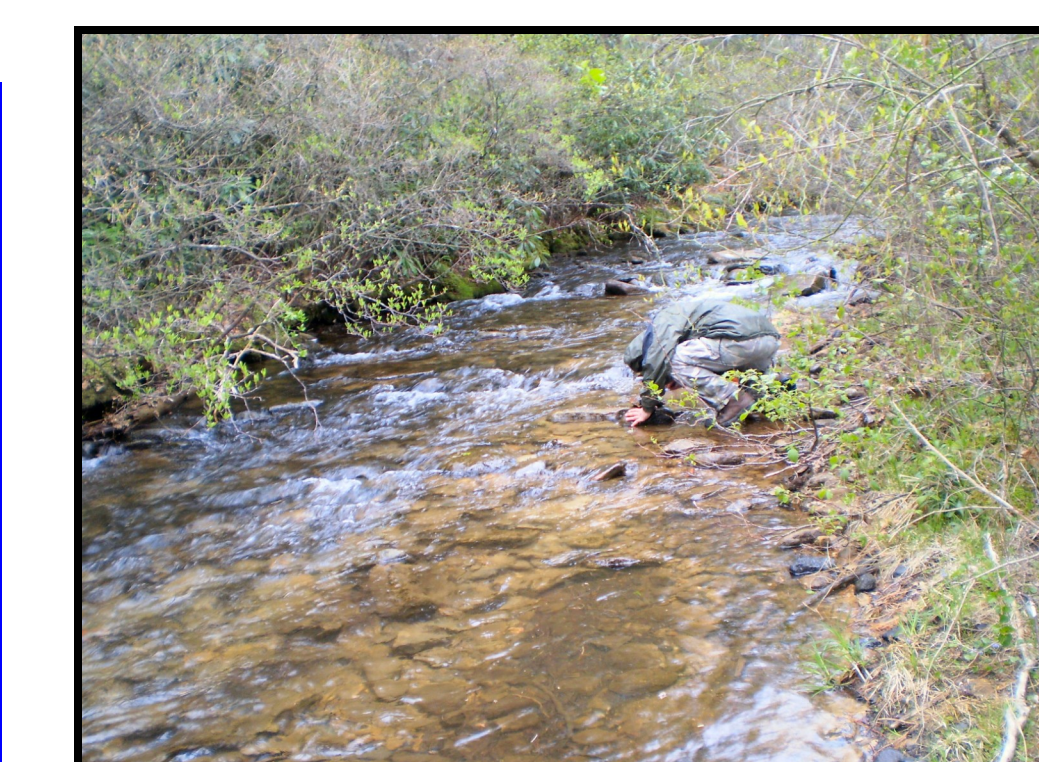
Lined pit for cuttings



Transmission line corridor



Compressor



¹Lock Haven University of PA, ²Pennsylvania Senior Environmental Corps, ³Centre 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.