

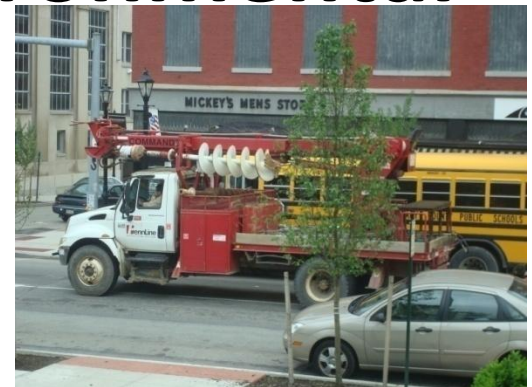
“Positives, Negatives, Uncertainty, Future Research, and Opinions on Hydrofracturing in the Marcellus Shale”



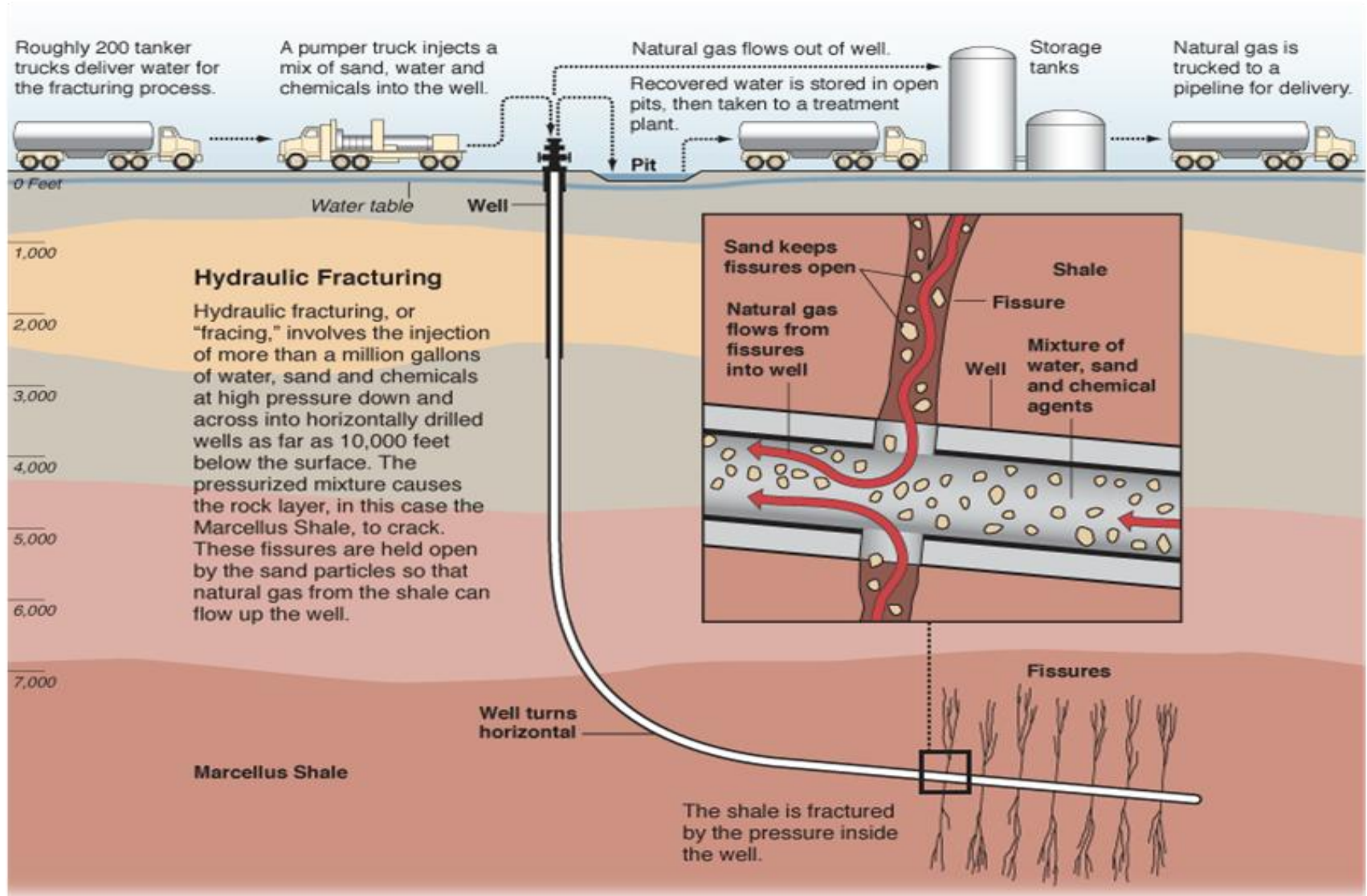
Mountain Ridge AP Environmental Science



February 2012



Basic diagram depicting how the process of hydraulic fracturing works







All information presented in this presentation are supported by one or more of the above sources and can be referenced in our works cited page of the full research paper.



George's Creek Watershed Association



ENERGY.GOV



Commissioner Valentine, Brodie,
McKay



Delegate Beitzel



Senator Edwards



Governor O'Malley



Waynesburg, Pennsylvania





Times-News Photo: Ben Meredith, a Mountain Ridge High School senior, presents a student-authored report on Marcellus shale gas drilling Thursday at the Allegany County Commission meeting

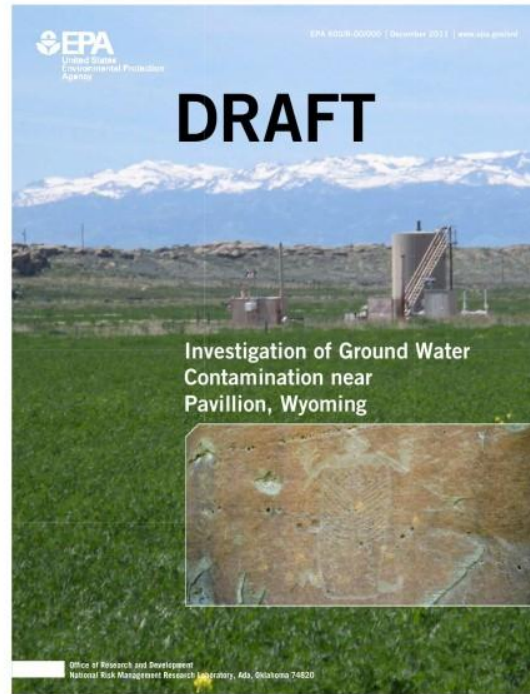
The original presentation was reviewed
by
environmentalists,
members of the gas drilling industry,
independent scientists,
politicians,
and members of the general public.

It was praised from all sides for its
accuracy and fairness.

The Impact of Marcellus Gas Drilling on Rural Drinking Water Supplies



The Center for
Rural Pennsylvania
A Legislative Agency of the Pennsylvania General Assembly



DRAFT

Investigation of Ground Water Contamination near Pavillion, Wyoming

Office of Research and Development
National Risk Management Research Laboratory, Ada, Oklahoma 74820



MARCELLUS SHALE SAFE DRILLING INITIATIVE STUDY PART I

DECEMBER 2011

Prepared By:
Maryland Department of the Environment
Maryland Department of Natural Resources

Prepared For:
Martin O'Malley, Governor
State of Maryland
Thomas V. Mike Miller, Jr., Senate President
Maryland General Assembly
Michael E. Busch, House Speaker
Maryland General Assembly

Prepared pursuant to Executive Order 01.01.2011.11



The Supplemental Generic Environmental Impact Statement...

...on the Oil, Gas and Solution Mining Regulatory Program

Well Permit Issuance for Horizontal Drilling And High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs

TCCOG – November 5, 2009

David Kay, Senior Extension Associate
Cornell Community and Rural Development Institute
(CaRDI) dlk2@cornell.edu

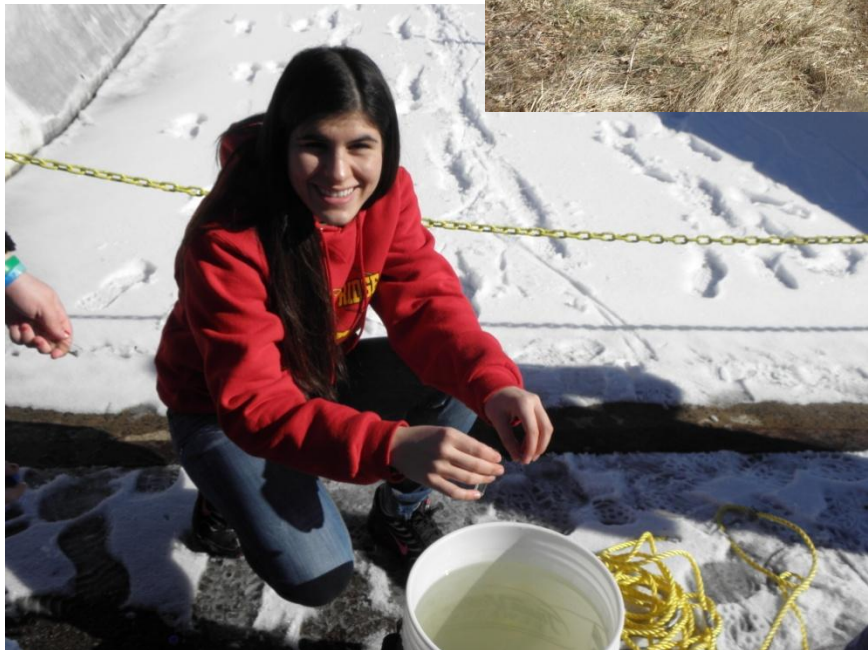




UNIVERSITY OF MARYLAND

Center for Environmental Science





Positives

Job increases:

The unemployment rate dropped from 10.1% to 9.0% in Clearfield, Pennsylvania.



10 % of the jobs in the Marcellus industry will be in trucking

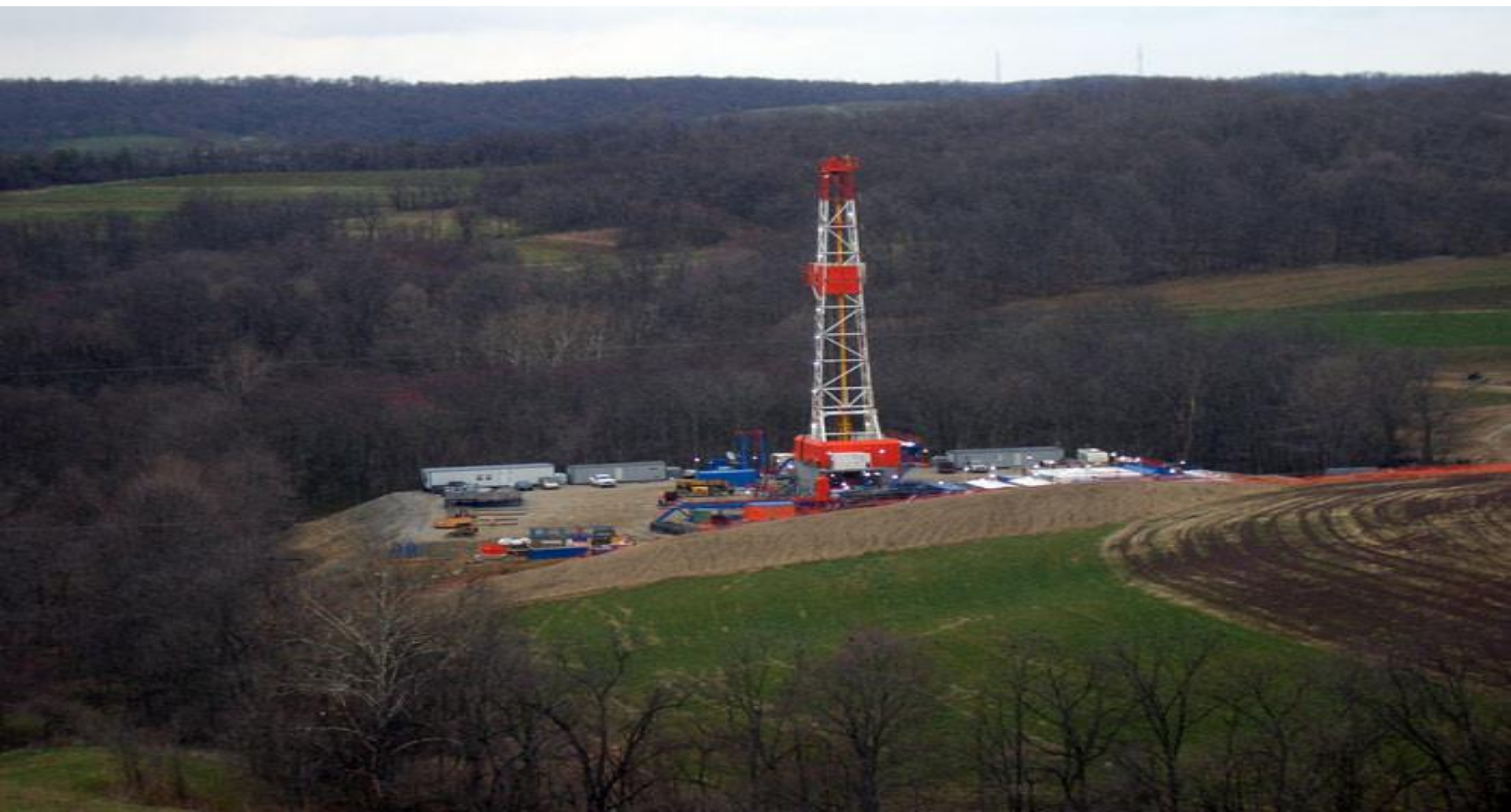
This may allow local business to expand or hire new employees.



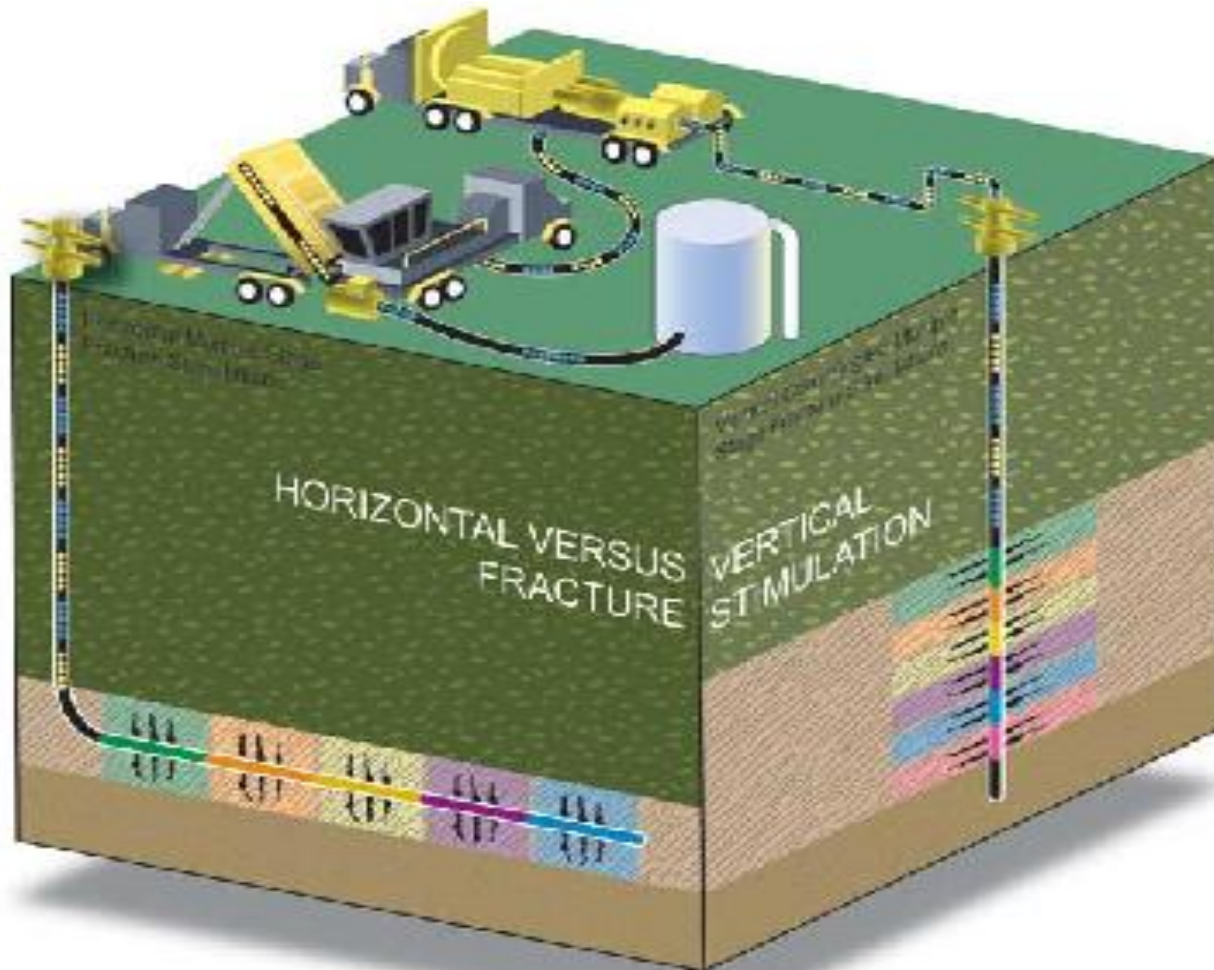
Tax revenue can be used to fund school and hospital needs.



One farmer received a \$250,000 signing bonus and is currently receiving \$15,000 per month in royalties.



Compared to traditional vertical drilling, fracking uses a horizontal drilling technique. This minimizes disruption of habitats and maximizes gas output for each site.



When burned, natural gas releases 58% less CO₂ than coal and 33% less CO₂ than oil.



If we converted all of our electricity production to natural gas, we would have enough to power the entire country for 33 years.

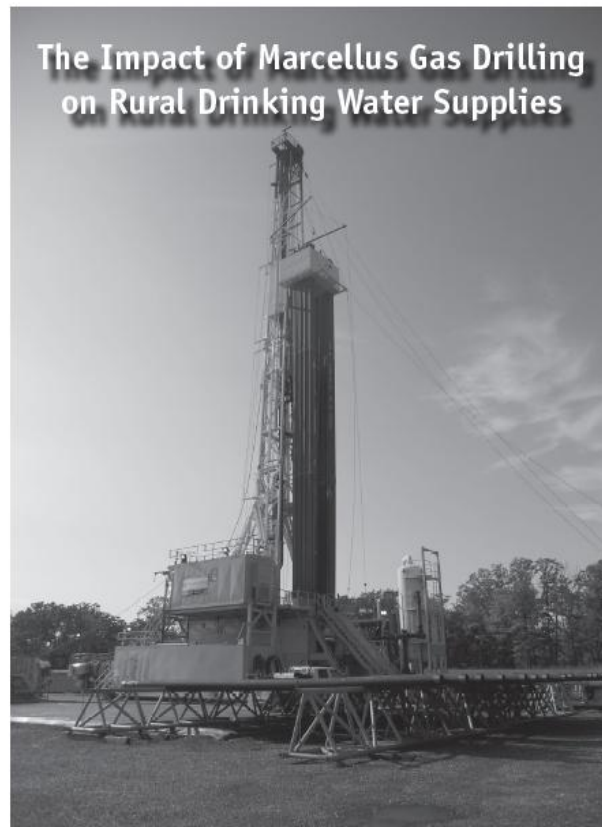


The Marcellus may have enough gas to replace all oil imports for 54 years.

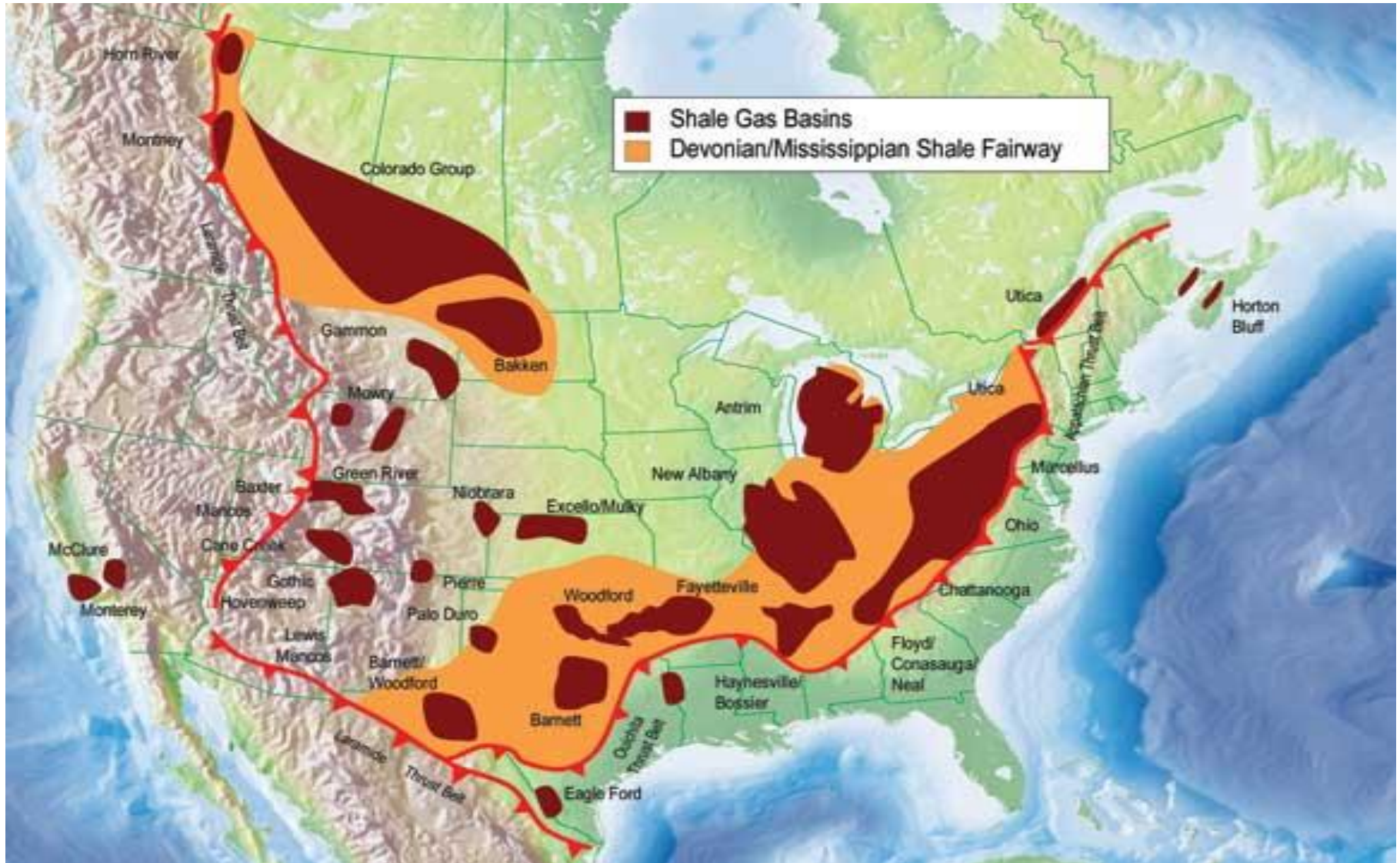


Only an estimated 0.5% of
recorded drill sites produce
“newsworthy” spills

Comparative analysis of pre-fracturing and post-fracturing water wells shows no significant changes in levels of key indicator chemicals used in hydraulic fracturing, or in levels of methane.



Even more gas is held in the Utica Shale, a similar untapped natural gas deposit below the Marcellus.



Negatives

There are approximately 4 million gallons of water used per well to retrieve the gas.



These “proppant” chemicals include kerosene, benzene, hydrochloric acid, other carcinogens, neurotoxins, and a host of other dangerous substances.

For each drilling project, more than 15,000 gallons of these harmful chemicals are used.

**Potential Land Contaminants in Frack
Fluids and Marcellus Production Brine
Contaminant List**

*Chemical Additives in Hydraulic Fracturing
Fluids*

Acetone
Ammonia
Benzene
Dimethyl Formamide
Ethyl Benzene
Formaldehyde
Naphthalene
Toluene
Xylene

*Naturally-Occurring Radioactive Materials
Detected in Marcellus Production Brine*

Cesium-137
Radium-226
Radium-228
Thorium-228
Thorium-230
Uranium-234
Uranium-235

Small spills of 10-100 gallons are a common occurrence.

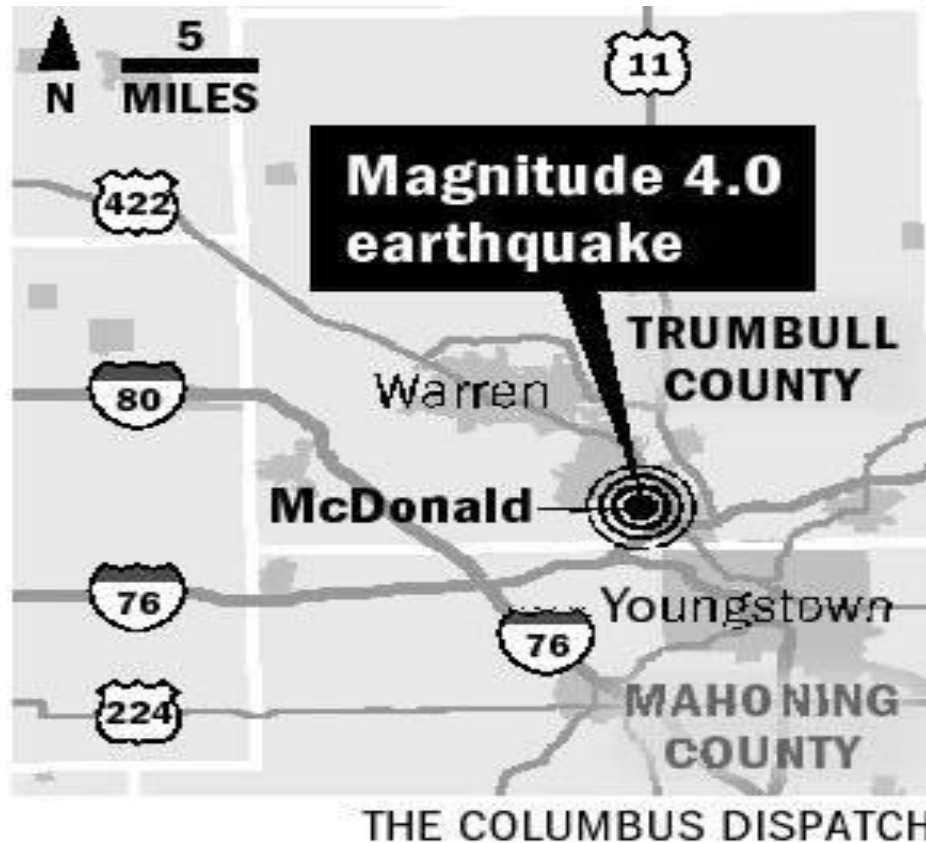




This “produced” water, in many cases, sits in man made ponds.



Injection of wastewater fluids into deep-injection wells 20,000 feet below Earth's surface has been linked with small earthquakes in Ohio and Arkansas.



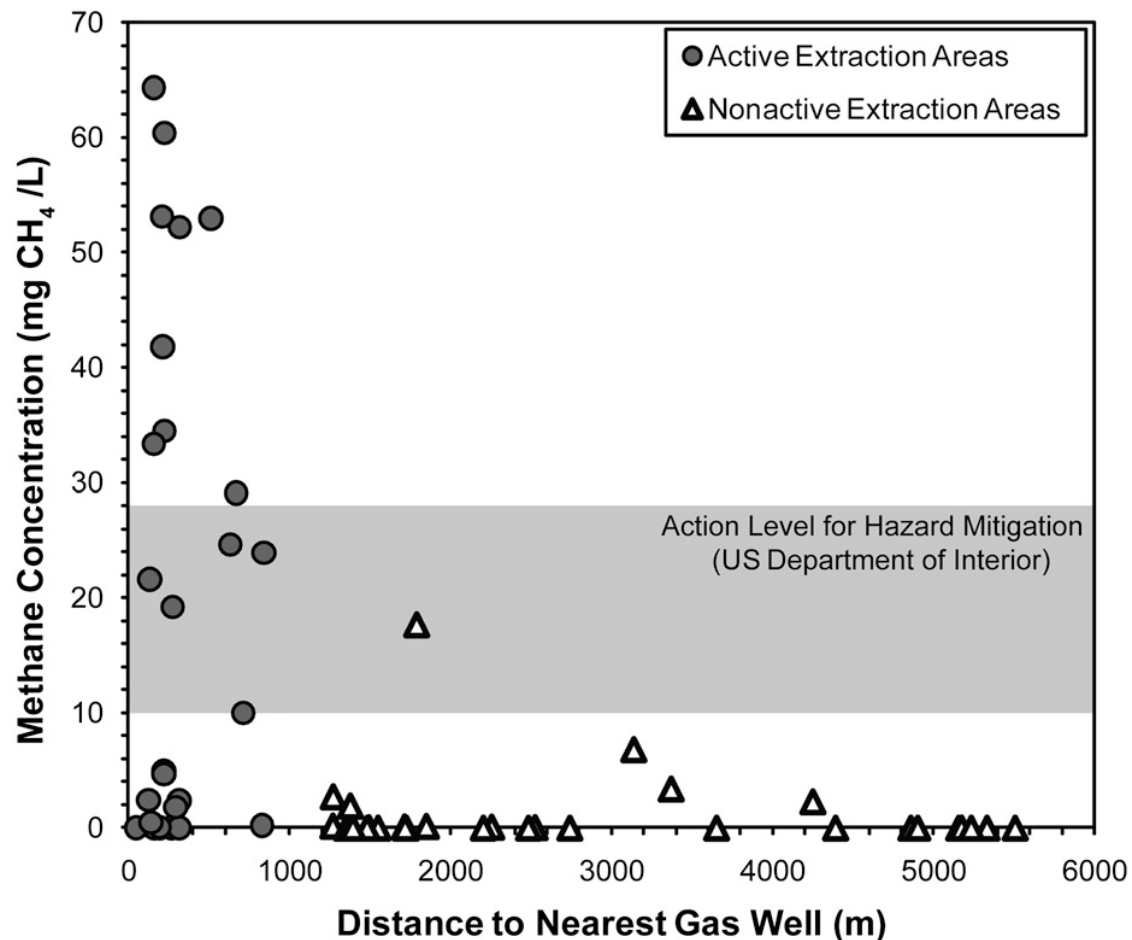
250 tons of drill cuttings are collected...they contain harmful amounts of radioactivity.

Soeder, 2012



Wells within a one-kilometer radius of a drilling site have 17 times higher concentration of methane than wells outside of a one-kilometer radius.

(But no pre-fracking baseline data was available.)



Seven families in
Bradford County
were ordered to
evacuate and
drink bottled
water after a
blowout occurred
on April 19th.



Of 8000 total wells fracked in the Mid-Eastern States, there have been 40 newsworthy contamination events...These 40 are only those that have gained media attention...



Photo by Doug Mazer, used with permission, Dan Soeder



Approximately fifty 18-wheelers passed in a one hour period.



Unwelcomed increases in property taxes.



Greene County saw a 16 percent increase in overall crime from 2005-2010.



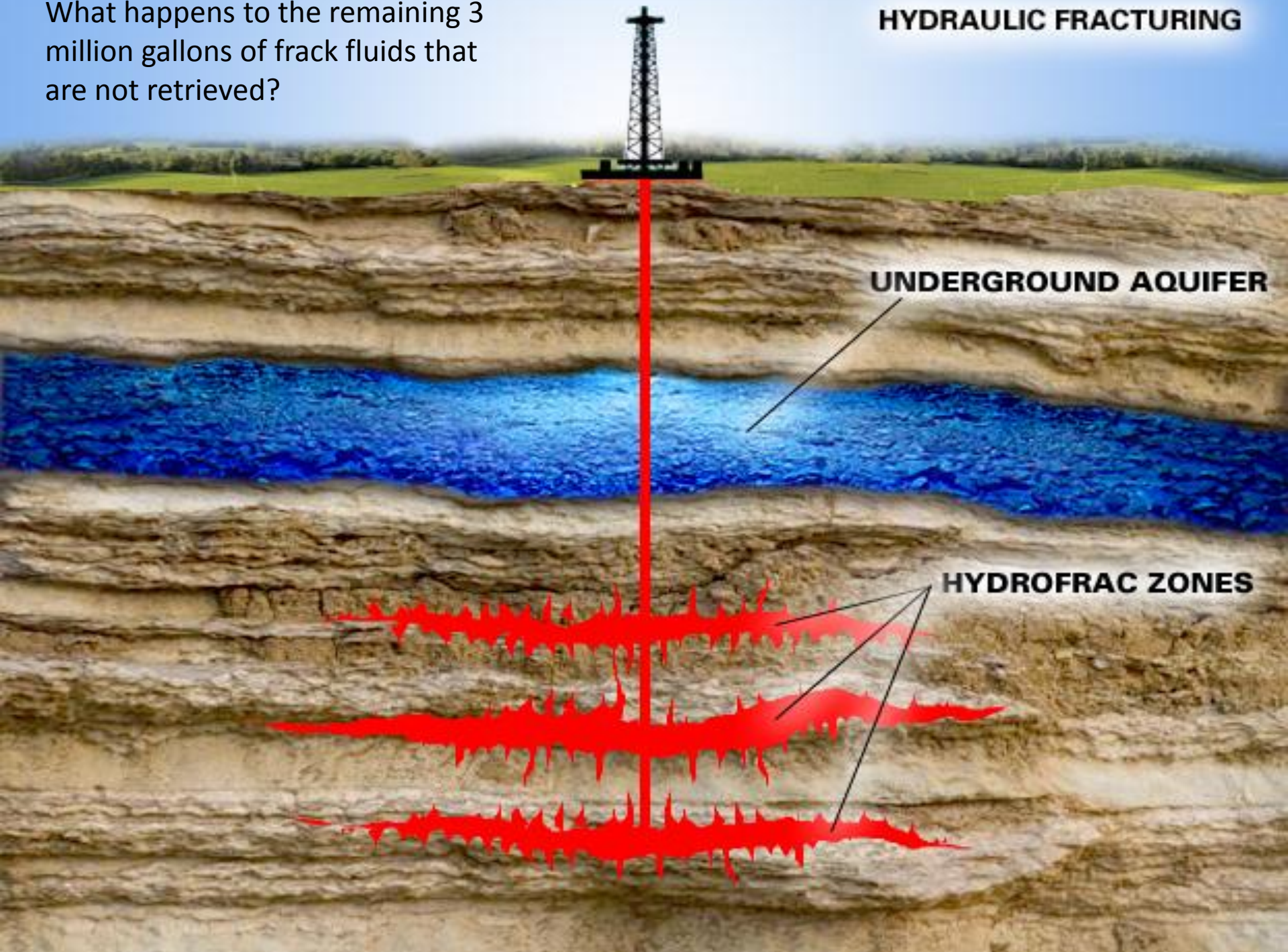
Methane is actually 25 times more potent as a greenhouse gas than carbon dioxide...the extracted gas currently provides no climate change prevention benefit.

			GWP Time Horizon	
<i>Greenhouse Gas (GHG)</i>	<i>Formula</i>	<i>Lifetime (Years)</i>	<i>20 Years</i>	<i>100 Years</i>
Carbon Dioxide	CO ₂	Variable	1	1
Methane	CH₄	12	72	25
Nitrous Oxide	N ₂ O	114	310	298
Hydrofluorocarbon-23	CHF ₃	270	1,200	14,800
Hydrofluorocarbon-134a	CH ₂ FCF ₃	14	3,830	1,430
CFC-12	CCl ₂ F ₂	100	11,000	10,900
Sulfur Hexafluoride	SF ₆	3,200	16,300	22,800

Uncertainty

What happens to the remaining 3 million gallons of frack fluids that are not retrieved?

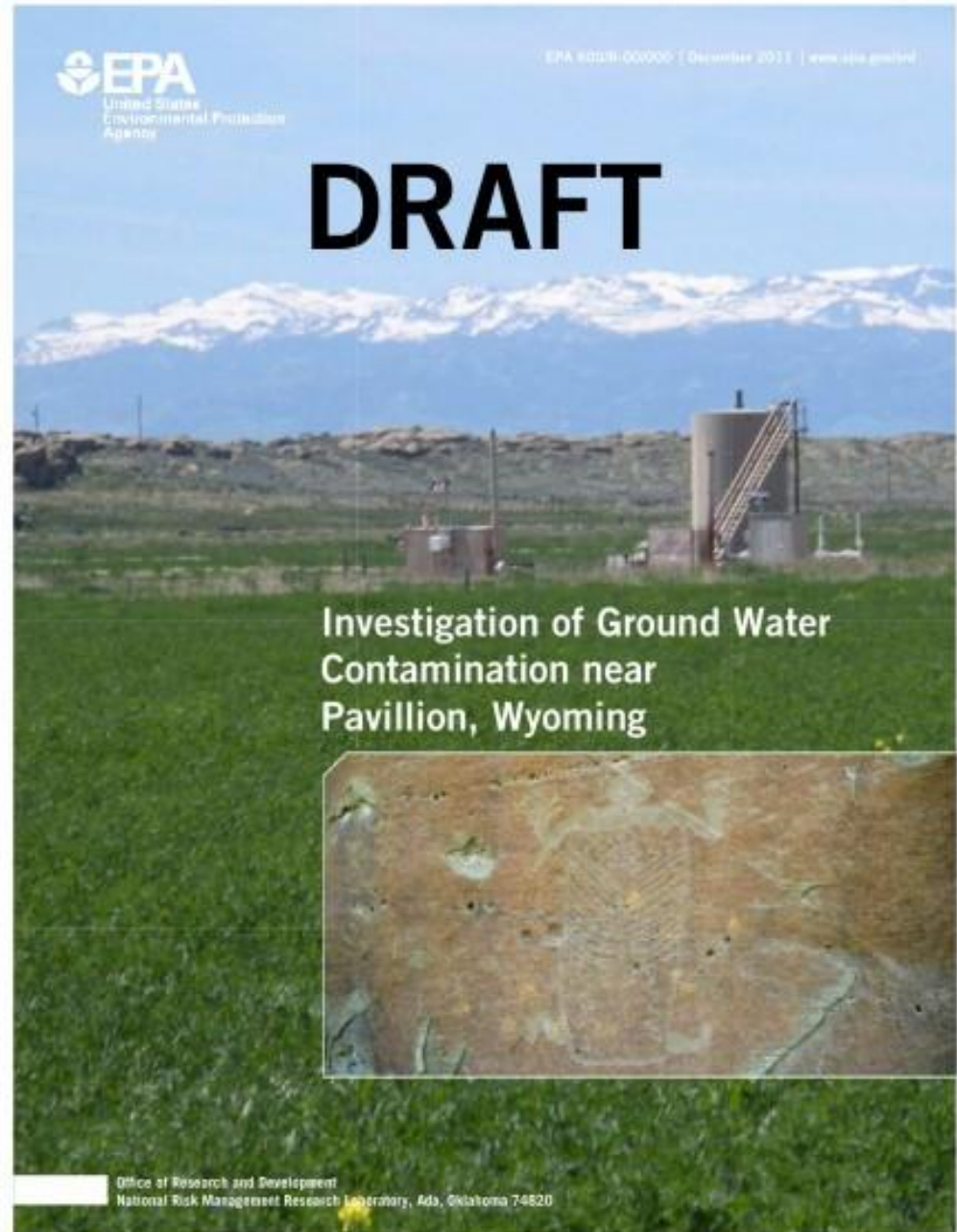
HYDRAULIC FRACTURING



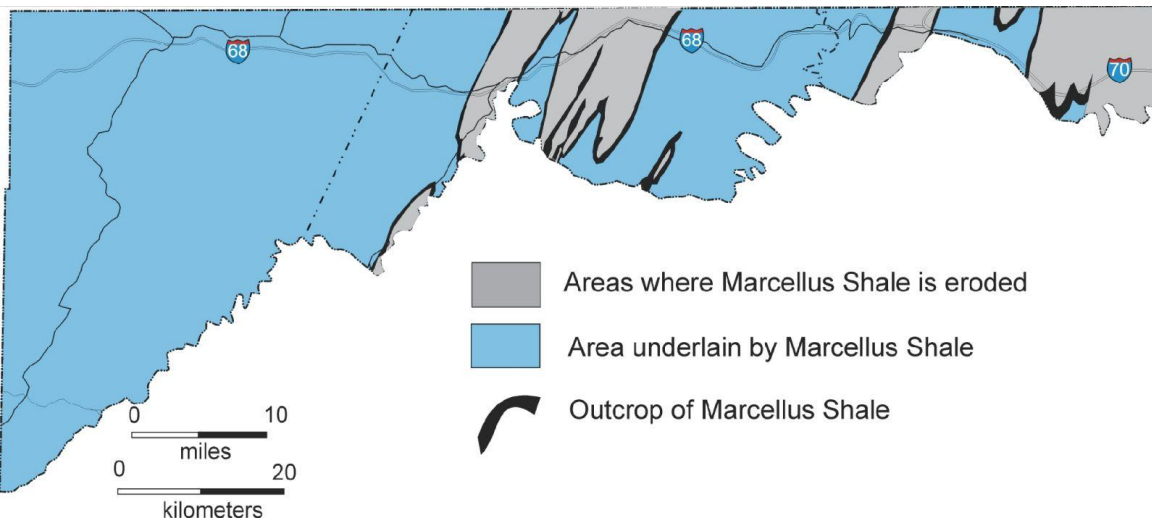
What are the health impacts of continued low-level consumption over many years?



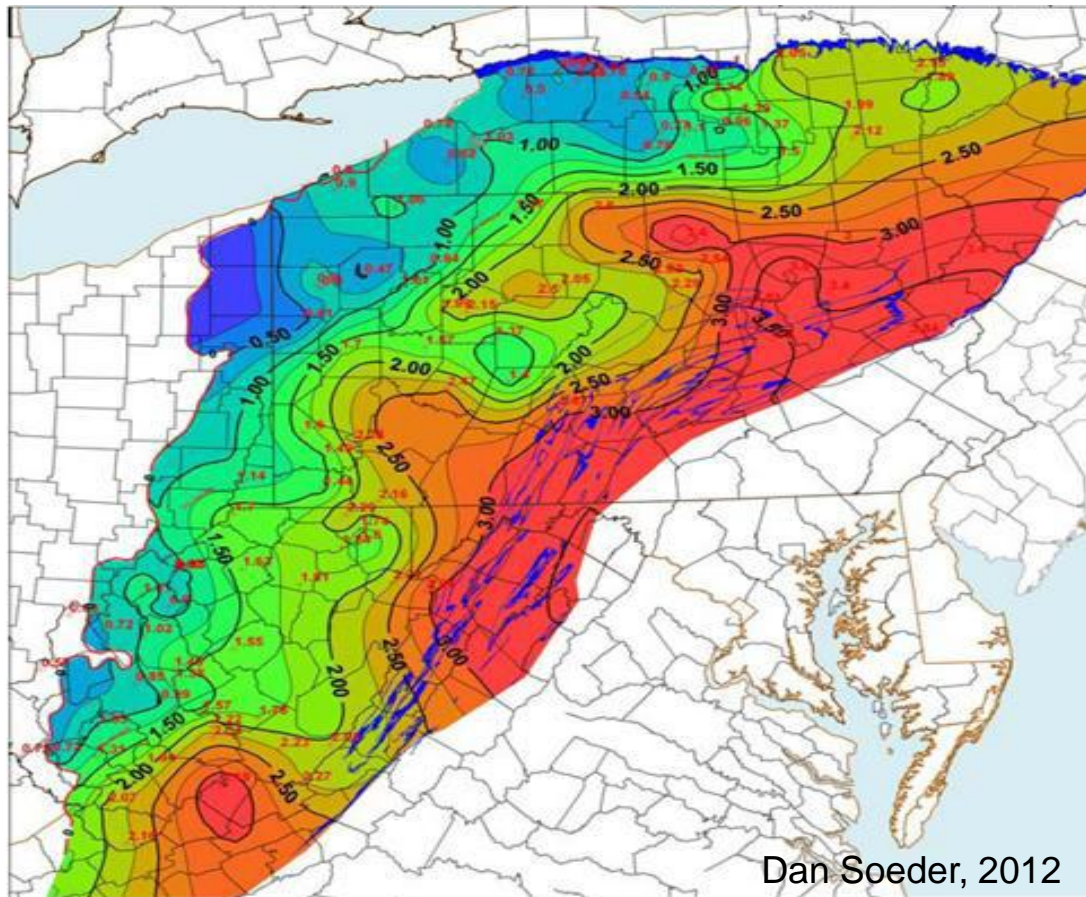
An EPA draft study indicates that fracking caused significant contamination of many drinking water wells in Pavillion, Wyoming. However this study has fallen under much criticism and scrutiny. What can we learn from this data?



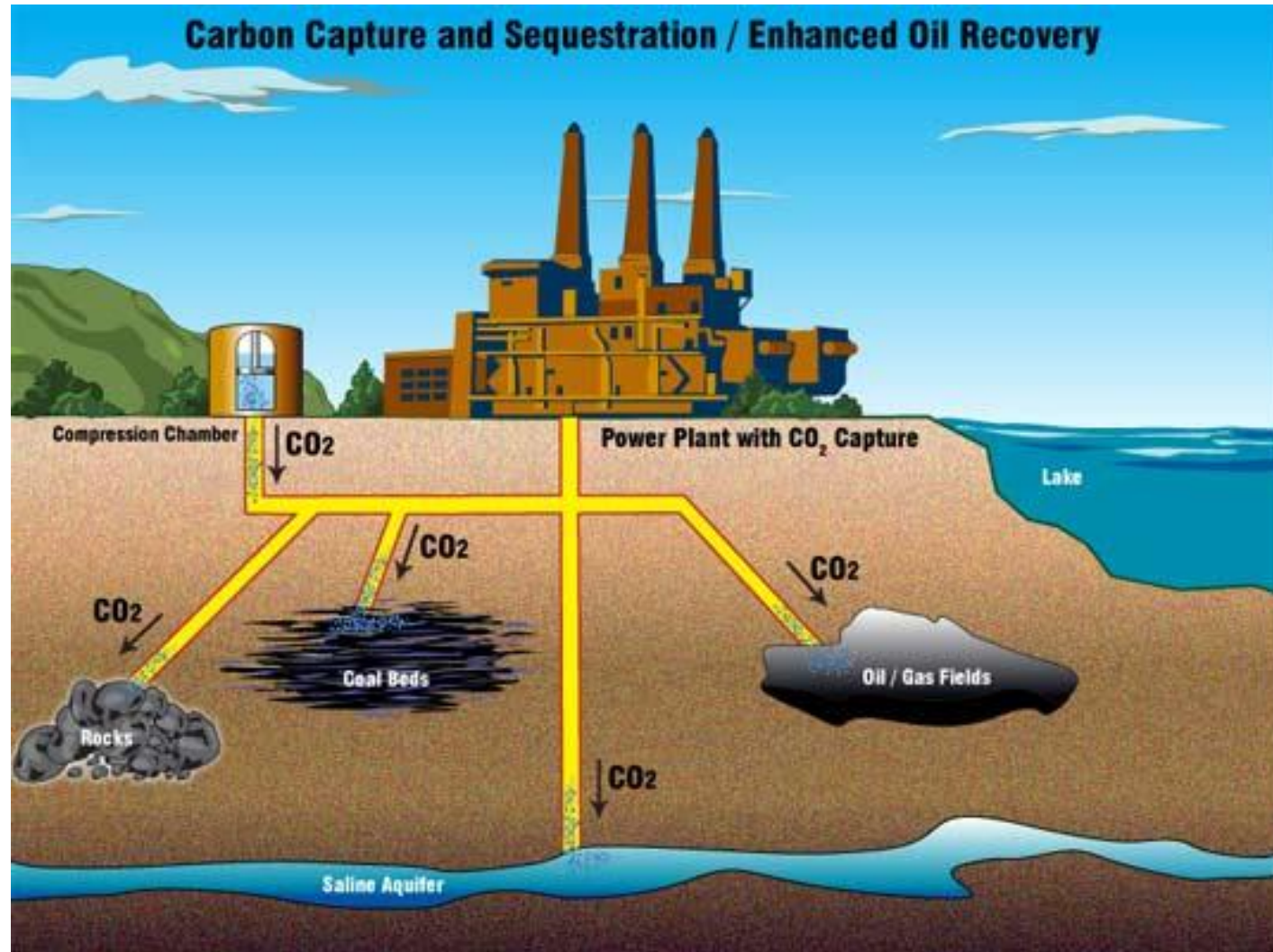
How many fracking sites will we really have in Garrett and Allegany County? (Garrett=1500, Allegany =200???)



Total Marcellus output predictions range from 400 trillion cubic feet to 200 trillion cubic feet



Will carbon dioxide fracking work?



The fact is: We need ANSWERS before we can move forward.



Until answers to the above questions are found, the consequences of Marcellus Shale drilling will remain a mystery and legislation will be guesswork.



Future Research

Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

Data will be collected on air quality, soil gas, avian populations, groundwater and stream health, and endangered species before and after fracking.



Stream Testing



Ground Water Testing



**US Army Corps
of Engineers.**

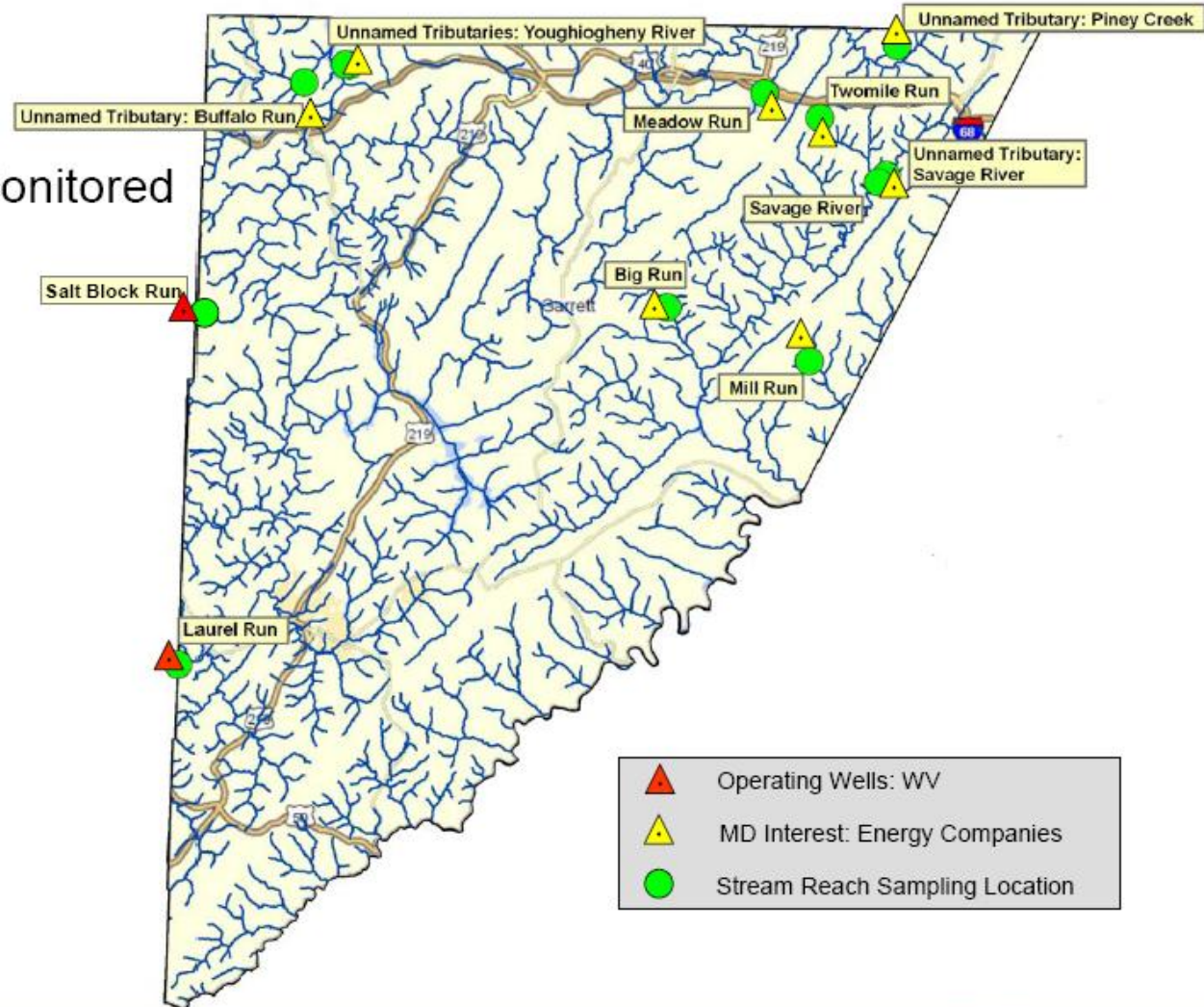


**US Army Corps
of Engineers.**



FULL STUDY TO BE RELEASED IN 2014

- 12 Stream Reaches Monitored in 2011
- Continuing in 2012





MARCELLUS SHALE SAFE DRILLING
INITIATIVE STUDY
PART I

DECEMBER 2011

Prepared By:

Maryland Department of the Environment
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Maryland General Assembly

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**December 2011,
revenue sources and liability**

**August 2012,
best practices for gas exploration**

**August 2014,
findings and recommendations relating to the impact of
Marcellus Shale drilling including possible contamination of
ground water, handling and disposal of waste water,
environmental and natural resource impacts to forests and
important habitats, greenhouse gas emissions, and economic
impact.**

**Potential Frack Tributary to Piney Run Reservoir
(1 mile northwest, in Pennsylvania)**

Frostburg
Reservoir

Piney Run Reservoir for Frostburg

We, the AP Environmental Science students of Mountain Ridge High School, have decided to take the initiative and conduct baseline testing at five locations that could potentially be affected by this fracking site.



Savage River Aquifer for Frostburg

**Frostburg Municipal Drinking Water
Treatment Plant**

Mountain Ridge Baseline Tests and Sites

Fracking Indicators

- Total Dissolved Solids
- Barium
- Bromide
- Strontium
- pH

Sites

- Piney Run Tributary
- Piney Run Dam
- Savage River Aquifer
- Water Treatment Plant-Raw
- Water Treatment Plant-Filtered



Our Elected Officials

Commissioner Valentine, Brodie,
McKay



Senator Edwards Delegate Beitzel



President Obama



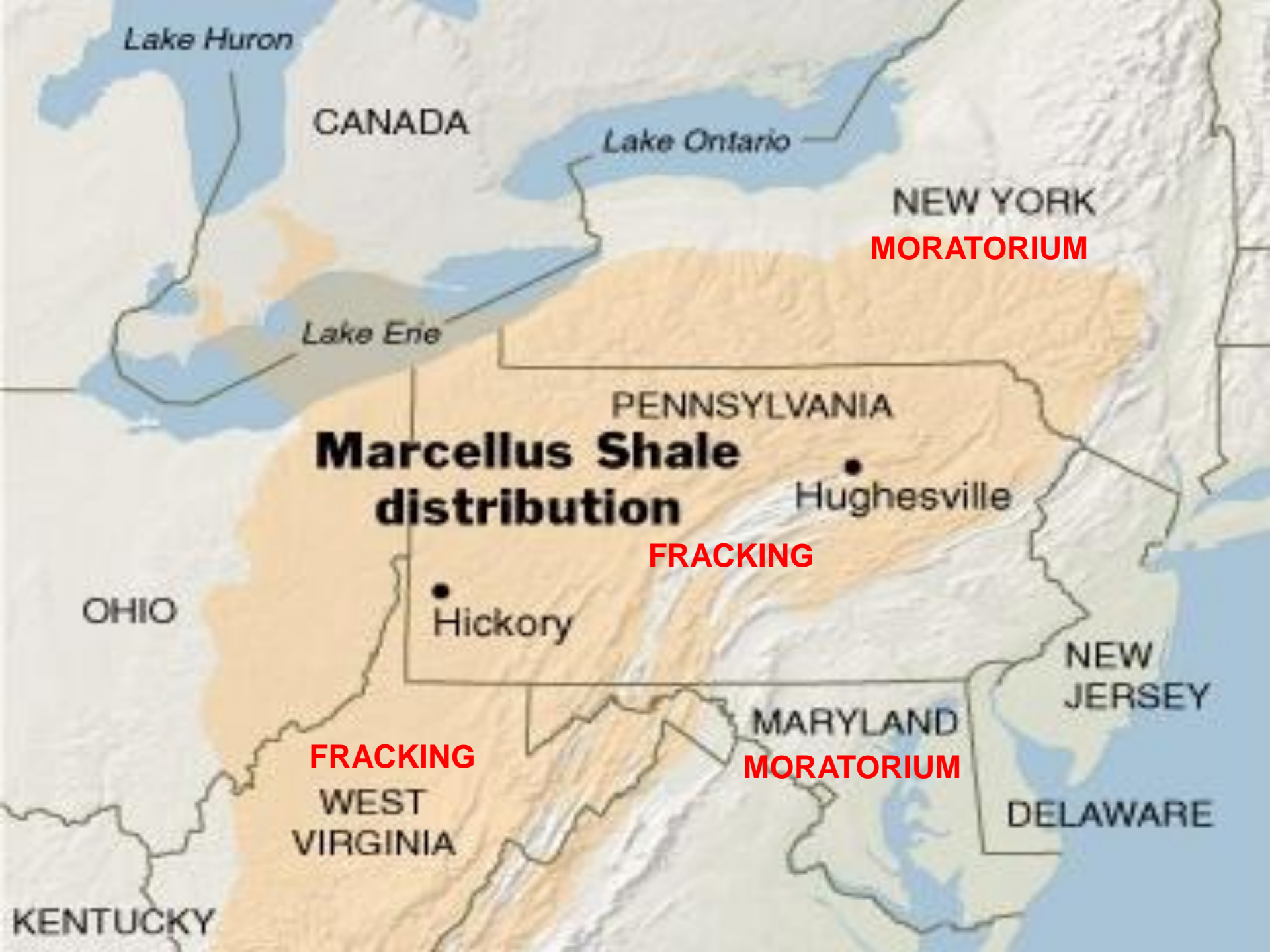
Governor O'Malley



Senator Cardin



Senator Mikulski



Lake Huron

CANADA

Lake Ontario

NEW YORK

MORATORIUM

Lake Erie

PENNSYLVANIA

**Marcellus Shale
distribution**

Hughesville

FRACKING

OHIO

Hickory

NEW
JERSEY

MARYLAND

FRACKING

MORATORIUM

WEST
VIRGINIA

DELAWARE

KENTUCKY

**Poll from the Maryland Petroleum Council: 74% in favor of
development of natural gas**
Poll from the Cumberland Times News: 66% against fracking

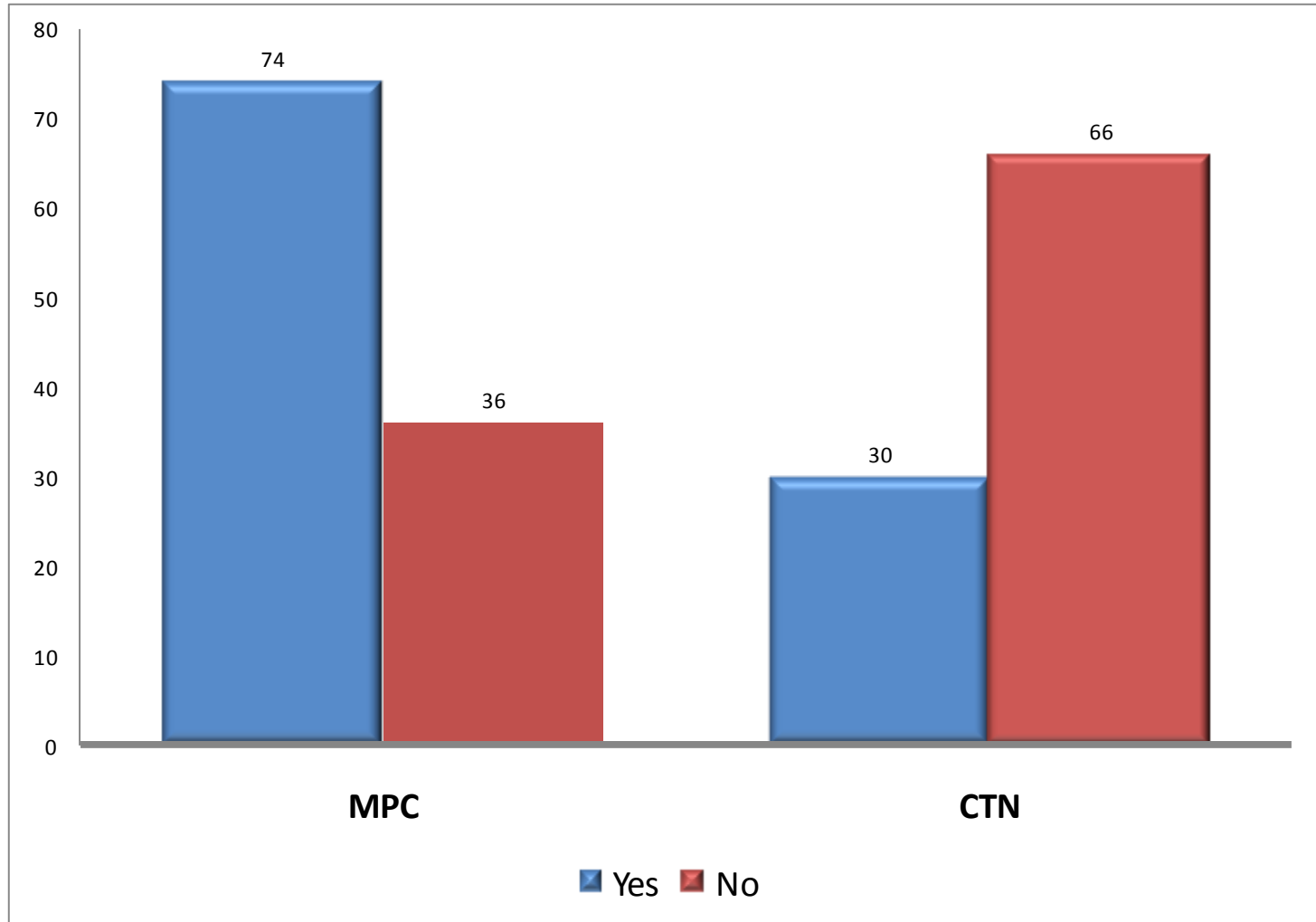


Photo Source Page

- Slide 2, *diagram showing how fracking works* N.d. Photograph. Another World Is PossibleWeb. 21 Feb 2012. <http://www.a-w-i-p.com/index.php/2011/10/27/hazardous-hydrofracking-in-america>.
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Slide 6 and 57-below

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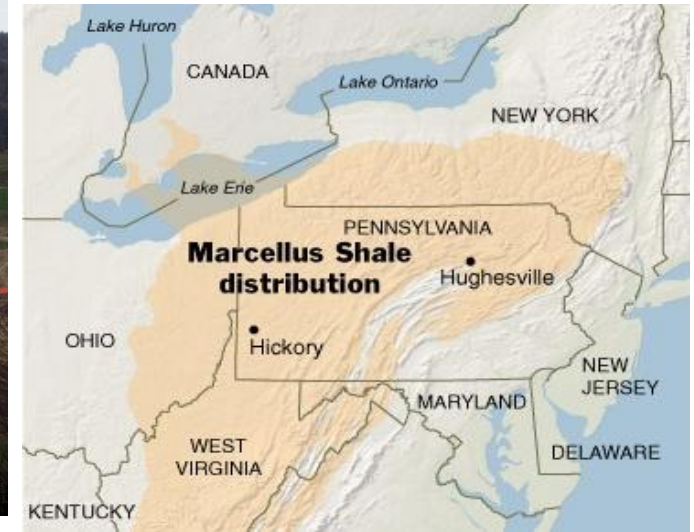
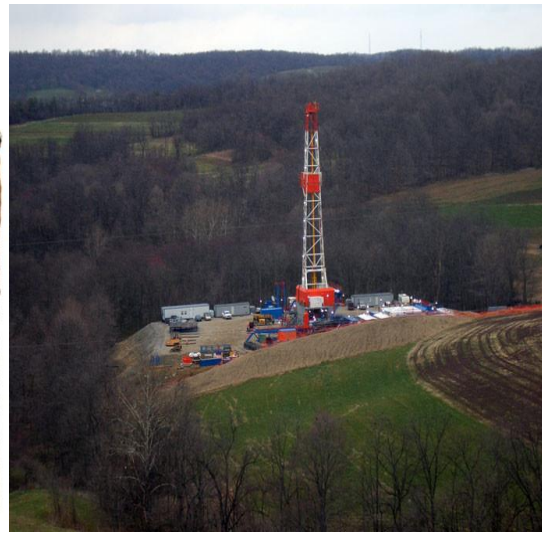
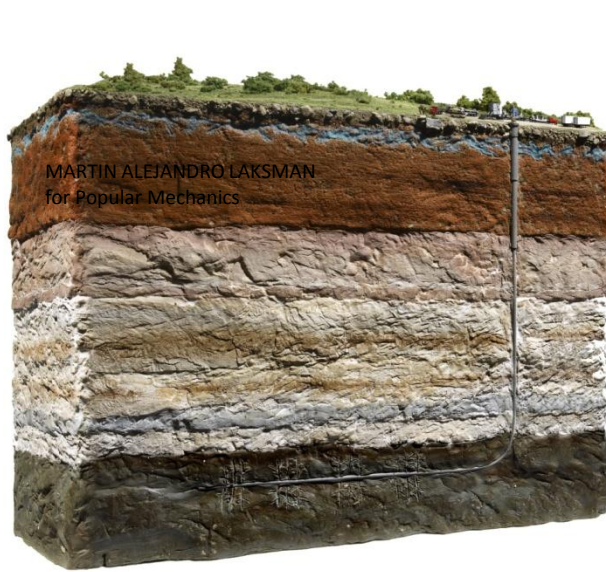
Senator Edwards. 21 February 2012. Maryland Senate. <http://www.msa.md.gov/msa/mdmanual/05sen/html/msa12217.html>

Delegate Beitzal. 21 February 2012. Maryland House Of Delegates. <http://www.msa.md.gov/msa/mdmanual/06hse/html/msa14614.html>

Senator Cardin. 21 February 2012. Afro. <http://www.afro.com/sections/news/baltimore/story.htm?storyid=74115>

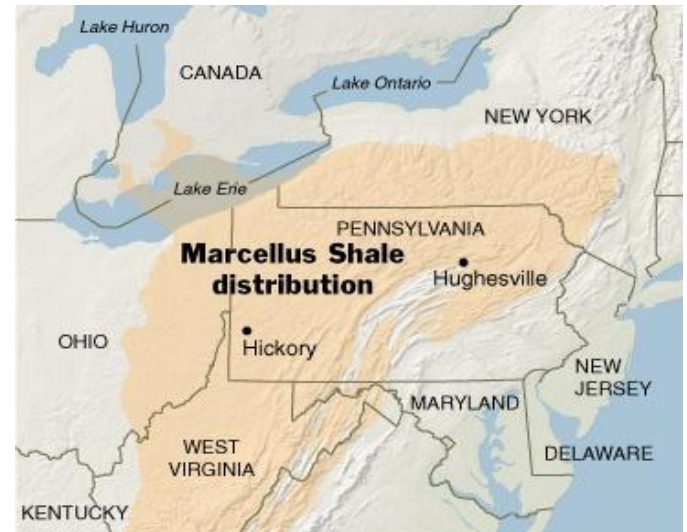
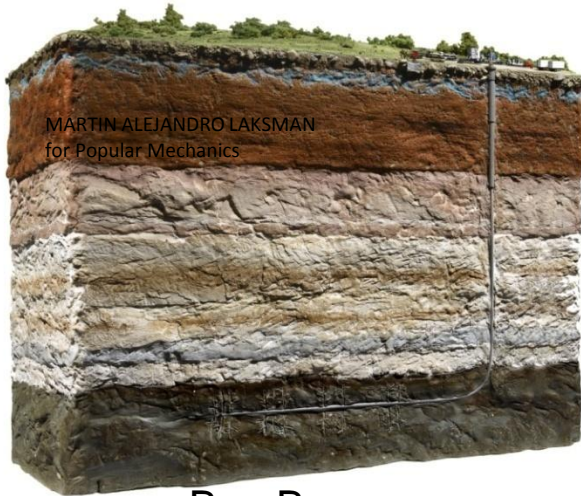
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YOUR QUESTIONS AND THEN A SURVEY





THANK YOU!

Ben Bowers
Peyton Brown
Amanda Carney-Steer
Sidney Castro
Jacy Eisel
Georgia Grace Edwards
Sam Greenawalt
Kyle Harris

Alexis Kifer
Mark Manwani
Madison Offstein
Jessica Smith
Tori Smith
Chris Stemple
Kristie Whiteman

Kiya Wilhelm
Victoria Winebrenner
Leah Yazdani
Meghan Coburn*
Bryce Dougherty*
Jake Kincer*
Jess Reed*
Riya Shah*



* - members of 2010-2011 class who helped this year