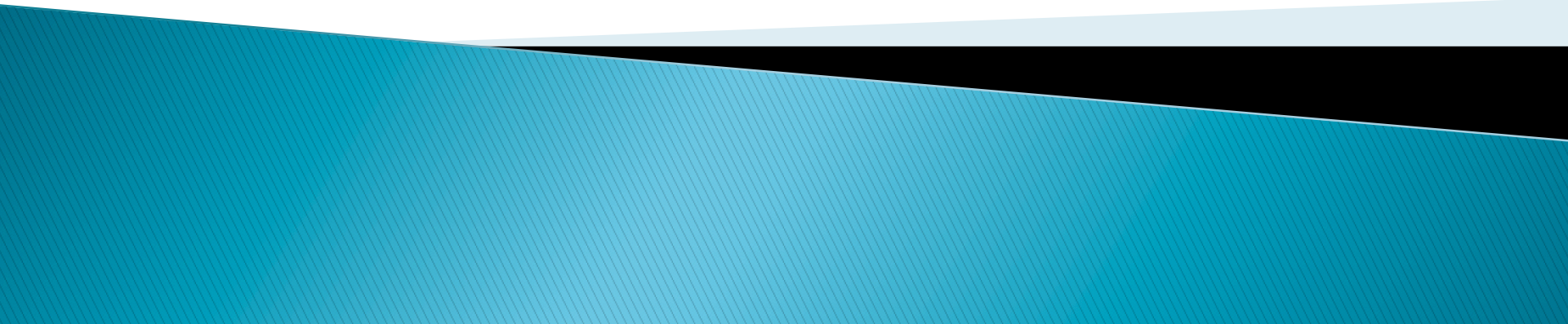


Research on Ground Water Monitoring



Background on Fracing

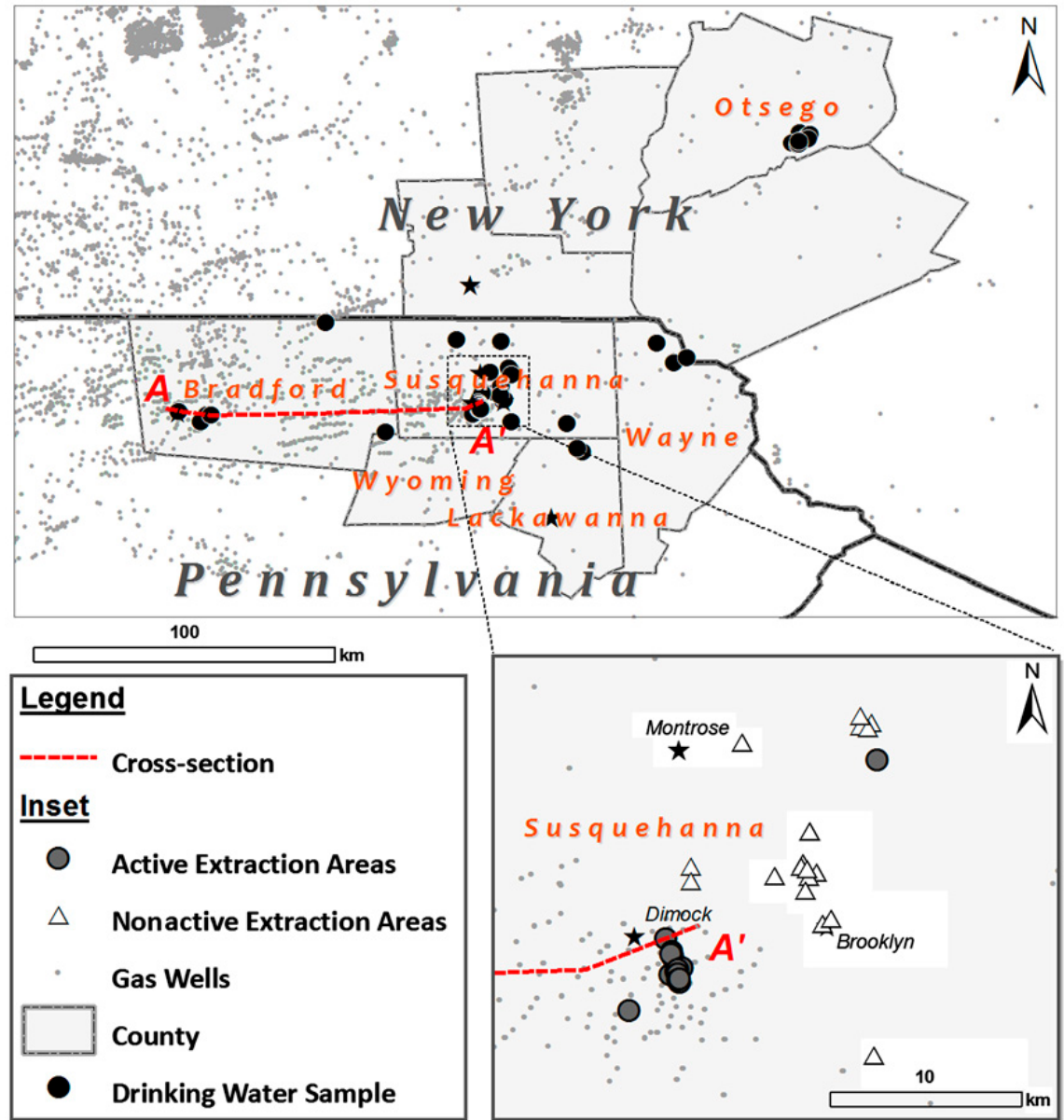
- ▶ HYDRAULIC FRACTURING 101: What Every Representative, Environmentalist, Regulator, Reporter, Investor, University Researcher, Neighbor and Engineer Should Know About Estimating Frac Risk and Improving Frac Performance in Unconventional Gas and Oil Well.
 - By George E. King
- ▶ Presented at 2012 SPE Hydraulic Fracturing Technology Conference

Marcellus and Utica study

- ▶ Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing.
 - By Stephen Osbor, Avner Vengosh, Nathaniel Warner, and Robert Jackson – Duke University
 - April 2011
- ▶ <http://www.nicholas.duke.edu/cgc/pnas2011.pdf>

Marcellus and Utica study

- Map of drilling operations and well-water sampling locations in Pennsylvania and New York. A drinking-water well is classified as being in an active extraction area if a gas well is within 1 km.



Criticism of Methane article

- ▶ Lack of data to support a relationship between methane contamination of drinking water wells and hydraulic fracturing.
 - By Tarek Saba & Mark Orzechowski. Proceedings of the National Academy of Sciences. 2011;108:E663.
- ▶ Hydraulic fracturing not responsible for methane migration.
 - By Samuel Schon. Proceedings of the National Academy of Sciences. 2011;108:E664.

San Juan Basin – COGCC site

The screenshot shows a Mozilla Firefox browser window with the address bar displaying cogcc.state.co.us/Library/SanJuanBasinReports.htm. The page title is "Studies in the San Juan Basin" and it includes a note "(Need Adobe Acrobat?)". The main content is a list of reports:

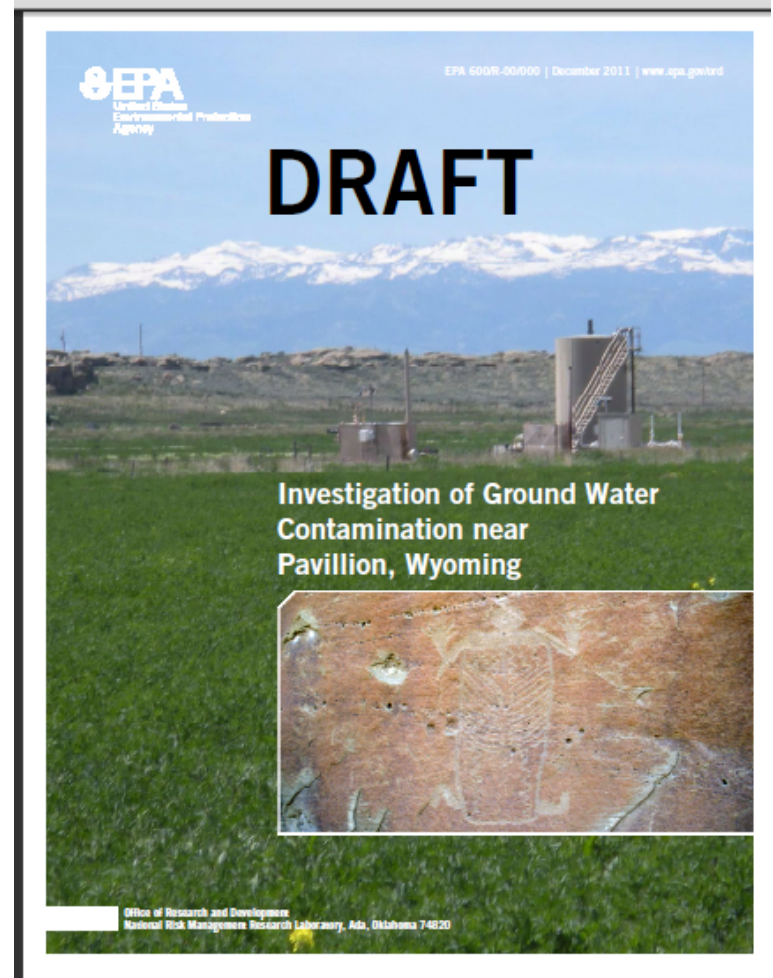
- [BLM North San Juan Basin White Paper](#) (December 1999)
- [San Juan Basin Summary of Bradenhead Testing and Ground Water Quality](#) (May 2000)
- [San Juan Basin Ground Water Modeling Study: Ground Water – Surface Water Interactions Between Fruitland Coalbed Methane Development and Rivers](#) (October 2001)
- [Methane in Ground Water, San Juan Basin, La Plata County Colorado: Analysis of Data Submitted in Response to COGCC Orders 112-156 and 112-157](#) (July 2004)
- [Coalbed Methane Stream Depletion Assessment Study - Northern San Juan Basin](#) (February 2006)
 - [Responses to Comments](#) (September 2006)
- [Trend and Data Analysis San Juan Basin Water Quality Analysis Project San Juan Basin, Colorado](#) (June 2010)
 - [Appendix A - Data Quality Review Summary](#)
 - [Appendix B - Time Concentration Plots](#)
 - [Appendix C - Mann-Kendall Results](#)
- [Trend and Data Analysis San Juan Basin Water Quality Analysis Project San Juan Basin, Colorado](#) (June 2011)
 - [Appendix A - Time Concentration Plots](#)
 - [Appendix B - Mann - Kendall Results](#)

At the bottom of the browser window, the address bar shows the path to a PDF file: cogcc.state.co.us/Library/sanjuanbasin/3m_project/SanJuanBasinModelingStudy.pdf. The taskbar at the bottom of the screen shows various application icons and the system clock indicating 2:26 PM on 11/25/2012.

▶ <http://cogcc.state.co.us/Library/SanJuanBasinReports.htm>

EPA: Pavillion, Wyoming

- ▶ EPA released a draft report outlining findings from the Pavillion, Wyoming groundwater investigation for public comment and independent scientific peer review in December 2011.
- ▶ <http://www.epa.gov/region8/superfund/wy/pavillion/>



USGS: Pavillion, Wyoming



In cooperation with the Wyoming Department of Environmental Quality

Groundwater-Quality and Quality-Control Data for Two Monitoring Wells near Pavillion, Wyoming, April and May 2012

- ▶ http://pubs.usgs.gov/ds/718/DS718_508.pdf

Pavillion, Wyoming

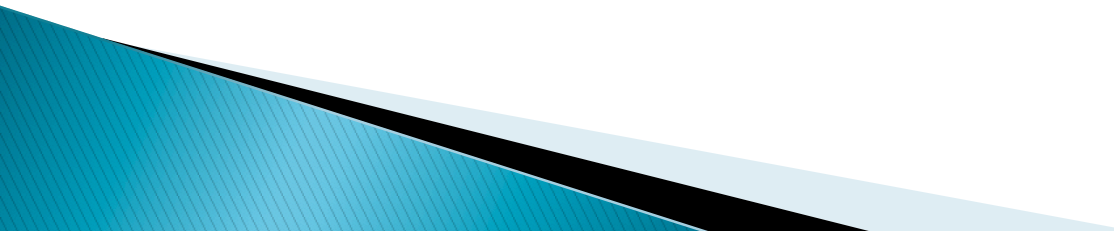
- ▶ Technical Memorandum:
Assessment of
Groundwater Sampling
Results Completed by the
U.S. Geological Survey
(2012).
 - By Tom Myers
 - September 30, 2012
- ▶ [http://
www.sierraclub.org/
pressroom/downloads/
myers-tech-
memo-093012.pdf](http://www.sierraclub.org/pressroom/downloads/myers-tech-memo-093012.pdf)



Groundwater Protection Council

- ▶ **2012 UIC Conference**
 - Hydraulic Fracturing Seminar Part 1 Regulatory Considerations for Hydraulic Fracturing and Groundwater Protection
 - Hydraulic Fracturing Seminar Part 2 Technical considerations for Hydraulic Fracturing and Groundwater Protection
- ▶ <http://gwpc.brocodev.com/events/gwpc-proceedings/2012-uic-conference>

Upcoming Studies

- ▶ The University of Texas Bureau of Economic Geology will produce a comprehensive Technology Assessment report on the Eagle Ford Shale Play.
 - ▶ This report proposes to cover the entire areal extent of this area and include both surface and subsurface geological analysis and water resources.
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Upcoming Studies

- ▶ Field Tests –Marcellus /Utica: Establishing the East Environmentally Friendly Drilling Regional Center
 - ▶ Regional University Alliance is working with the National Energy Technology Laboratory to perform a baseline monitoring field test in the Marcellus.
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