Hydraulic Fracturing in Michigan

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29 January 2011

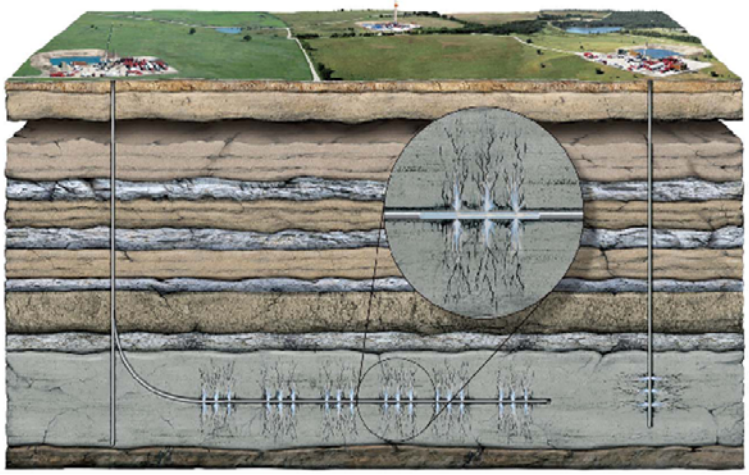
What is Hydraulic Fracturing?

"Fracking" is a process used to extract natural gas from shale formations as deep as 9000 feet. From one half to 3 million gallons of fresh clean groundwater, or more, plus chemicals* and sand are forcibly pumped down a pipe to fracture small fissures into larger ones, to allow more natural gas to flow to the surface.

In other states, notably Pennsylvania, and many others in the Western U.S., groundwater, surface water, and air pollution have all been documented, as well as severe consequences to human and animal health.

*The chemicals used by the Gas Companies are currently considered proprietary – the companies don't have to report them, or even provide a list of them. ...

Vertical vs. Horizontal Drilling



Fracking requires perforating the pipe underground and forcing water, sand, and chemicals under high pressure into the rock, opening cracks to allow gas to flow. Horizontal drilling can run 5000 feet.

Image source:
Chief Oil and Gas

Michigan's Regulations Need to:

- Require the use of the water withdrawal assessment process for the wells, and ideally all water withdrawals for oil & gas drilling
- Remove exemption for Oil & Gas under Part 327
- Require public disclosure of all chemicals used in fracking process
- Increase conformance bond & financial responsibility statement requirements for gas drilling operations and for plugging the injection wells.
- Require seismic monitoring to ensure that hydraulic fracturing is inducing microseismic activity ONLY within the shale gas reservoir.
- Require monitoring and reporting of fracturing fluid flowback volume
- Require companies to use BEST MANAGEMENT PRACTICES.
- Reassess rules and regulations after EPA releases results of the study due out in 2012, and modify Michigan rules as needed.

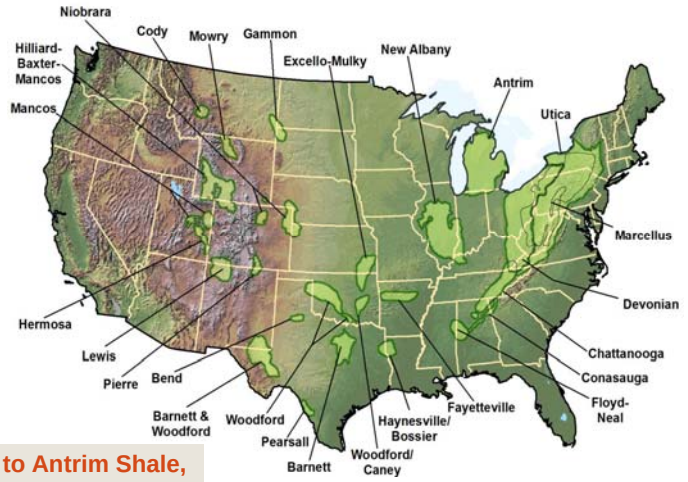
Conventional vs. Unconventional Gas

- **Conventional Gas Formation Extractions utilize-**
  - **Shallow Wells**
  - **Vertical Wells**
  - **Close Spacing**
  - **And have Low Yields**

- **Unconventional Shale (in Michigan: Utica & Collingwood Shale)**
  - **Deep Wells (4000 - 9000 feet)**
  - **Vertical and Horizontal Wells**
  - **Fracturing of Shale with High Volume of Sand and Water**
  - **High Volume Production (4 million cubic feet/day/well)**

Slide source: Sierra Club Pennsylvania Chapter, with some updated info for Michigan.

US Shale Gas Regions



In addition to Antrim Shale, Michigan has Collingwood and Utica Shale formations.

Source: US Dept of Energy

Drilling Process: Seismic Surveys

Big trucks are used to pound the ground, with microphones placed to pick up the sounds that indicate the geology deep below.

Drilling Process: Very Large Clearings for Well Sites

(photo taken in Pennsylvania.)

Drilling Process: 24/7

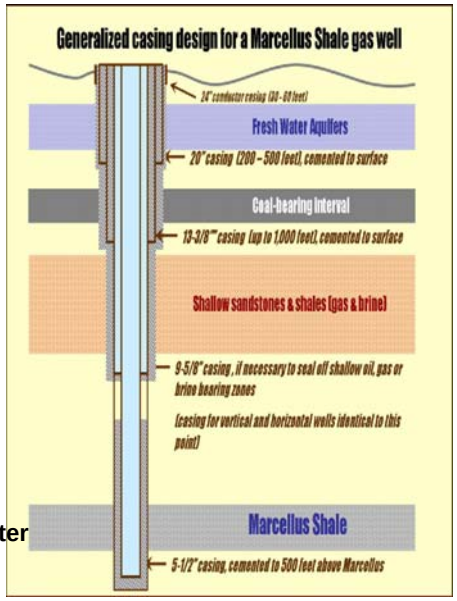
Drilling rigs are expensive to lease, so the companies want to keep them busy at All times. Large drilling rigs (that are capable of pushing 90 feet of pipe) run 24/7.

Drilling Process: Tanker Trucks for Making the Fractures

Common Marcellus well bore construction

-Well is drilled in stages with each section of the process grouted with concrete to prevent intrusion of water from deeper rock strata from reaching groundwater layers.

Illustration courtesy Range Resources

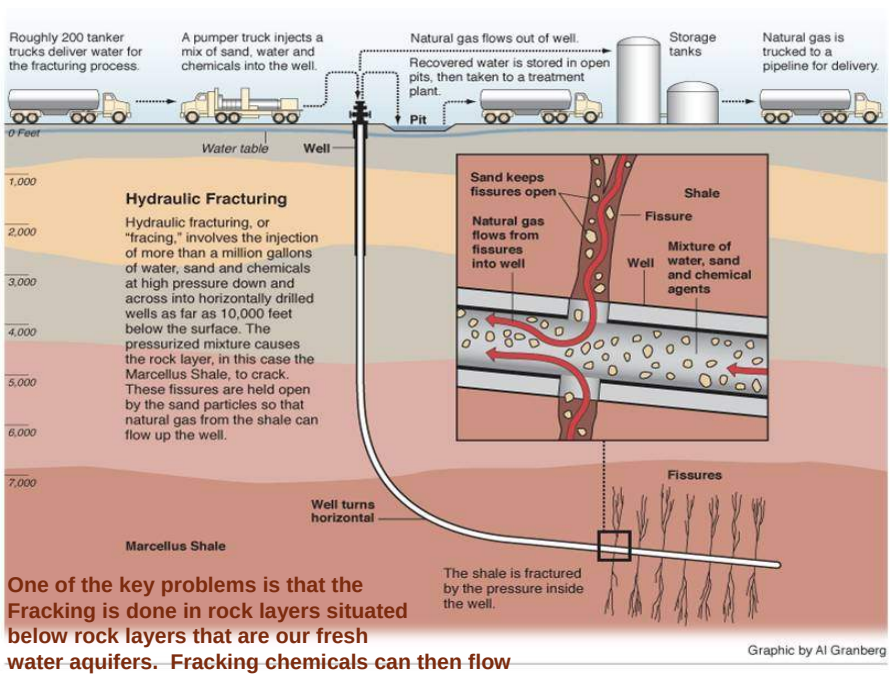


Each well is encased with concrete where the well goes through freshwater aquifers.

Marcellus Shale Wells: examples from Pennsylvania

- **Cost per well -- $2 to $4 Million+**
- **0.5 to 3 million gallons of water to Frack once**
- **Yields vary between horizontally or vertically drilled wells: 0.5 to 7.0 million cubic feet/day and improving vs. 2.0 to 6.0 in Barnett Shales of TX**

So it's mighty expensive to drill a well. However, the gas yields make it a worth their while.



One of the key problems is that the Fracking is done in rock layers situated below rock layers that are our fresh water aquifers. Fracking chemicals can then flow upward in the new fissures into our drinking water wells.

Potential Areas for Problems

- **Leaks in casing or pipe**
- **Leaks in the pits and from liners in holding ponds**
- **Spills from transportation of water to and from well site**
- **Stormwater overflow from pits and ponds**
- **Site erosion into streams and wetlands**
- **Fuel spills from operations**

Wastewater Practices

Photo source: WVSORO

- In some states, wastewater is collected in lagoons, then transported off site for “treatment”.
- In Michigan, the wastewater is injected back into the ground, avoiding NPDES permits. Since the companies are exempt from the federal Safe Drinking Water Act, they don’t need permits to re-inject the water.

Two Kinds of Wastewater…

- **Frac Water (flowback) contains:**

  chemicals such as: demulsifiers, corrosion inhibitors, friction reducers, clay stabilizers, scale inhibitors, biocides, breaker aids, mutual solvents, alcohols, surfactants, anti-foam agents, defoamers, viscosity stabilizers, iron control agents, diverters, emulsifiers, foamers, oxygen scavengers, pH control agents, and buffers.
- **Produced water or brine from shale contains:**

  high total dissolved solids, chlorides, sulfates, heavy metals, and some radioactive material

Other land "footprint" consequences: Pipeline installation and gathering lines

Picture courtesy Fortuna Energy

Compressor station used to increase gas pressure into pipeline – more footprint, and more potential for air pollution and spills (photo from Pennsylvania)

Picture courtesy Fortuna Energy

Permanent Structures:
Well head, brine tanks, and drying equipment

Picture courtesy Fortuna Energy

Some Key Issues

- **Water Withdrawals of millions of gallons per well, and per fracture**
- **Preventing Spills and Leaks**
- **Treating Wastewater – hard to remove all those chemicals typically not found in wastewater at a treatment plant.**
- **Roads and Forest fragmentation**
- **Pipelines and Compressors**
- **Long Term Consequences**
- **Air quality impacts – these can be huge, and they're exempt from the Clean Air Act, so they're not permitted.**

Sierra Club Policy on Fracking

1. The Sierra Club opposes fracking projects if the identity and volume of fracking fluids are not fully disclosed to the public.
2. The Club opposes any projects using fracking fluids that pose unacceptable toxic risks.
3. The Club opposes any projects that do not properly treat, manage, and account for fracking fluids, drilling muds, and produced water.

Sierra Club Policy on Unconventional Gas

4. The Club opposes fracking projects that would endanger water supplies or critical watersheds, that would seriously damage important wildland resources, and that would imperil human health.
5. The Club opposes any fracking projects that would cause violations of air quality standards.
6. Best management practices should be swiftly incorporated into regulatory requirements as they are developed.

Hydraulic Fracturing is exempt from…

http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfm

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Regulation of Hydraulic Fracturing by the Office of Water

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Water is an integral component of the hydraulic fracturing process. EPA Office of Water regulates waste disposal of flowback and sometimes the injection of fracturing fluids as authorized by the Safe Drinking Water Act and Clean Water Act.

Safe Drinking Water Act

Several statutes may be leveraged to protect water quality, but EPA's central authority to protect drinking water is drawn from the Safe Drinking Water Act (SDWA). The protection of USDWs is focused in the Underground Injection Control (UIC) program, which regulates the subsurface emplacement of fluid. Congress provided for exclusions to UIC authority (SDWA § 1421(d)), however, with the most recent language added via the Energy Policy Act of 2005:

"The term 'underground injection' -

(A) **means** the subsurface emplacement of fluids by well injection; and
(B) **excludes** -
(i) the underground injection of natural gas for purposes of storage; and
(ii) the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fractu...
operations related to oil, gas, or geothermal production activities."

While the SDWA specifically excludes hydraulic fracturing from UIC regulation under SDWA § 1421 (d)(1), the use of diesel fuel during hydraulic fracturing is still regulated by the UIC program. Any service company that performs hydraulic fracturing using diesel fuel must receive prior authorization from the UIC program. Injection wells receiving diesel fuel as a hydraulic fracturing additive will be considered Class II wells by the UIC program. The UIC regulations can be found in Title 40 of the Code of Federal Regulations Parts 144-148. State oil and gas agencies may have additional regulations for hydraulic fracturing. In addition, states or EPA have authority under the Clean Water Act to regulate discharge of produced waters from hydraulic fracturing operations.

The term "underground injection" excludes Hydraulic fracturing!

As USEPA points out below, since Congress took away their ability to regulate Fracking, it's really up to the states to protect their own water.

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Clean Water Act

Disposal of flowback into surface waters of the United States is regulated by the National Pollutant Discharge Elimination System (NPDES) permit program. The Clean Water Act authorizes the NPDES program.

State regulations

In addition to federal authority to regulate the hydraulic fracturing process, states may have additional regulations on hydraulic fracturing and the production of fossil fuels.

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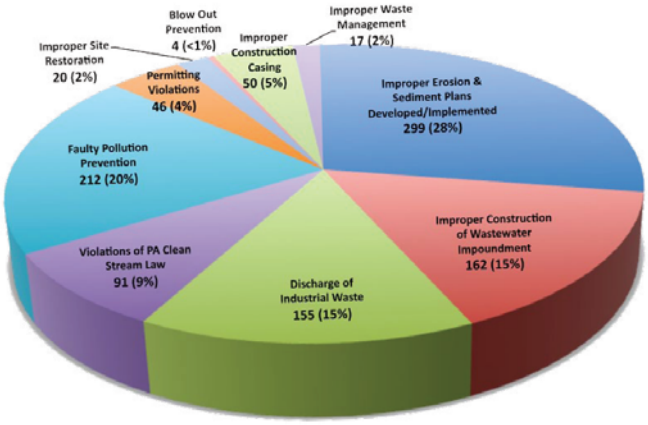
Marcellus Shale Drillers in Pennsylvania Amass 1614 Violations since 2008

1056 Identified as Most Likely to Harm the Environment

The Pennsylvania Land Trust Association identified a total of **1614 violations accrued by 45** Pennsylvania Marcellus Shale drillers between 1/1/2008 and 8/20/2010, using records obtained by the PA Department of Environmental Protection. Of these, the Association identified 558 where the violations seemed unlikely to directly endanger the environment and/or the safety of communities.

This report focuses on the remaining **1056 violations which were judged as having the most potential** for direct impact on the environment. These violations do not include violations incurred by drilling wastewater haulers. During a 3-day enforcement blitz in June 2010, **669 traffic citations and 818 written warnings were issued to trucks hauling Marcellus Shale drilling wastewater.**



1 Pennsylvania Department of Environmental Protection News Release (6/23/2010)For information on methodology, contact Elana Richman at 717.230.8560 or email erichman@conserveland.org.

As of Feb. 1, 2011, Michigan has only two exploratory wells. Many more have recently been permitted, though.

Contact the Sierra Club Michigan Chapter to help!

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