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Fracking, Water Quality and Public Health:
Examining Current Laws and Regulations
(March 20)

2014

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SLIDES: Best Management Practices for Oil and Gas Development and Comparative Water Quality Database of Regulations Relating to Shale Oil and Gas

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Best Management Practices for Oil and Gas Development & Comparative Water Quality Database of Regulations relating to Shale Oil and Gas

Public Health Law Webinar series

March 20, 2014

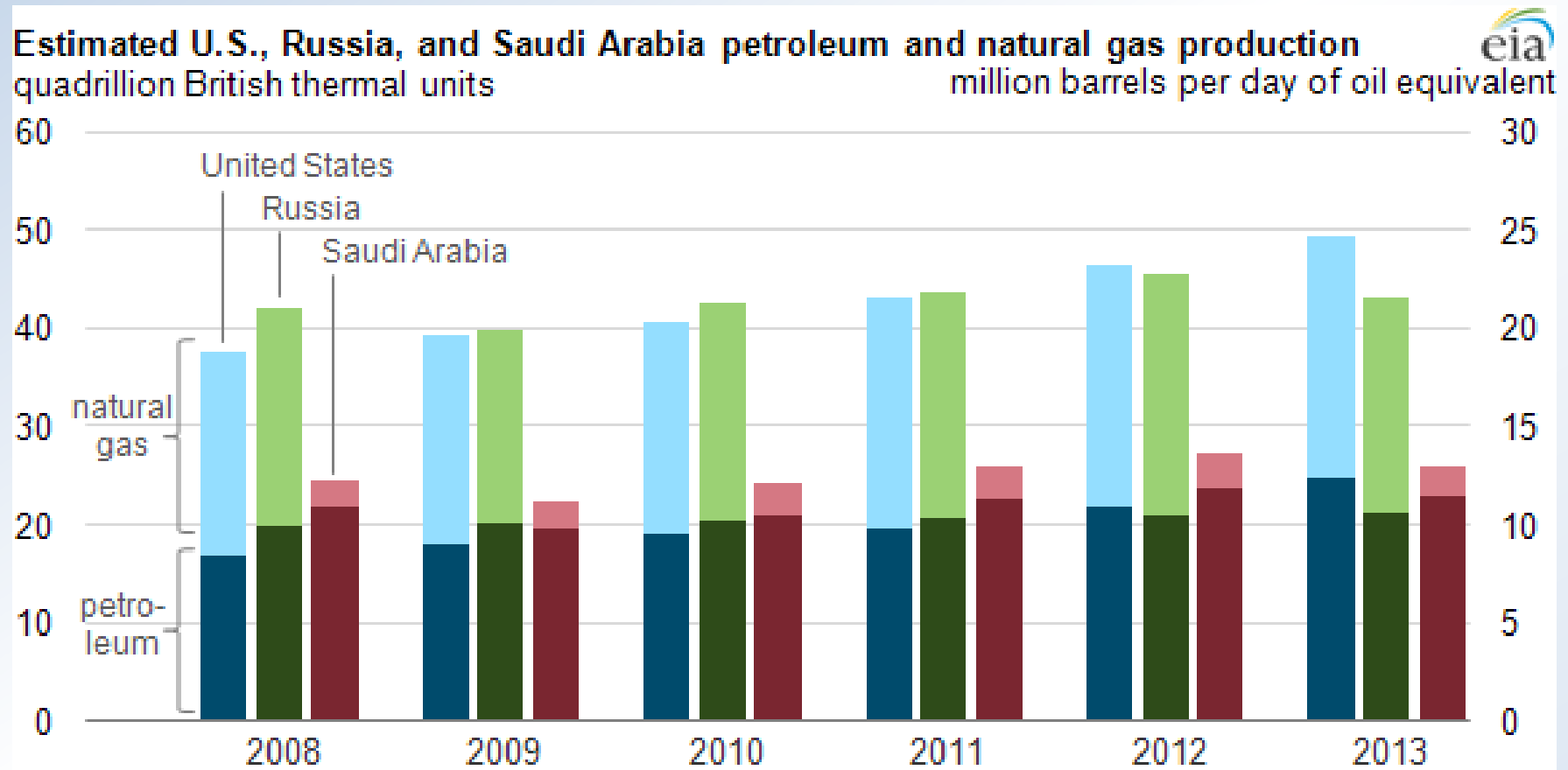
Matt Samelson

**Getches-Wilkinson Center for Natural Resources, Energy and the
Environment, University of Colorado Law School**



Context

Estimate U.S., Russia, and Saudi Arabia Petroleum and Natural Gas Production





Context

“For years, environmentalists and the gas drilling industry have been in a pitched battle over the possible health implications of hydro fracking. But to a great extent, the debate — as well as the emerging lawsuits and the various proposed regulations in numerous states — has been hampered by a shortage of science.”

Drilling for Certainty: The Latest in Fracking Health Studies.
ProPublica, March 5, 2014



Context

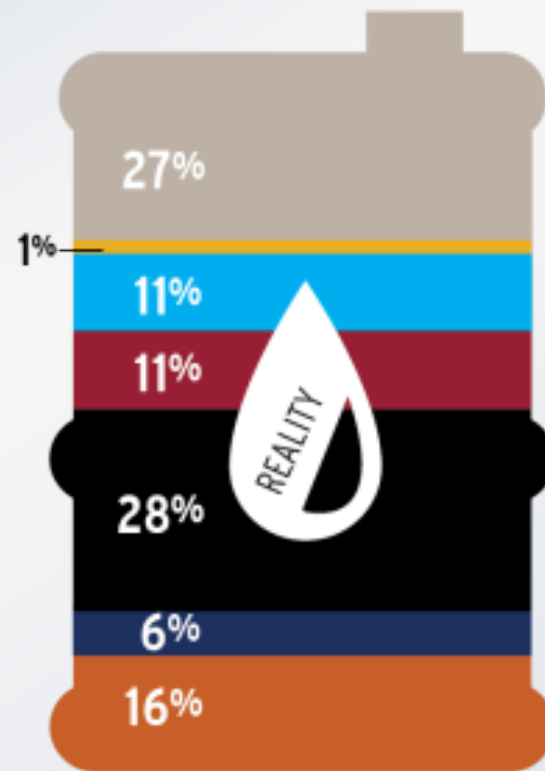
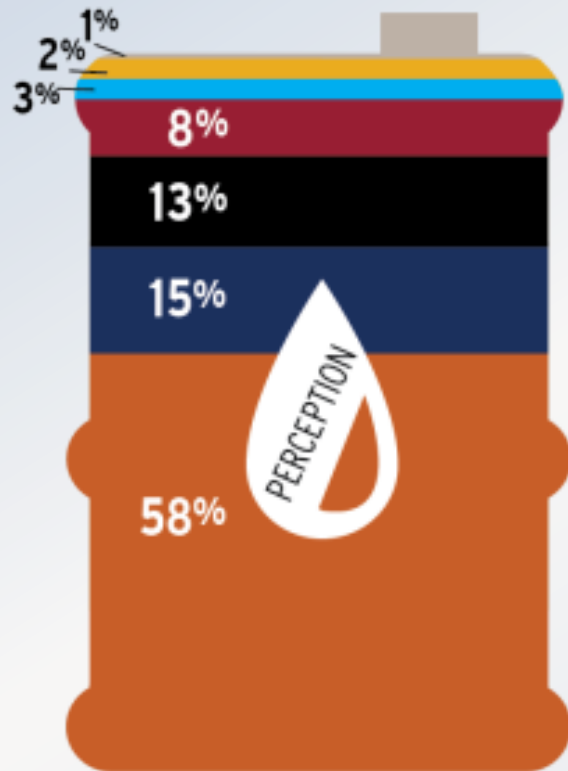
“Despite broad public concern, no comprehensive population-based studies of the public health effects of unconventional natural gas operations exist.”

“Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development”
Environmental Science & Technology, Feb. 24, 2014
John L. Adgate, Bernard D. Goldstein, and Lisa M. McKenzie

Public Perception

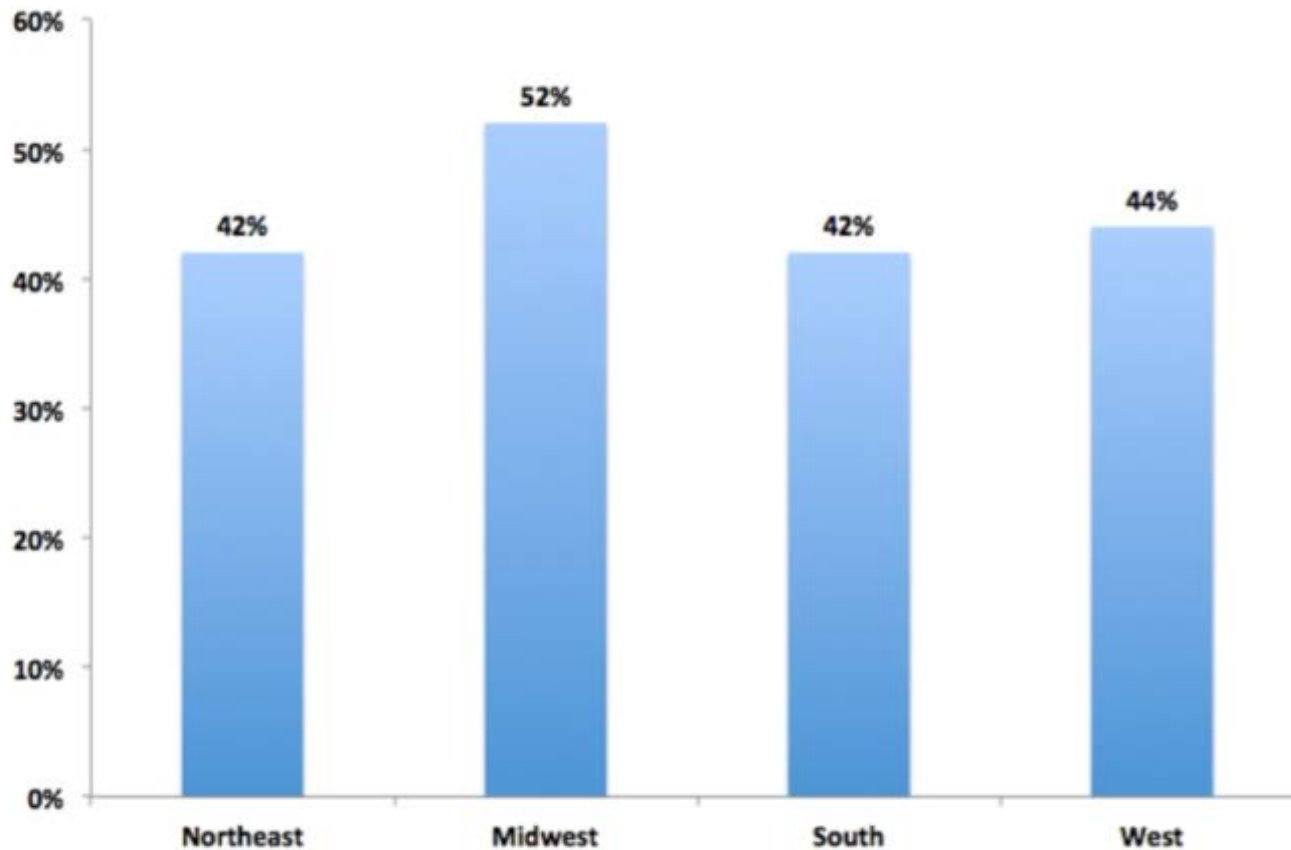
Where does the U.S. get imported oil?

Legend: Saudi Arabia (Orange), Iraq (Dark Blue), Canada (Black), Venezuela (Red), Mexico (Light Blue), Russia (Yellow), Other (Grey)



Public Perception

Support for the use of hydraulic fracturing by region

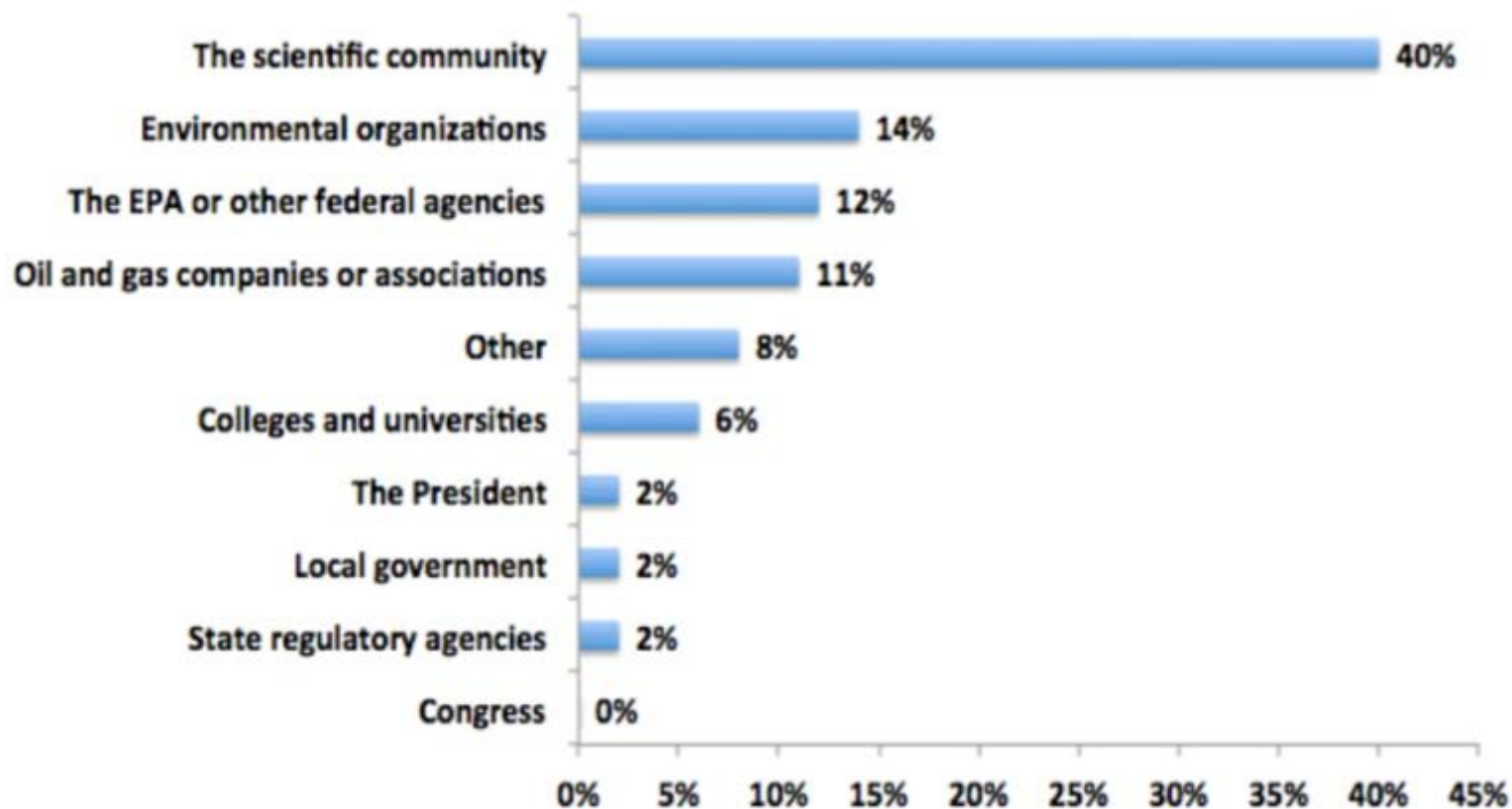


Data represents survey respondents who say they are familiar with the term hydraulic fracturing (42% of total base or 889 out of 2117 individuals). March 2013

March 2013 Base: 889.
All results based on weighted data

Public Perception

Who do you trust most to provide accurate, impartial information on hydraulic fracturing?



March 2013 Base: 889.
All results based on weighted data

Source: University of Texas at Austin Energy Poll

Resources

Intermountain Oil & Gas Best Management
Practices project

<http://www.oilandgasbmps.org>

LawAtlas Water Quality Database

<http://lawatlas.org/oilandgas>

Environmentally Friendly Drilling Systems

Environmentally Friendly Drilling Systems - Mozilla Firefox

File Edit View History Bookmarks Tools Help

www.efdsystems.org

Google

Most Visited Getting Started Latest Headlines shale_gas.jpg (JPEG Im...

Environmentally Friendly Drilling Systems +

PRODUCED WATER TESTING

Testing innovative technologies for treatment and reuse of flow back and produced water...



Know More.  Use Less.

**WELCOME TO
THE EFD WEBSITE**

BMP Definitions

Bureau of Land Management / BMP Project

State-of-the-art mitigation measures applied to oil and natural gas drilling and production to help ensure that energy development is conducted in an environmentally responsible manner.

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices.html



Best Management Practices for Oil and Gas Development

Intermountain Oil and Gas BMP Project – www.oilandgasbmeps.org

Project Objectives

- Create a free, online database documenting BMPs for responsible oil and gas development in the Intermountain West
- Provide BMPs and other resource information to a wide audience, including industry, community, government, and environmental advocates

The screenshot shows the homepage of the Intermountain Oil and Gas BMP Project website. The header includes the project title and a navigation menu with links for HOME, SEARCH, BIBLIOGRAPHY, RESOURCES, LAW & POLICY, TRAINING & WORKSHOPS, FORUM, and ABOUT US. The main content area is divided into several sections:

- BEST MANAGEMENT PRACTICES:** A text block explaining the project's purpose and a small image of an oil pumpjack.
- BMP CATEGORIES:** A list of categories such as Air Quality and Emissions, Cultural Resources, and Water Quality and Storm.
- WHAT'S NEW:** A section for recent updates, including a link to 'New Resources sections: Strategic, Economic and Economics of EOP's' and an image of an industrial facility.
- BMP SEARCH:** A search interface with fields for keywords, category, and location, along with a search button.
- TRAINING AND WORKSHOPS:** A section for educational opportunities.
- SEARCH THE BIBLIOGRAPHY:** A section for finding related literature.

The footer contains the CU logo and additional information about the project's scope and content.

Intermountain Oil & Gas BMP Project



Project Components

- Geographic Scope
 - CO, MT, NM, UT, WY
 - Beyond the Region
- Website Background Materials
 - Resource Pages
 - Law and Policy
(Federal, state, local, tribes)
- Database and Bibliography
 - Voluntary practices
 - Required practices
- Research Services
- Workshops



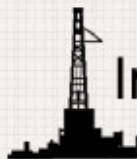
Intermountain Oil & Gas BMP Project



Project Results

- The database contains 8,500 BMPs, from nearly 500 source documents in categories such as Wildlife, Water, Air, Health, Soils, and Vegetation.
- Resource and Law & Policy sections provide additional information, such as Hydraulic Fracturing, Economics of BMPs, Reclamation, and laws and policies governing oil and gas development in the Intermountain West





Intermountain Oil and Gas BMP Project

HOME SEARCH BIBLIOGRAPHY RESOURCES LAW & POLICY TRAINING & WORKSHOPS FORUM ABOUT US

RESOURCES

To better understand the oil and gas development processes and the potential for reducing impacts through BMPs, please see the following pages. We also have a growing list of resources regarding legal and regulatory processes, technical descriptions, and virtual tours of well sites.

Development

Coalbed Methane

GIS

Air Quality

Water Quality

Hydraulic Fracturing

Solid Waste

Wildlife

Vegetation

Reclamation

Communities

Economics of BMPs

OTHER RESOURCES

BMP Case Studies

Further Research

Add Information

Acronyms

THE DEVELOPMENT PROCESS

This section offers an overview of the oil and gas extraction processes including exploration, well development, production, and site abandonment with links to resources regarding legal and regulatory processes, technical descriptions, and virtual tours of well sites.

GEOGRAPHIC INFORMATION SYSTEMS

Geographic Information Systems (GIS) are used to analyze and display geospatial data and are powerful tools when examining the potential impacts of oil and gas development on local resources, such as water, vegetation, and wildlife.

This section describes the basics of GIS and provides links to sample maps, interactive web-mapping applications, downloadable GIS data, and free/open source GIS software.



As affected by development, and the potential for reducing impacts through BMPs, please see detail Best Management Practices in depth.

AIR QUALITY

This section discusses the impacts of oil and gas development on air quality, and provides links to information on issues such as flaring, venting, methane production, and fugitive emissions. Additional information from state and federal agencies on air quality standards and monitoring is available, along with reports from non-profit organizations and regional air partnerships regarding monitoring techniques, development and technology.



WATER QUALITY

Hydraulic fracturing, storm-water runoff and pollution from pits are a few water quality issues associated with oil and gas development. This section discusses the concerns over each issue as well as fact sheets, studies, and best management practices. Additional information is provided on state water rights, pollution prevention guides, and water quality standards for Colorado, New Mexico, Wyoming, Montana, and Utah.



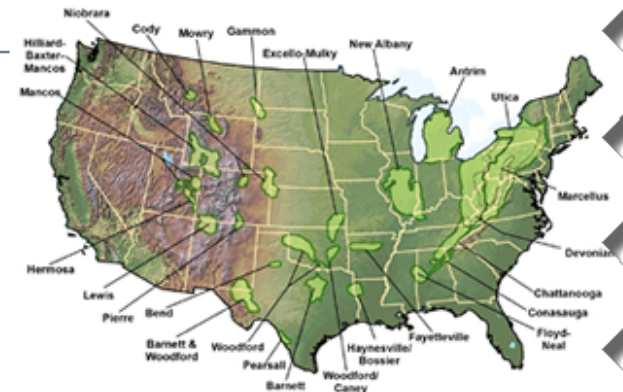


Intermountain Oil and Gas BMP Project

HOME SEARCH BIBLIOGRAPHY RESOURCES LAW & POLICY TRAINING & WORKSHOPS FORUM ABOUT US

HYDRAULIC FRACTURING

Oil and gas operators have conducted hydraulic fracturing, commonly known as “fracing,” for over sixty years in either vertical or slant wells (this is often referred to as “conventional drilling”). Within the past decade, the combination of horizontal drilling and hydraulic fracturing has been used with increasing frequency in each of the intermountain states (this is often referred to as “unconventional drilling”). Unconventional drilling increases the volume of natural gas that can be extracted from tight sand, coalbed, and shale formations, which makes the extraction process economically feasible. The Independent Petroleum Association of America reports that over 90% of vertical and horizontal oil and gas wells nationwide now require some form of hydraulic fracturing.



HYDRAULIC FRACTURING PROCESS

After a well is drilled, it is perforated, typically with explosive charges, to fracture the tight, shale reservoir surrounding the well. The fractures are typically located thousands of feet below the water table and extend only hundreds of feet in each direction from the well. Fluid is then injected under high pressure into the well to stimulate the production of natural gas, and in some cases oil. While procedures may differ depending upon the formation, fracing fluids are generally composed of water and chemical additives. After injecting the fracing fluid, producers inject proppants, which is generally either sand, resin-coated sand, or ceramic, to keep the fractures open and allow gas to flow. See this [video](#) for an animation of the hydraulic fracturing process.

According to the American Petroleum Institute's [Hydraulic Fracturing Primer](#), hydraulic fracturing fluids generally consist of 90% water, 9.5% sand, and 0.5% chemicals. The chemicals are used to enhance the fracturing process to produce

REGULATING FRACING

Oil and gas development is regulated by federal, state, and local governments. For information about the regulation of oil and gas development generally, see our [Law and Policy Section](#).

FEDERAL GOVERNMENT

Environmental Protection Agency (EPA)

The 2005 Energy Policy Act exempted the injection of fracing fluids from the Safe Drinking Water Act's Underground Injection Control Program. (See our [Federal Water Quality Regulation](#) page for more information.)





Intermountain Oil and Gas BMP Project

HOME SEARCH BIBLIOGRAPHY RESOURCES LAW & POLICY TRAINING & WORKSHOPS FORUM ABOUT US

WATER QUALITY

Impacts of oil and gas development on water quality are a concern across the Intermountain West. Of particular concern are: storm water runoff from construction activities, pollution from pits, hydraulic fracturing, and use and disposal of CBM produced water. The following resources provide an introduction to the problems and best practices for each of these issues.

For a complete overview of the Clean Water Act, as it addresses these issues visit the [Red Lodge Clearinghouse](#).

STORMWATER RUNOFF

Pollution from stormwater is an issue with all types of development from urban to rural areas. Regulation of stormwater discharges from oil and gas exploration, production, processing and treatment activities has been particularly controversial in the last few years. Resources on EPA's web pages address both the problem and some of the solutions.

See [Stormwater Permitting: A Colorado Example](#) for an example from Douglas County, Colorado.

[Stormwater Pollution Prevention Plans for Construction Activities](#) - Information on Pollution Prevention Plans, permitting and BMPs

[Construction Site Stormwater Runoff Control](#) - Requirements, BMPs and resources for controlling stormwater runoff.

[Regulation of Oil and Gas Construction Activities](#) - A summary of the issues, legislation, regulations and litigation

PIT POLLUTION

Pits - circulation, water storage, completion, flowback, and reserve - are dug to hold fluids and solids during well development and to dispose of waste from production. Pits may be lined or unlined, and their contents may be disposed of in many ways. Best management practices are essential for limiting pit pollution of both surface and groundwater



Torn pit liner. Photo courtesy of Earthwork

STATE BY STATE

COLORADO

[Piceance Basin Water Quality Repository](#) - As large-scale energy development continues in the Piceance Basin in northwestern Colorado, there is potential for changes in surface- and groundwater resources. USGS, in cooperation with over 25 entities created a [public, web-accessible common data repository](#) combining water-quality data from various sources to establish a baseline assessment of the region's water resources. Collaborative partners supporting the project include the energy industry, local citizens, cities and counties, state agencies, the Bureau of Land Management, private consultants, the West Divide Water Conservancy District, and the Colorado River Water Conservation District. The data will be used to develop regional monitoring strategies needed to fill identified data gaps, and minimize redundancies in current and future water-resource monitoring.



The Water Information Program - [Water Rights](#)

Colorado Oil and Gas Conservation Commission - New Rules

COGCC - [Text of the rules](#) (click on Rules)

Rocky Mountain Mineral Law Foundation Workshop - [The 317B Rules](#)

Technology Integration Program: Objective



LawAtlasSM
The Policy Surveillance Portal

Project Objective

- Produce and make publicly available, a searchable database of laws and regulations pertaining to shale oil and shale gas.
 - Water Quality (completed)
 - Water Quantity (June 2014)
 - Air Quality (Fall 2014)

North American shale plays (as of May 2011)



Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

Technology Integration Program: Objective



LawAtlasSM
The Policy Surveillance Portal

Project Results (ongoing)

- Comparative water quality database
 - www.lawatlas.org/oilandgas
 - Contains more than 1100 legal citations in five categories:
 - Permitting, Design, & Construction
 - Well Drilling
 - Well Completion
 - Production & Operation
 - Reclamation



Water Quality – LawAtlas Database

Current

Texas – Eagle Ford, Barnett

New York – Marcellus

Pennsylvania – Marcellus

Ohio – Marcellus

West Virginia – Marcellus

Colorado – Piceance, Niobrara

North Dakota – Bakken

Montana – Bakken

New Mexico – San Juan, Permian

Wyoming – Greater Green River, Powder River Basin

Utah – Mancos, Uinta

Next

Water Quantity (June 2014)

Air Quality (September 2014)

LawAtlas Database

LawAtlas - PHLR - Mozilla Firefox
File Edit View History Bookmarks Tools Help
www.lawatlas.org/oilandgas
getches wilkinson
Most Visited Getting Started Latest Headlines shale_gas.jpg (JPEG Im...
LawAtlas - PHLR LawAtlas - PHLR Water Quality - Permitting, Design, &... +

LawAtlasSM

The Policy Surveillance Portal

[Send Us Feedback](#)

[Home](#) > [Oil & Gas - Water Quality](#)



Intermountain Oil and Gas BMP Project

Oil & Gas - Water Quality

Improved technology developments in directional drilling and hydraulic fracturing, more commonly known as "fracking," have resulted in an oil and gas production boom nationwide. In October 2013, the U.S. Energy Information Administration announced that the United States would surpass Russia and Saudi Arabia as the world's largest producer of oil and natural gas by the end of the year. The boom has resulted in oil and gas development in regions unaccustomed to the industry as well as in regions that have a century-long relationship with oil and gas extraction. Nonetheless, the rapid development of oil and gas wells has sparked concern for public health related to oil and gas development.

Because of the number of water quality statutes and regulations, the database is divided into five different stages of oil and gas activities: Permitting, Design, & Construction, Well Drilling, Well Completion, Production & Operation, and Reclamation. While this database focuses on water quality, in the coming months databases for air quality and water quantity will be added.



States included in research

5:56 PM
2/28/2014

Natural Gas Research and Resources at CU Boulder

For more information

Browse the websites at www.oilandgasbmps.org and
www.lawatlas.org/oilandgas

Contact Matt Samelson
matthewsamelson@gmail.com

303-519-5769

for questions related to the comparative database.

Contact Kathryn Mutz
Kathryn.Mutz@colorado.edu

303-492-1293

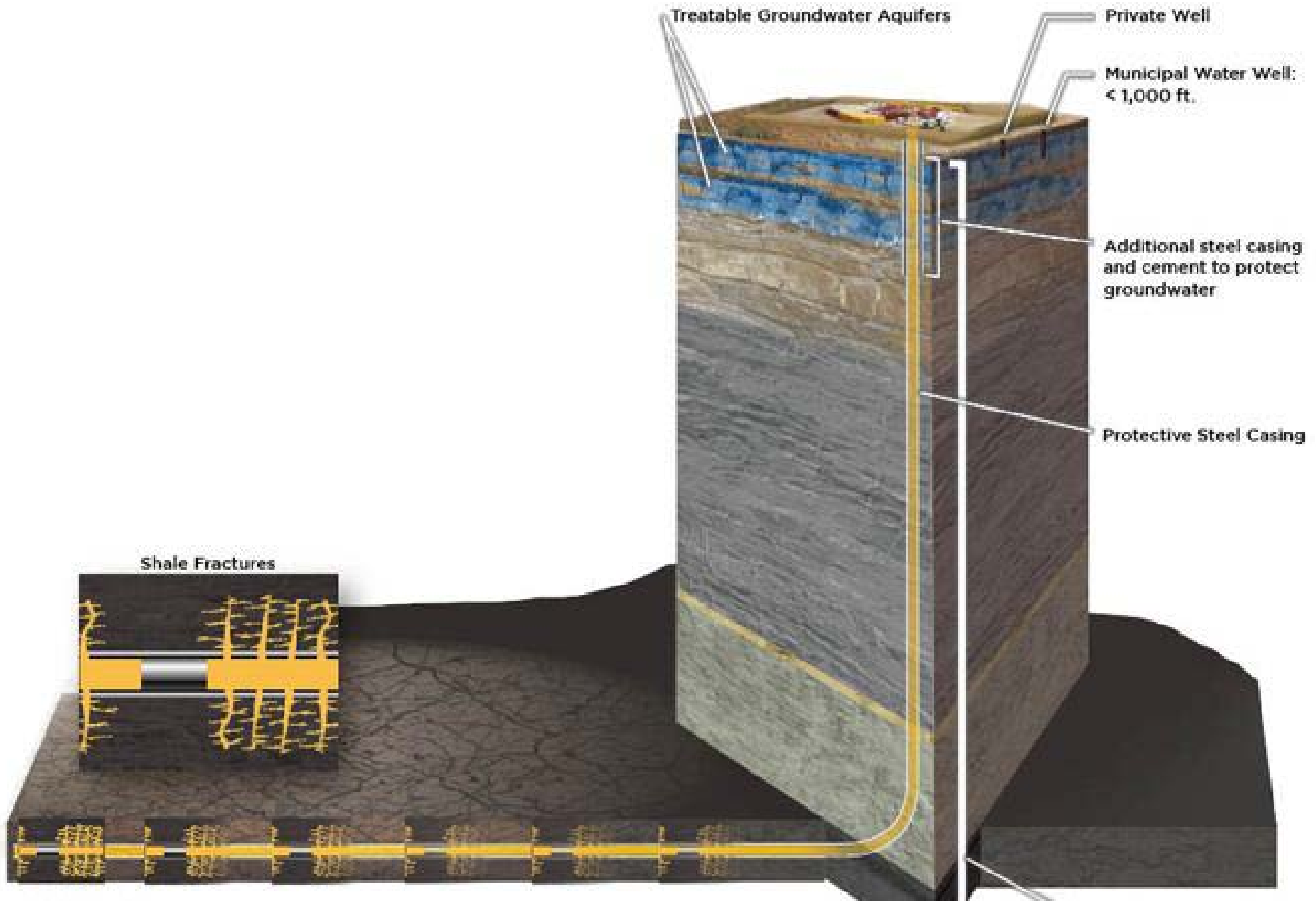
for questions related to the BMP project.



Hydraulic Fracturing



Example Horizontal Well



SPILLS

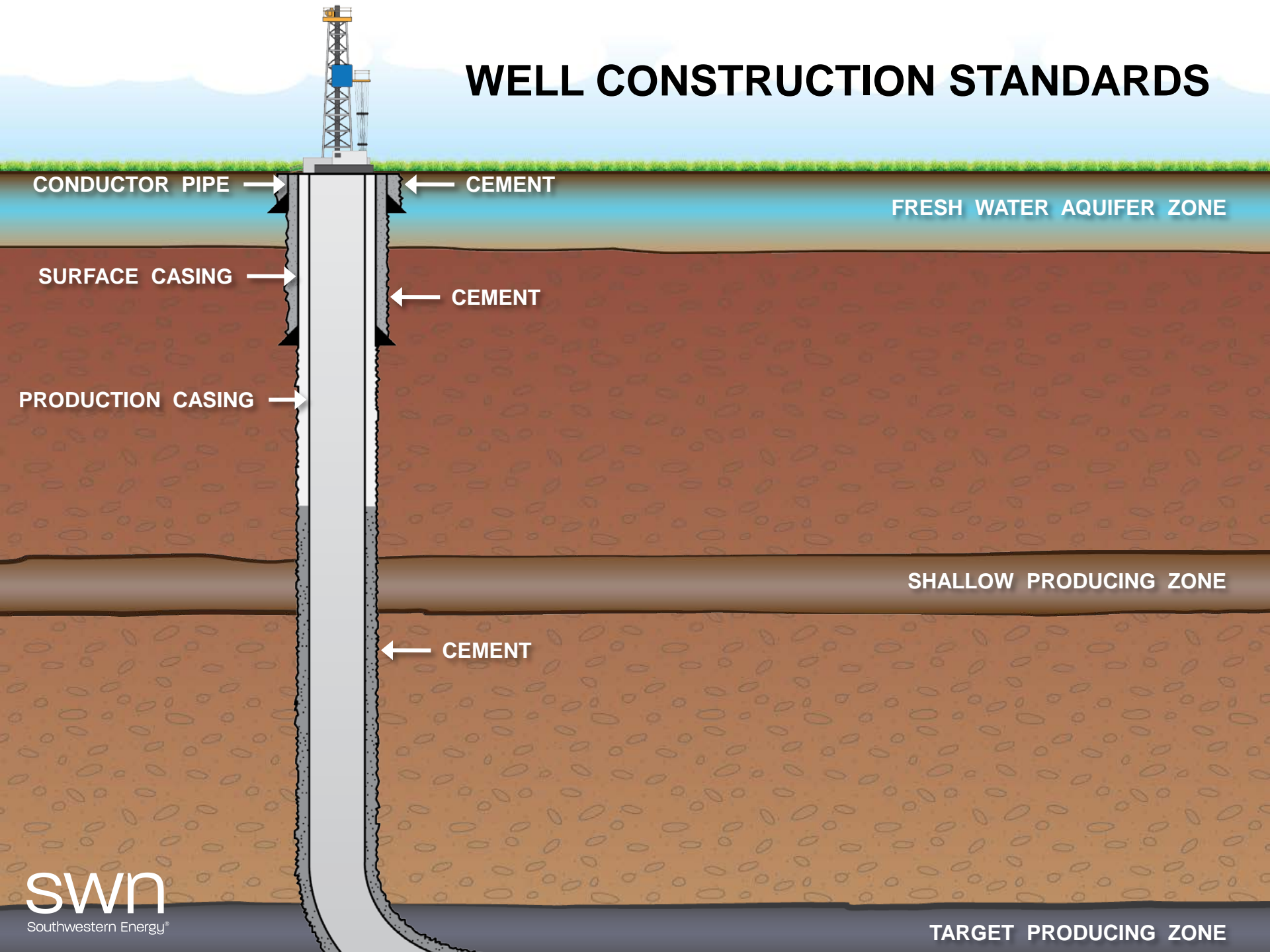


Denver Post study:
From 2008–2010,
average of more than
a spill per day,
average size of 5,300
gallons

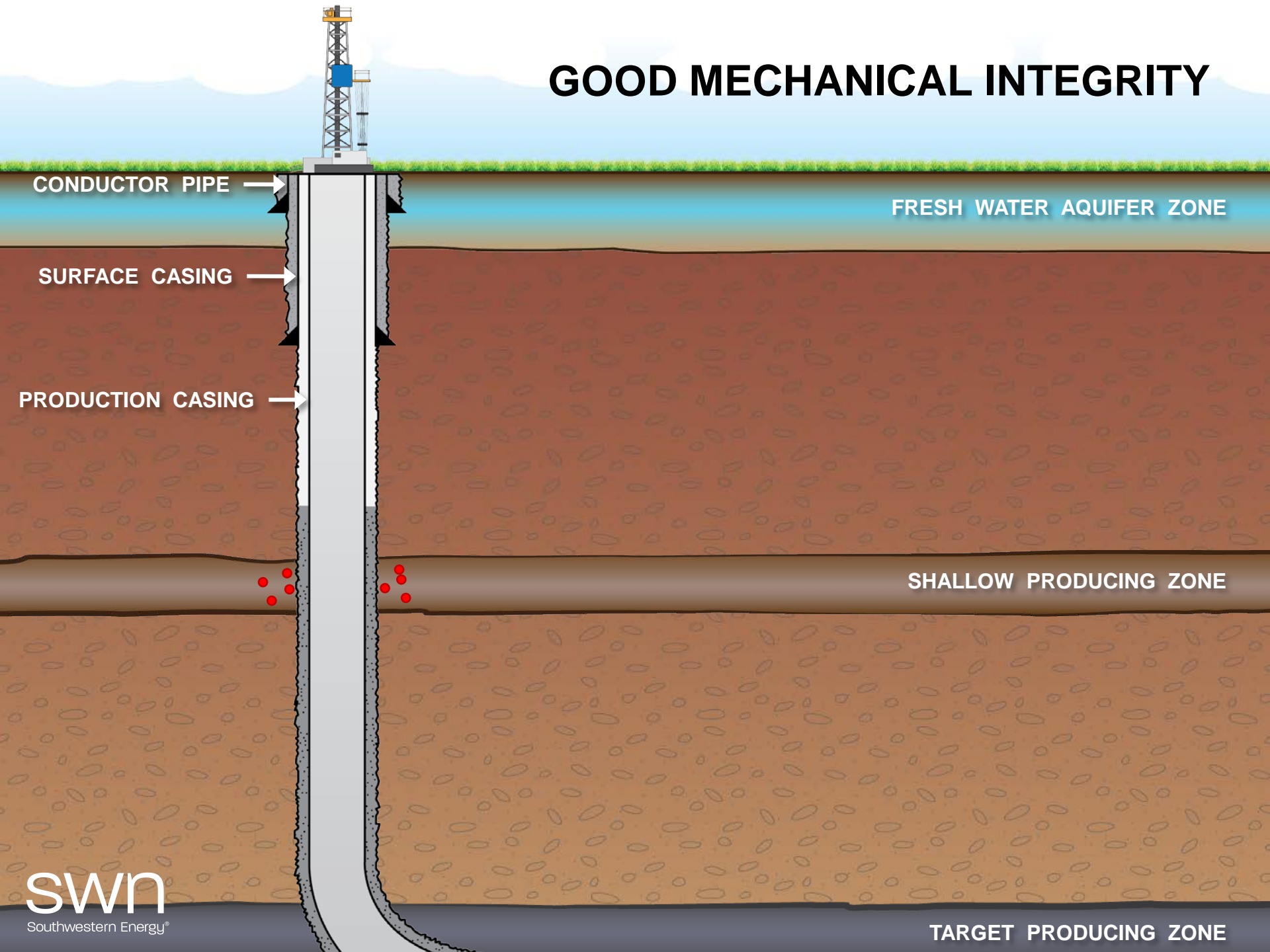




WELL CONSTRUCTION STANDARDS



GOOD MECHANICAL INTEGRITY



CONDUCTOR PIPE

SURFACE CASING

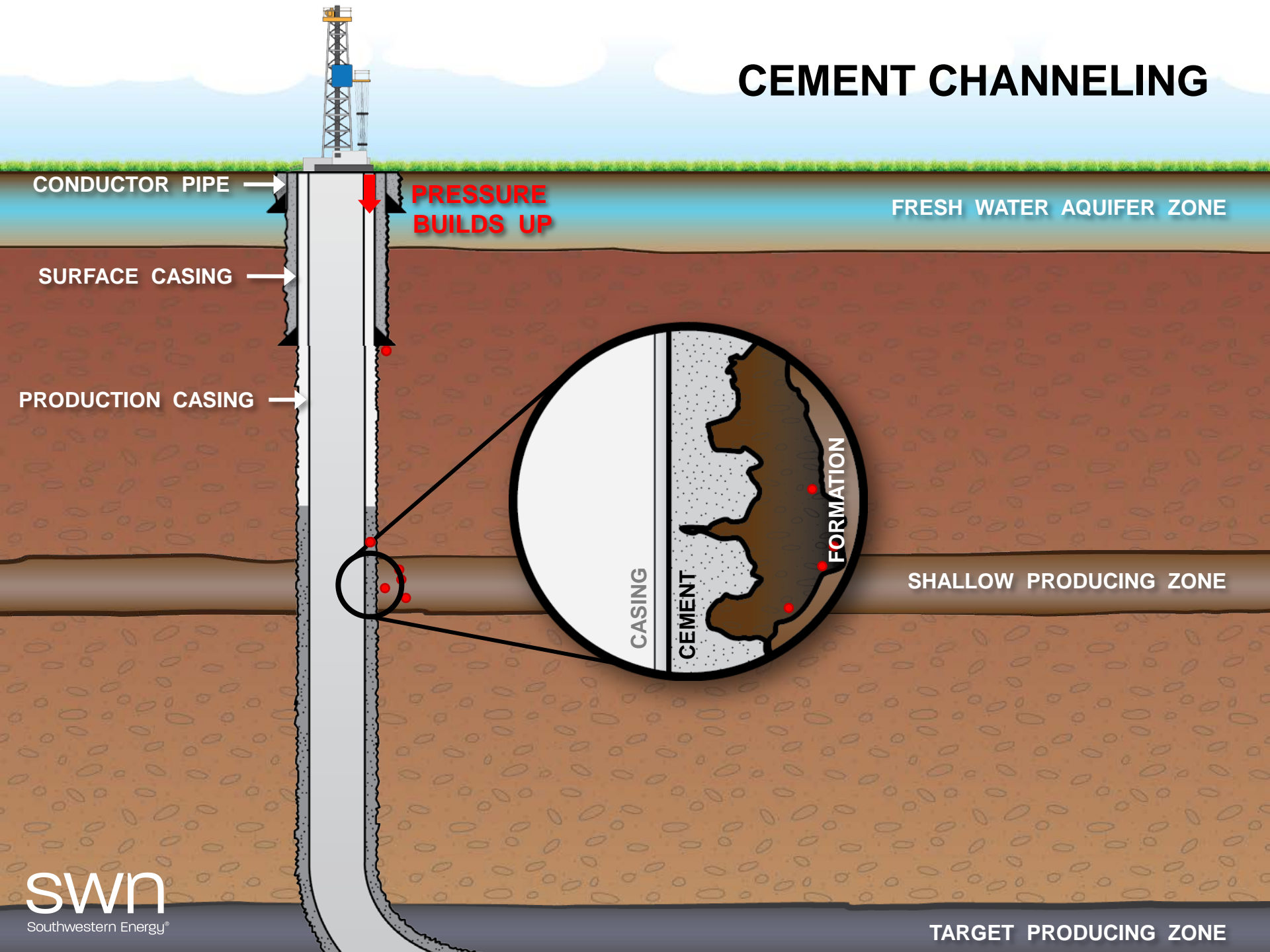
PRODUCTION CASING

FRESH WATER AQUIFER ZONE

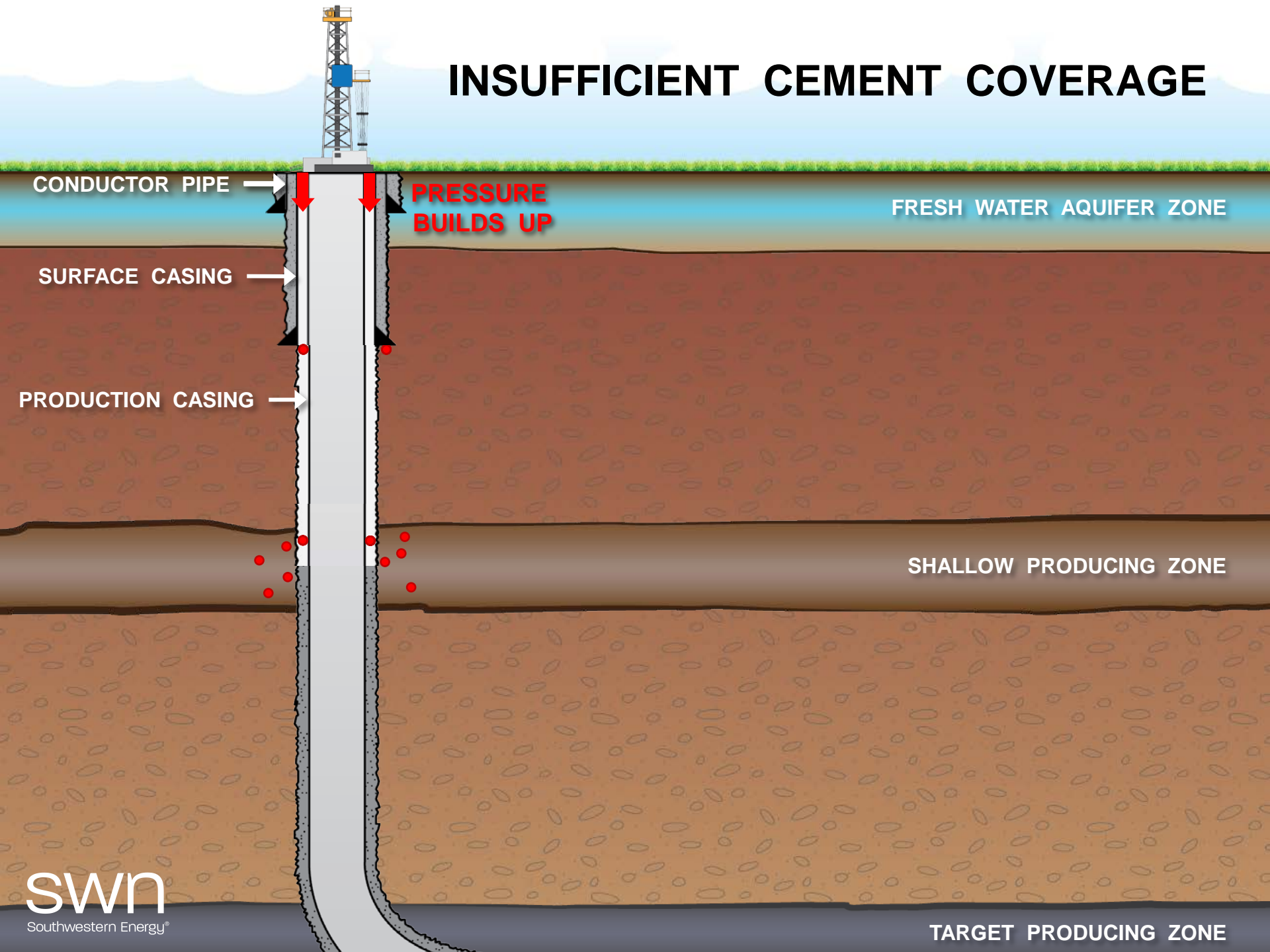
SHALLOW PRODUCING ZONE

TARGET PRODUCING ZONE

CEMENT CHANNELING



INSUFFICIENT CEMENT COVER



CONDUCTOR PIPE

SURFACE CASING

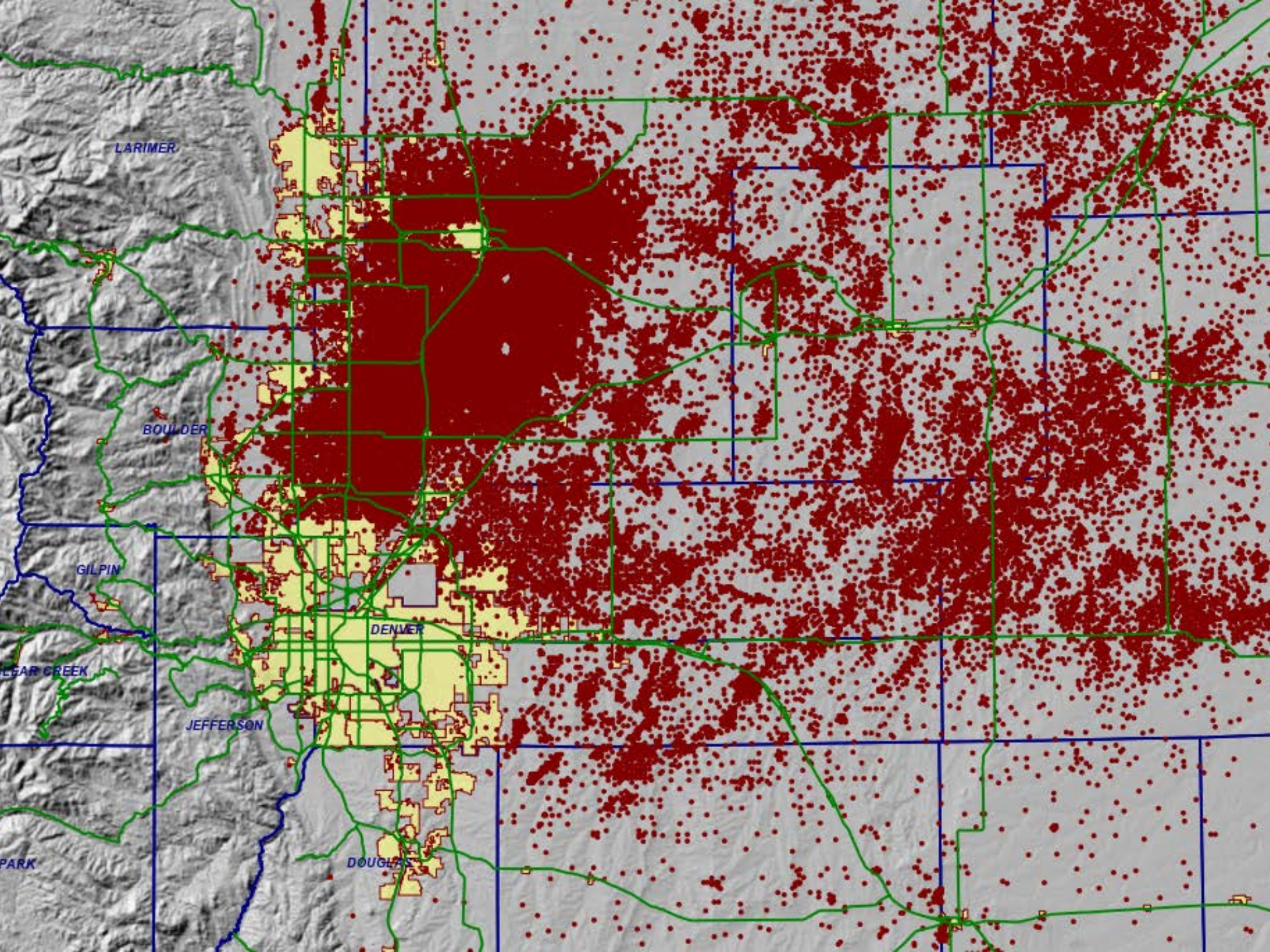
PRODUCTION CASING

PRESSURE
BUILDS UP

FRESH WATER AQUIFER ZONE

SHALLOW PRODUCING ZONE

TARGET PRODUCING ZONE





- Since January 1, 2013 oil and gas companies reported **495 spills**
- **210 Spills** occurred within 1,000 feet of surface water
- **136 Spills** occurred within 500 feet of surface water
- **151 Spills** occurred less than 50 feet from groundwater
- **41 Spills** occurred between 50 and 100 feet from groundwater



A worker watches oil-laden 'flowback' water spew from the bottom of an oil rig north of Windsor on Feb. 12. / V. Richard Haro/Coloradoan (Fort Collins, Colorado)