The Marcellus and Fracturing (or fracking)

The Fiction and the Facts

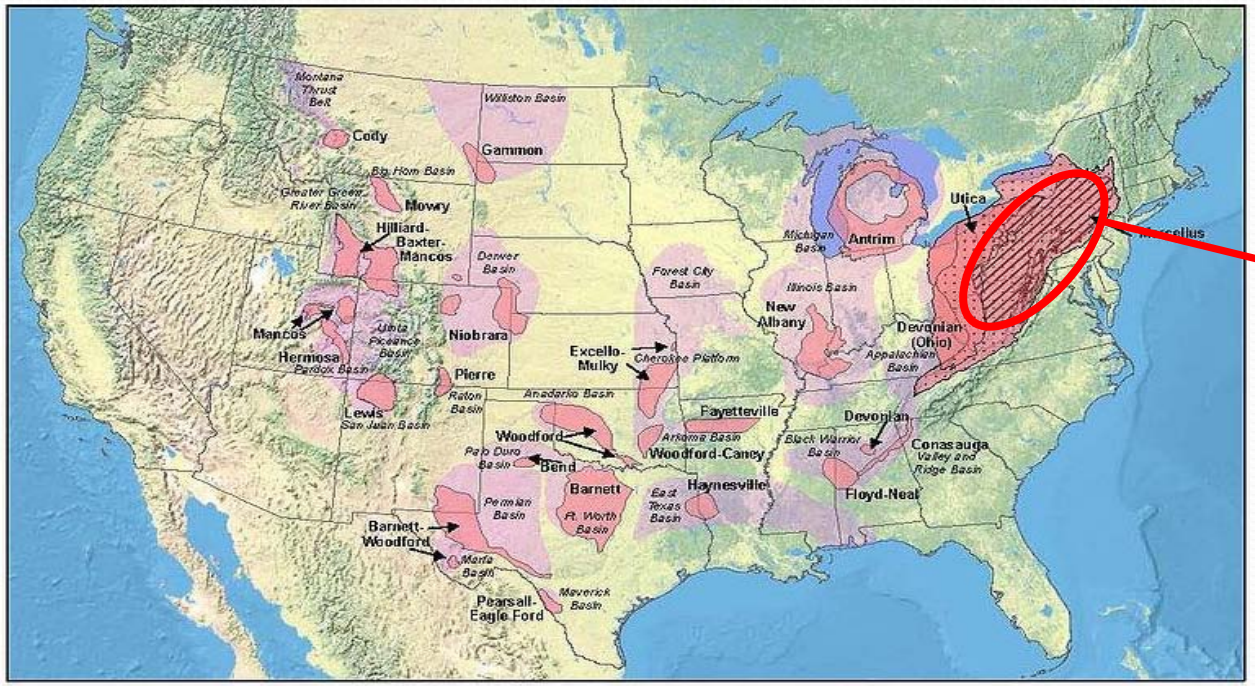
Greg Kozera- Superior Well Services


BEACH


BANKS

Navy Chief Master At Arms Corey M. Kozera is with Riverine Group ONE. This photograph was taken on May 31, 2011, at Fort Knox, Ky., while conducting high-risk live fire "boots on ground" training for a Riverine Detachment prior to deployment.

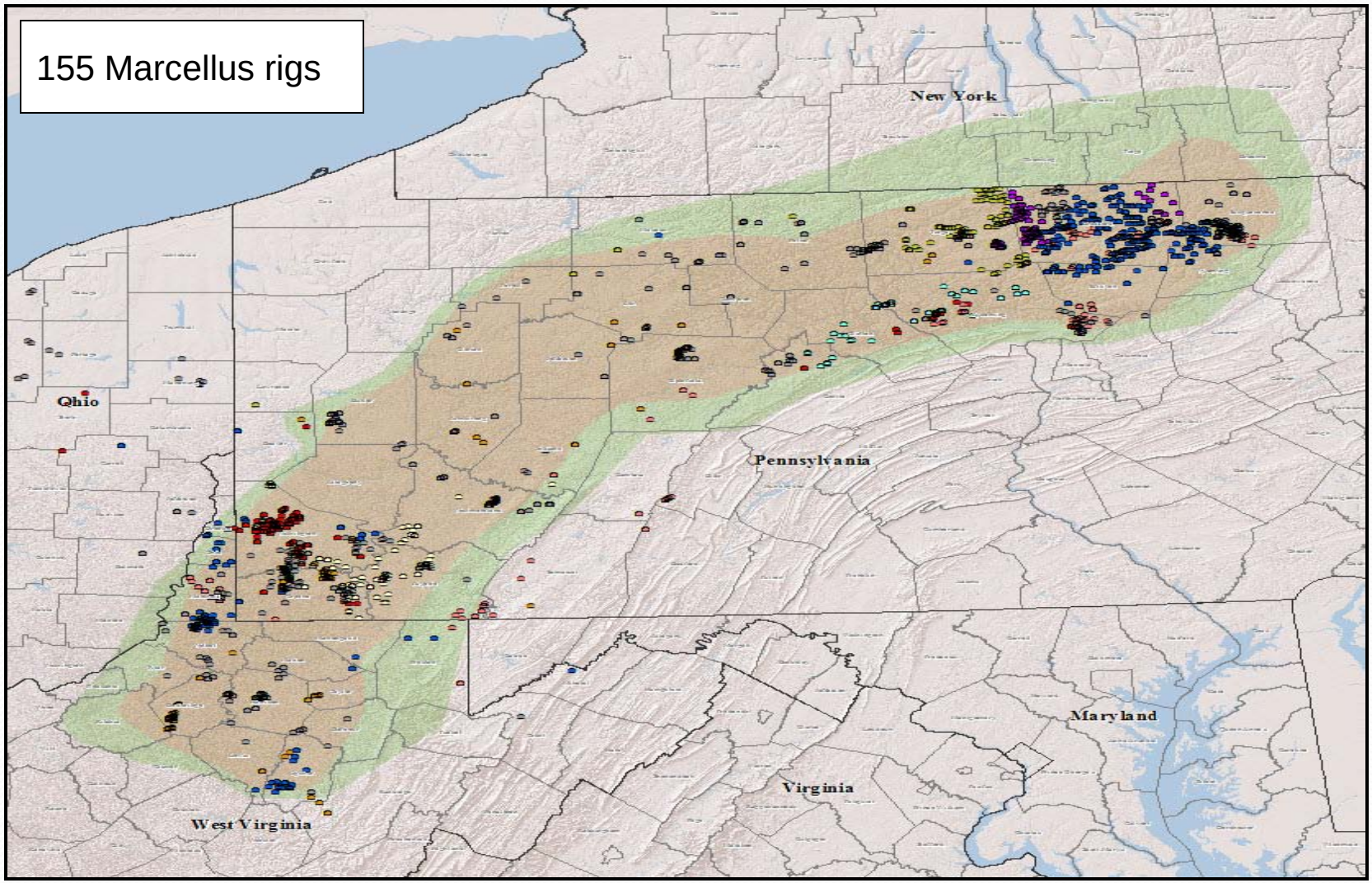
United States Shale Gas Plays



~600 TCF of Estimated Gas in Place in the Marcellus Shale

False
Evidence
Appearing
Real

Marcellus Activity – Active Drilling Rigs Across Play



The Fiction

Hydraulic Fracturing .....

Is Not a Drilling Technique

It is part of the well completion process

Is Not New

First Fracs were in the 1940s

Is Not Explosive

We create a crack in the rock hydraulically with fluid

Does Not Cause Breast Cancer

Does Not Cause Hair Loss

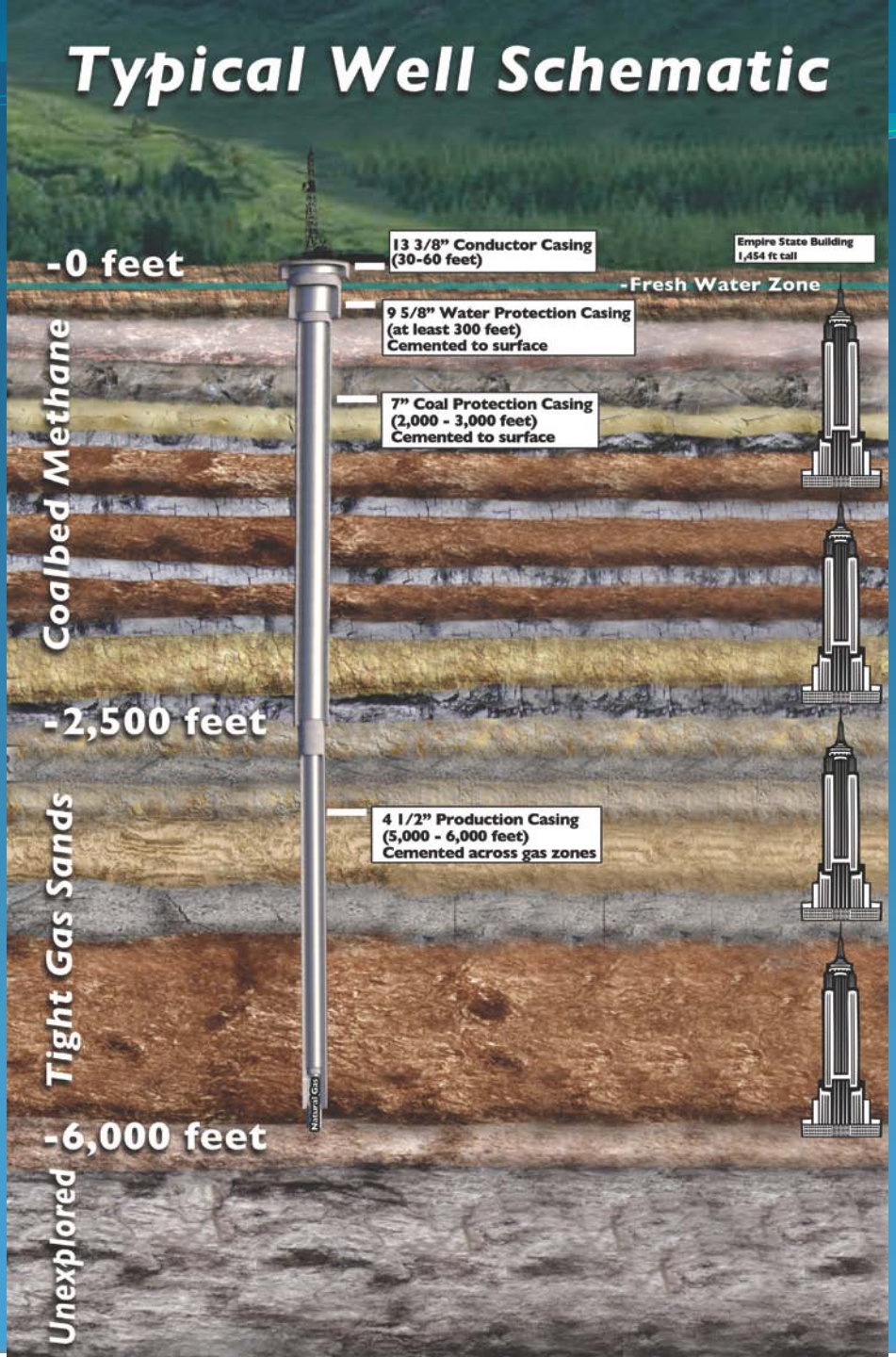
Does Not Cause Homosexuality

Does NOT Pollute Ground Water

A little science and logic proves it

JUST BENEATH THE SURFACE

Casing Off Water and Coal


Typical Well Schematic
-0 feet
13 3/8" Conductor Casing
(30-60 feet)
Empire State Building
1,454 ft tall
-Fresh Water Zone
9 5/8" Water Protection Casing
(at least 300 feet)
Cemented to surface
7" Coal Protection Casing
(2,000 - 3,000 feet)
Cemented to surface
Coalbed Methane
-2,500 feet
4 1/2" Production Casing
(5,000 - 6,000 feet)
Cemented across gas zones
Tight Gas Sands
-6,000 feet
Unexplored
Natural Gas

Does NOT, Cause Earthquakes

After 60 years of fracturing, come on

Hydraulic Fracturing IS Regulated

THE FACTS DON'T COUNT

UNLESS…

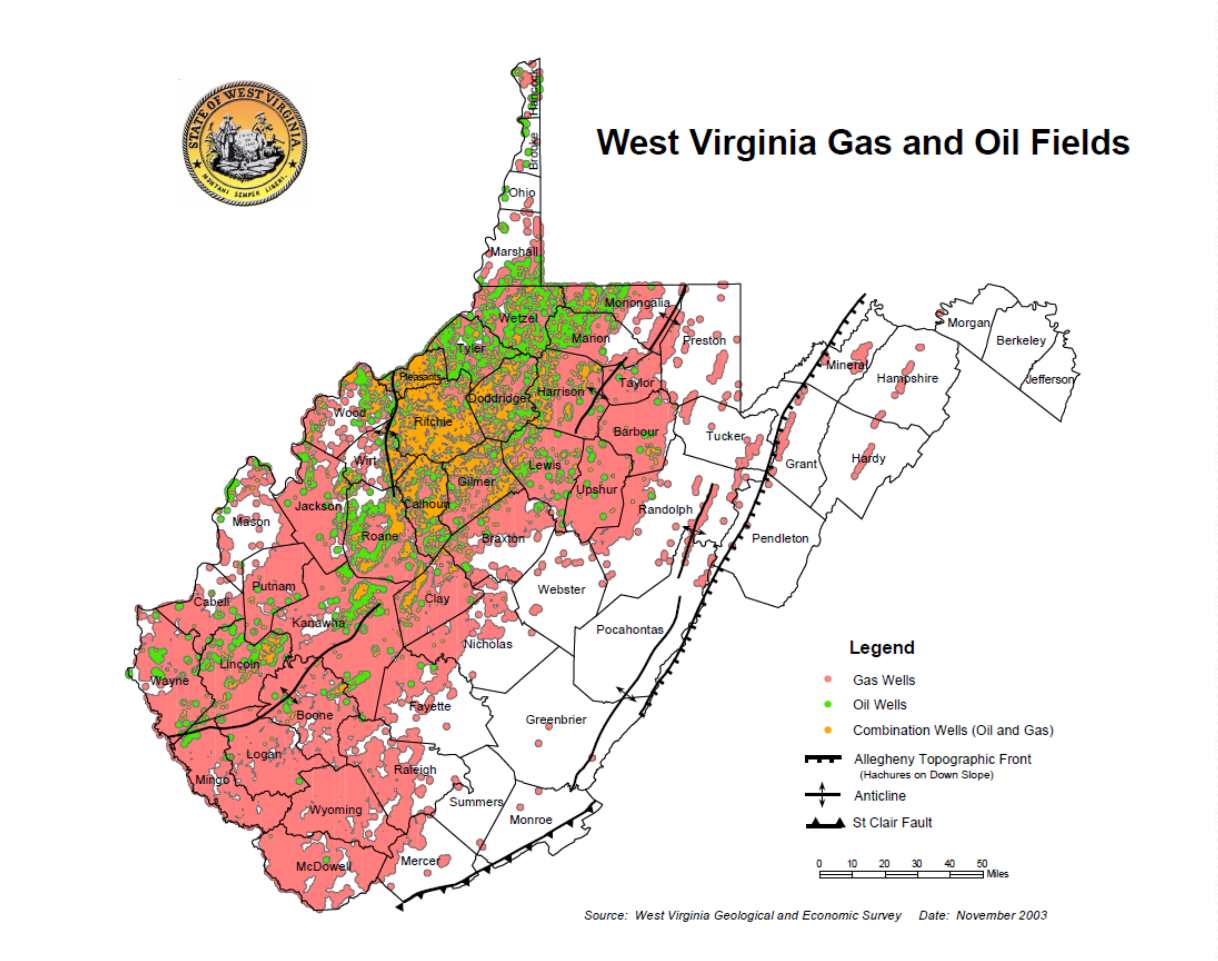
People Make Decisions on *Emotion* NOT Logic

Let's Replace Fear with Facts

The Facts about Hydraulic Fracturing…

Over 90% of wells in the US require fracturing

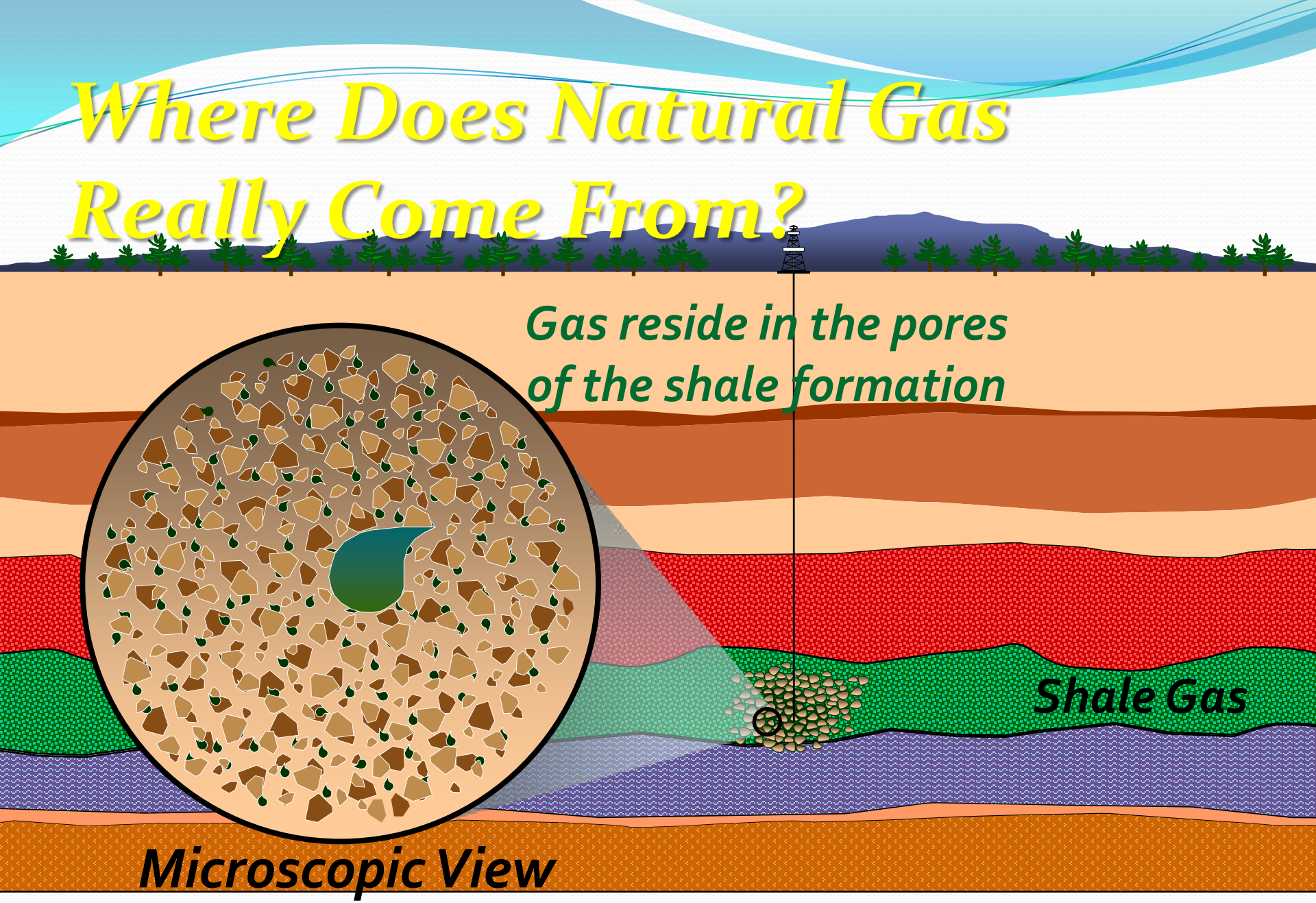
Wells drilled in West Virginia



Over 140,000 wells in WV

Shallow wells hydraulically fractured

Where Does Natural Gas Really Come From?

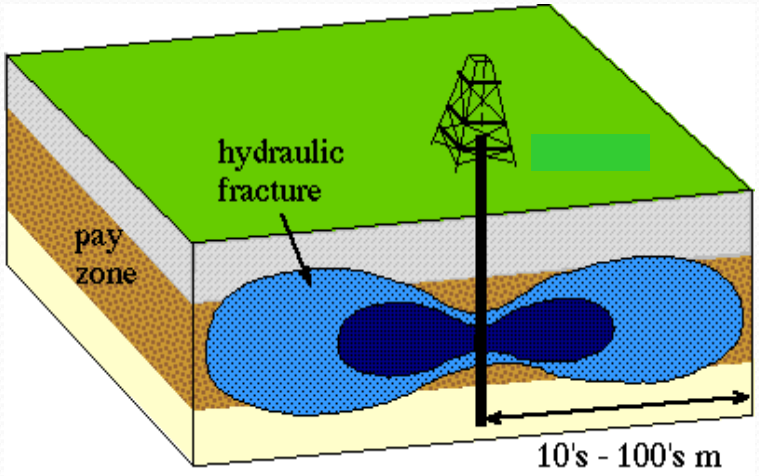


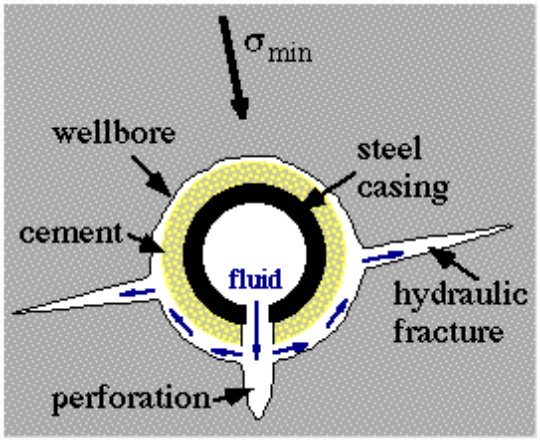
Why do we frac?

Hydraulic Fracturing

- *The process of injecting a fluid under pressure through wellbore to overcome native stresses and create a fracture or a fracture system in a porous medium.*

- *Generally a propping agent is also injected along with the fluid since hydraulically formed fractures tend to heal after parting pressure is released.*





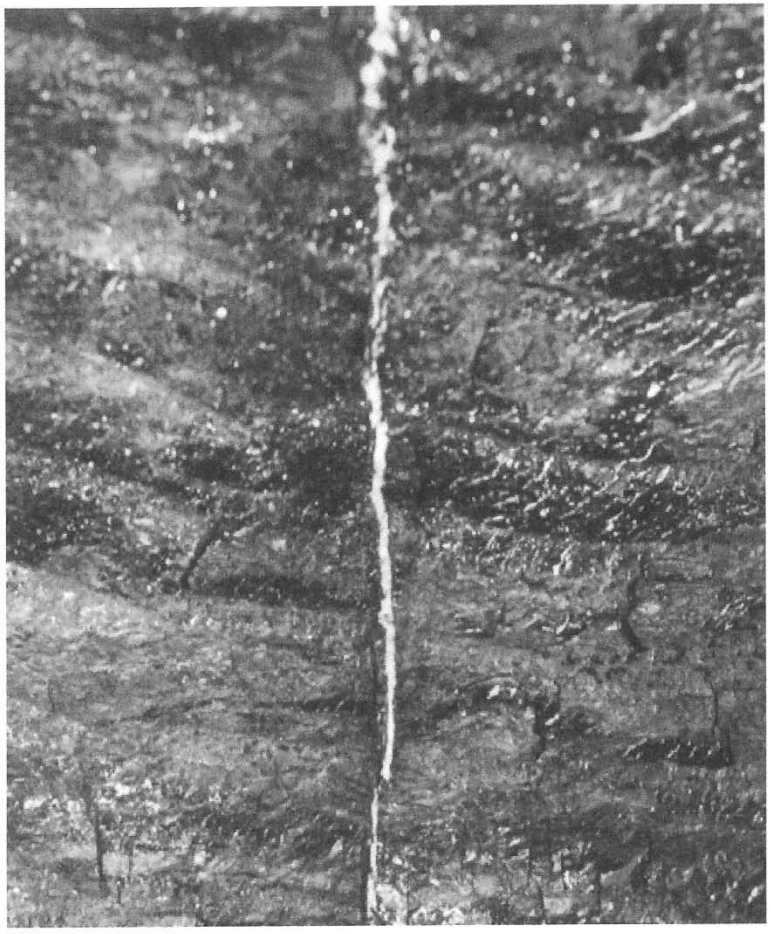
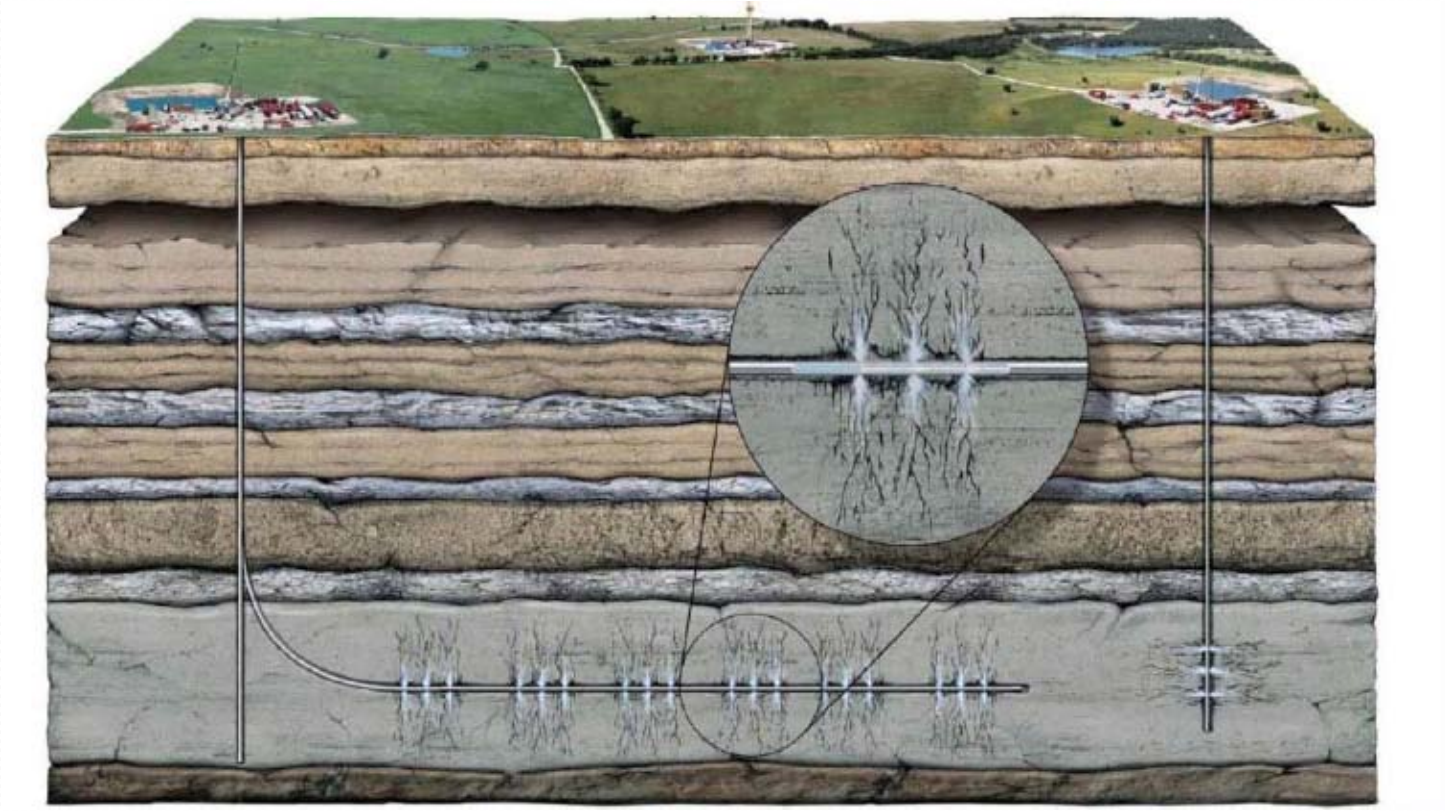


Photo 1 A hydraulic fracture propped with white sand in the roof coal at Dartbrook Coal Mine, NSW.

By placing sufficient proppant in a hydraulic fracture that extends a sufficient distance, a conductive channel is

Hydraulically Fractured Horizontal Well



Horizontal drilling has enabled higher well efficiencies despite the higher costs versus traditional vertical wells

Fracturing Fluids

- Water
- Foam
- Crosslinked foam or water
- Nitrogen
- Other


MARTIN

Treatment Control Center

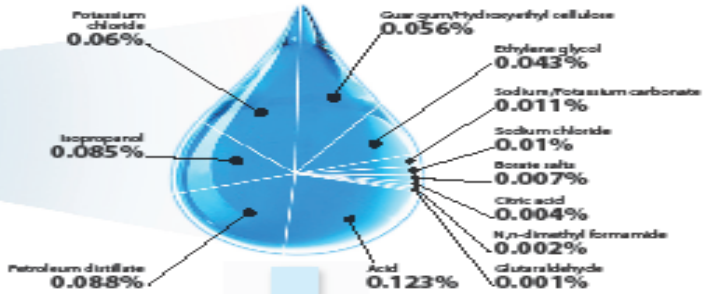
ENERGYINDEPTH

What about those chemicals?

A FLUID SITUATION:

TYPICAL SOLUTION* USED IN HYDRAULIC FRACTURING

0.49%
ADDITIVES*



On average, **99.5%** of fracturing fluids are comprised of freshwater and compounds are injected into deep shale gas formations and are typically confined by many thousands of feet or rock layers.

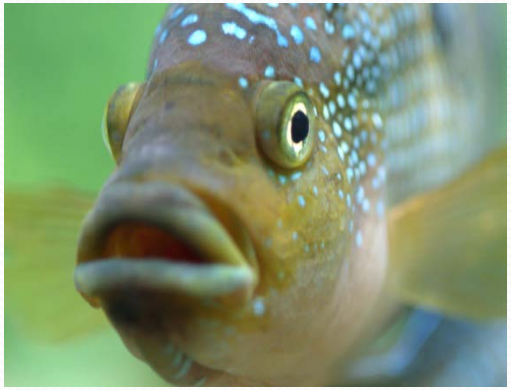
Source: DOE, GWPC-Modern Gas Shale Development in the United States: A Primer (2009)

Compound*	Purpose	Common application
Acids	Helps dissolve minerals and initiate fissure in rock (pre-fracture)	Swimming pool cleaner
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant; Sterilizer for medical and dental equipment
Sodium Chloride	Allows a delayed break down of the gel polymer chains	Table Salt
N, n-Dimethyl formamide	Prevents the corrosion of the pipe	Used in pharmaceuticals, acrylic fibers and plastics
Borate salts	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps and cosmetics
Polyacrylamide	Minimizes friction between fluid and pipe	Water treatment, soil conditioner
Petroleum distillates	"Slicks" the water to minimize friction	Make-up remover, laxatives, and candy
Guar gum	Thickens the water to suspend the sand	Thickener used in cosmetics, baked goods, ice cream, tooth-paste, sauces, and salad dressing
Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice
Potassium chloride	Creates a brine carrier fluid	Low sodium table salt substitute
Ammonium bisulfite	Removes oxygen from the water to protect the pipe from corrosion	Cosmetics, food and beverage processing, water treatment
Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Washing soda, detergents, soap, water softener, glass and ceramics
Proppant	Allows the fissures to remain open so the gas can escape	Drinking water filtration, play sand
Ethylene glycol	Prevents scale deposits in the pipe	Automotive antifreeze, household cleansers, deicing, and caulk
Isopropanol	Used to increase the viscosity of the fracture fluid	Glass cleaner, antiperspirant, and hair color

*The specific compounds used in a given fracturing operation will vary depending on source water quality and site, and specific characteristics of the target formation. The compounds listed above are representative of the major material components used in the hydraulic fracturing of natural gas shales. Compositions are approximate.

WFR-3B

- 2009 World Oil Award Winner
  - Best Drilling Completion and Production Fluid
- 2010 Hart Award for Innovation.
- Base Polymer has NSF Approval
- No EDC Issues
- Patented FR chemical
- Thermal Stability
- Application Dosages 4.5% of LC50 for C. dubia and P. promelas
- Designed to be used in flow back water so subsequent jobs requires less fresh water withdraw from environment



Reuse of Flow Back Water Flow Summary

4. Analyze and Treat Flow Back

stationary facility or mobile remediation

6. Determine Chemical Loading for Frac Fluids.

7. Reuse Treated Flow Back Water

Mobil remediation strategy for flow back water reuse

- Reuse rather than release
- Transportation savings

As Americans we have access to unlimited information

For the Sake of our Children and Grandchildren shouldn't we make sure what we believe is true?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Danielle
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