



Horizontal Drilling and High Volume Hydraulic Fracturing: The Transformation of the Oil and Gas Industry

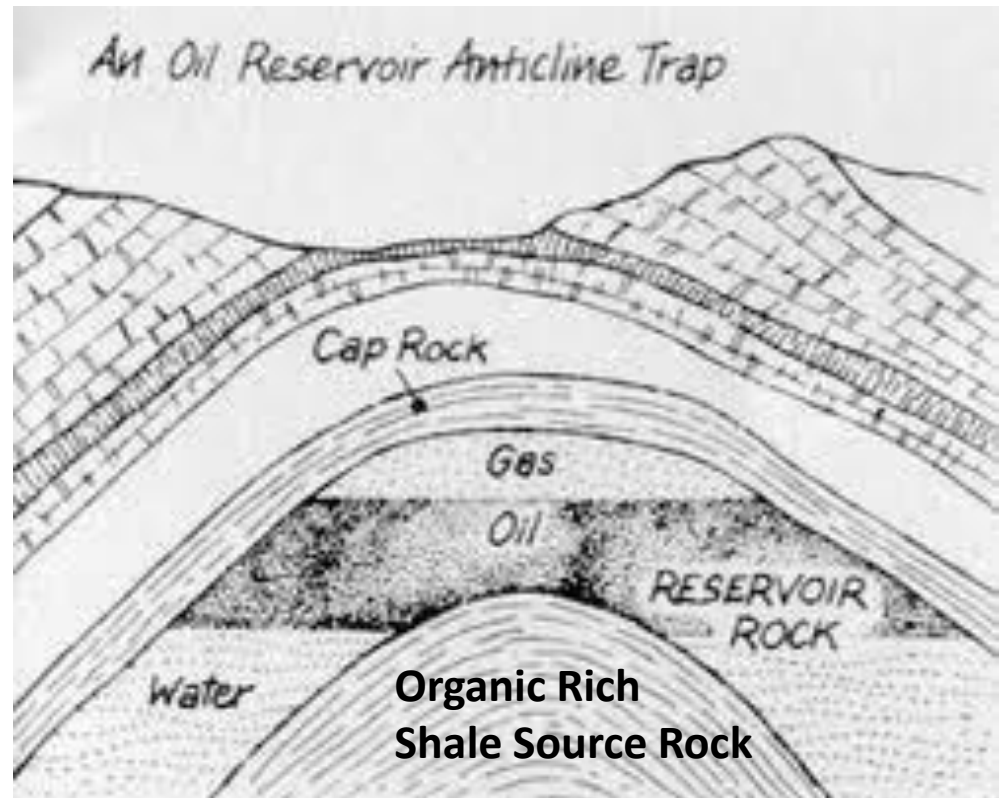
Illinois Mining Institute

August 13, 2013

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Conventional Oil & Gas Production

- Conventional oil and gas production requires several elements
 - Trap
 - Cap Rock or Seal
 - Reservoir Rock
 - Source Rock



UN-conventional Oil & Gas Production

- Organic rich shale (hydrocarbon source rock) is essentially present everywhere conventional oil production exists. After all it is one of the required elements.
- And while not all source rock will produce oil or gas, much of it will - with no need for reservoir rock, cap rock or structure. No need for unique conditions or anomalies.

UN-conventional Oil & Gas Production

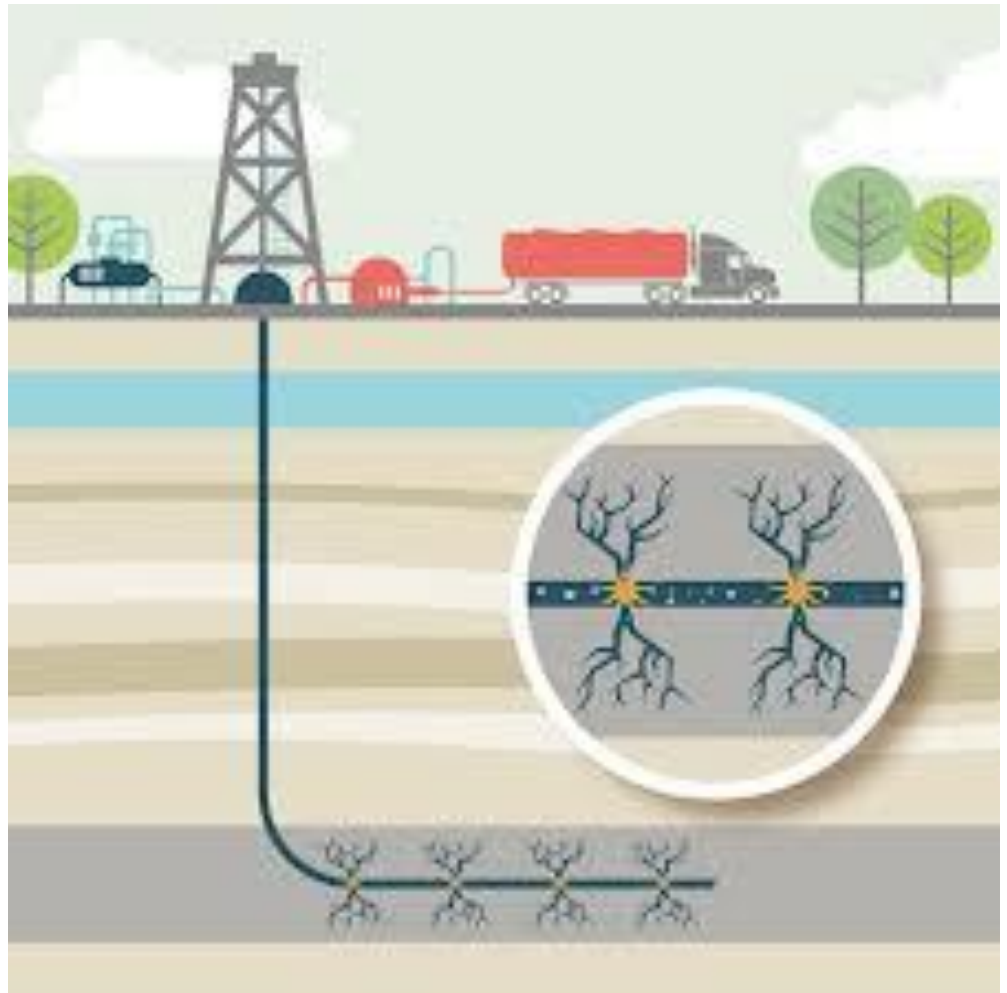
- These unconventional resources being discovered are huge. They can stretch over hundreds of square miles.
- As a result, the United States is becoming the dominant oil and gas producer in the world.

UN-conventional Technological Breakthrough

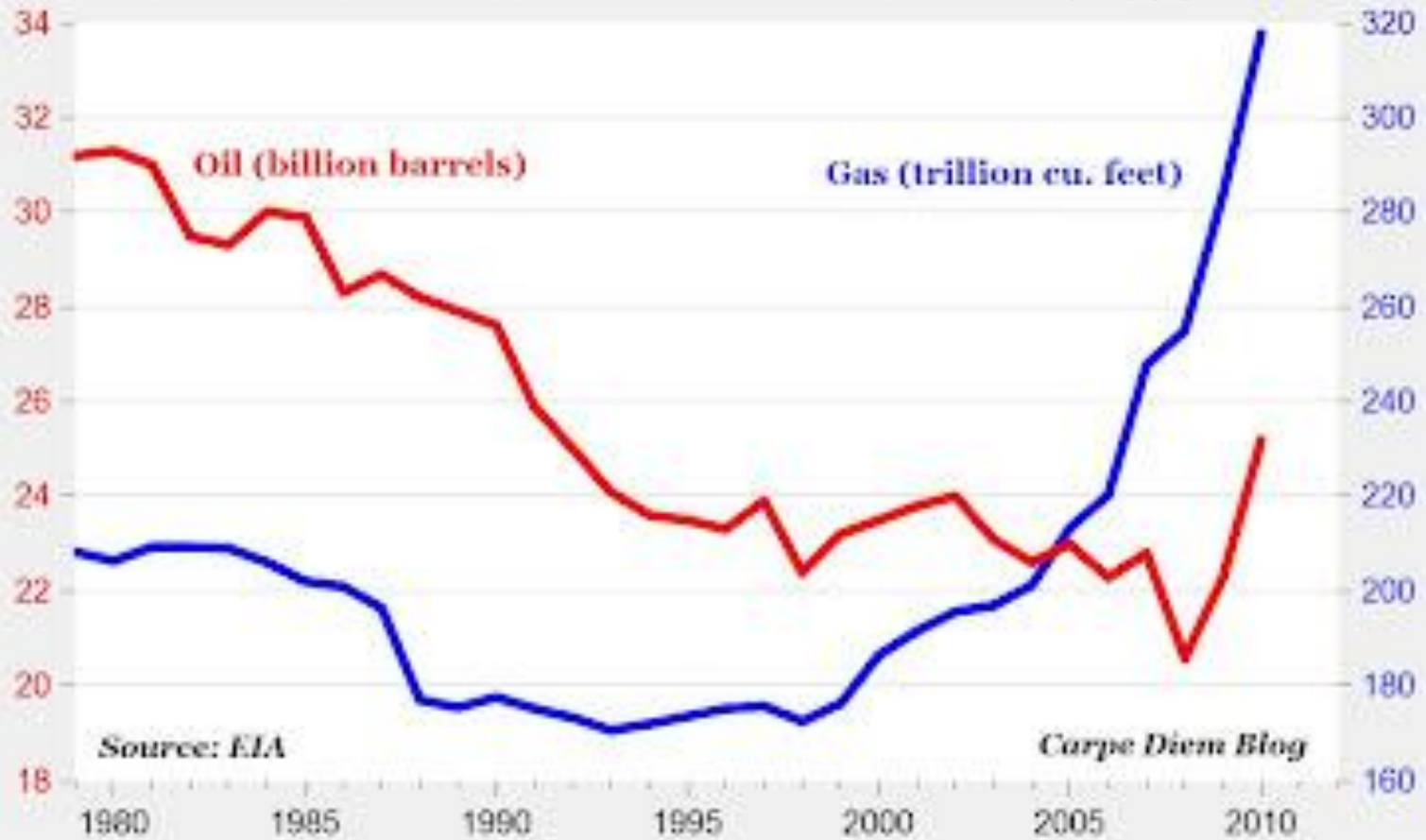
- The combination and refinement of two existing technologies has **transformed** the U.S. oil and gas industry:
 - Horizontal Drilling
 - High Volume Hydraulic Fracturing

Just How Transformational?

- Now we don't need multiple favorable conditions to exist....we just drill sideways in the source rock and create the reservoir with hydraulic fracturing



U.S. Oil and Natural Gas Proved Reserves, 1979-2010



Source: EIA

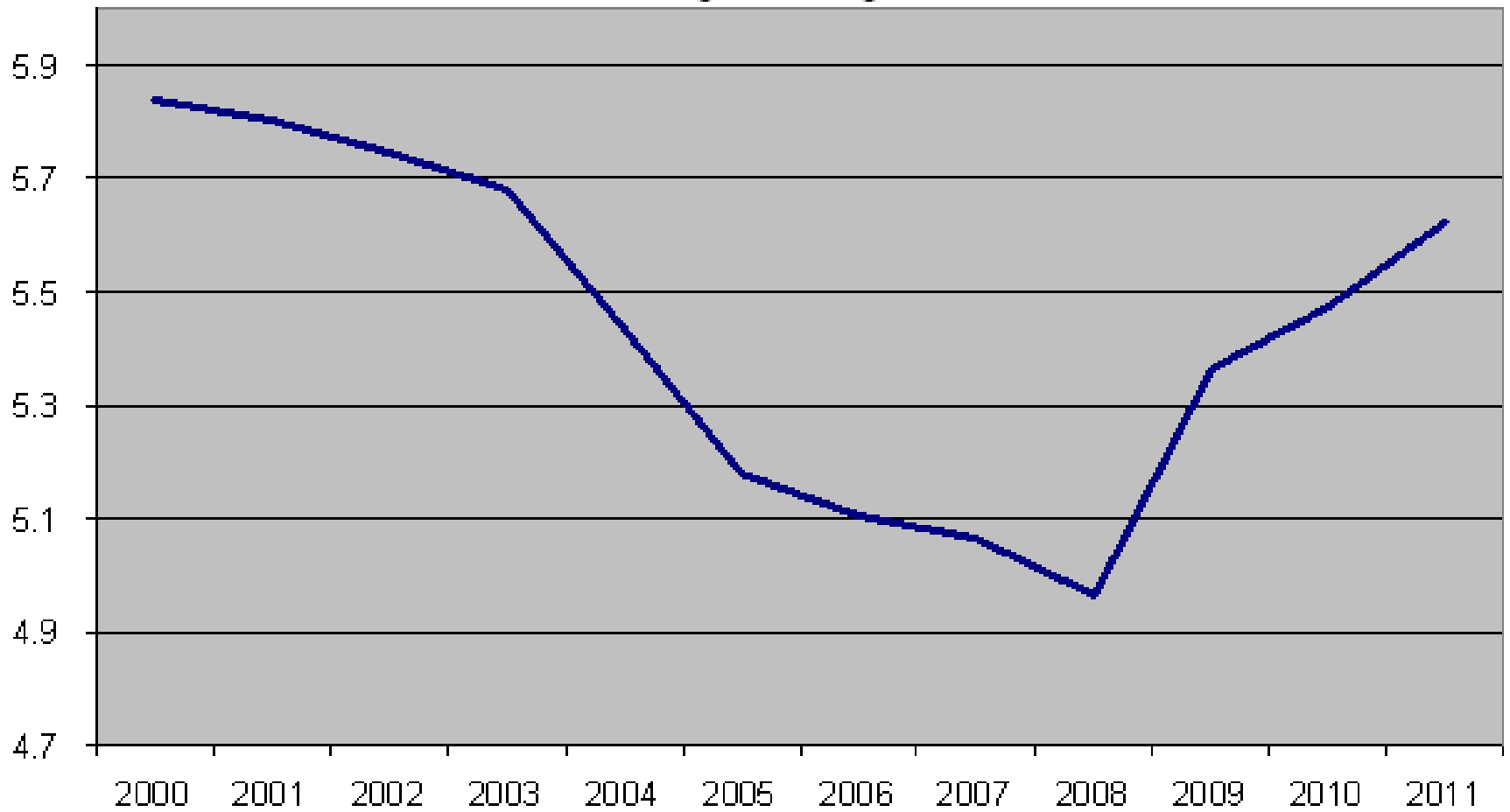
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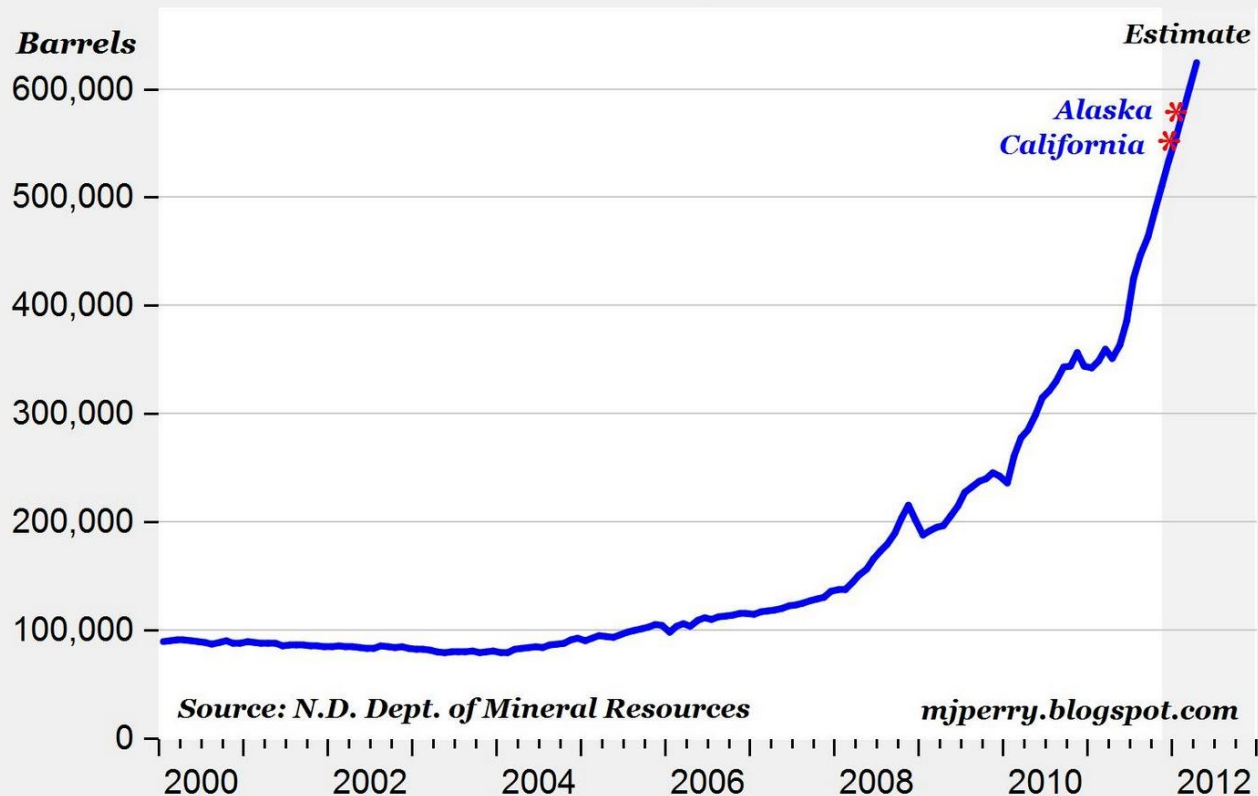
U.S. Field Production of Crude Oil (Million Barrels per Day)

Source: Climate Progress using U.S. EIA data



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North Dakota Daily Oil Production Jan. 2000 to April 2012 (est.)



Texas: Daily Oil Production January 1988 to August 2012

Thousands
of barrels



Source: EIA

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The Numbers Don't Lie!

- The United States has surpassed Russia as the world's largest natural gas producer
 - A report released last month says the growth in shale gas production will last for decades
- The International Energy Agency forecasts that the United States will become the world's leading oil producer by 2017

What About Illinois?

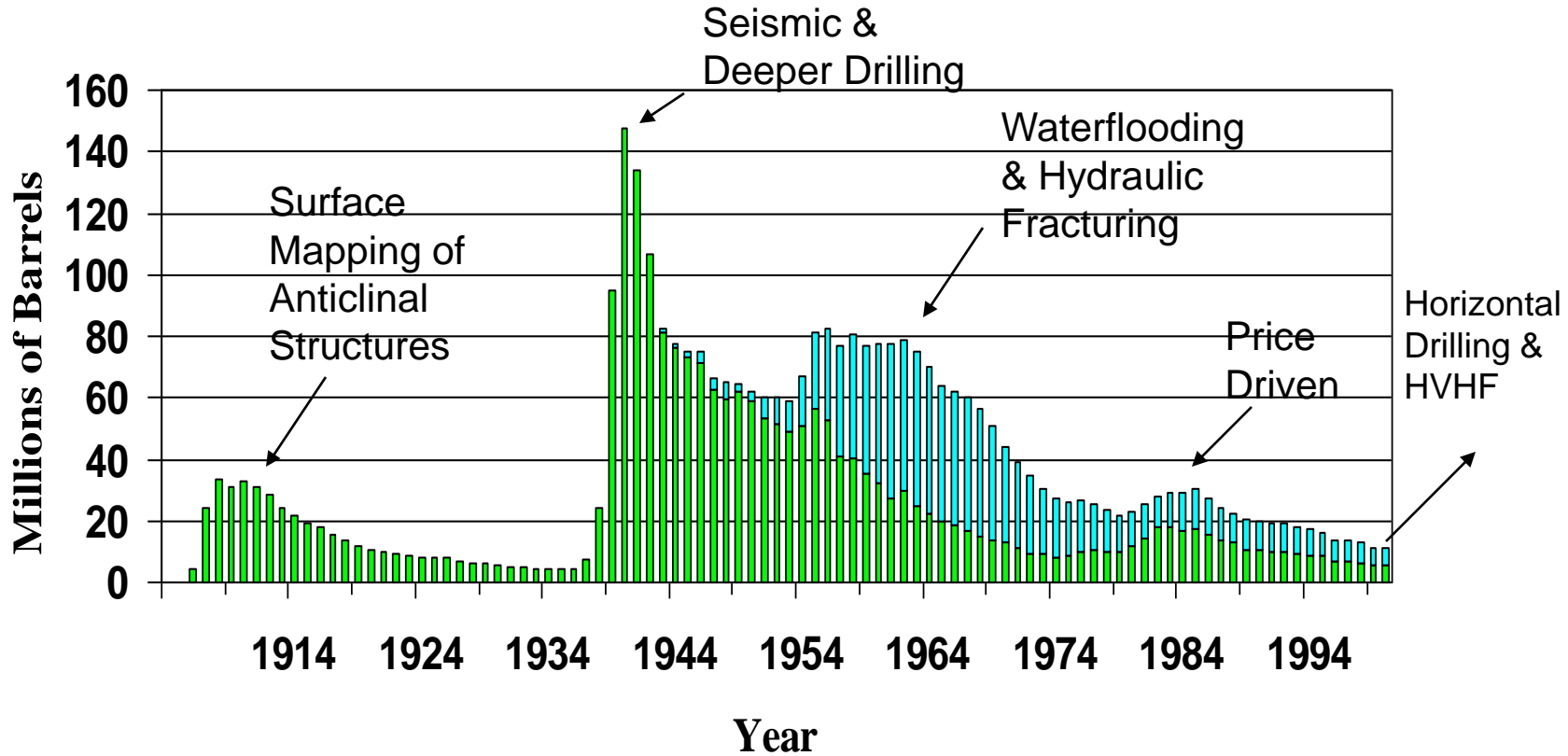
- Illinois has largely been just an observer of the transformation of the oil and gas industry....until now
- More than 500,000 acres have been leased in Illinois with a conservative estimate of more than \$200 million invested as companies have looked to Illinois for the next big oil and gas development



Technology has always been the key?

- Illinois has had multiple peaks in oil production, and nearly all have been driven by technology

Illinois Oil Production History



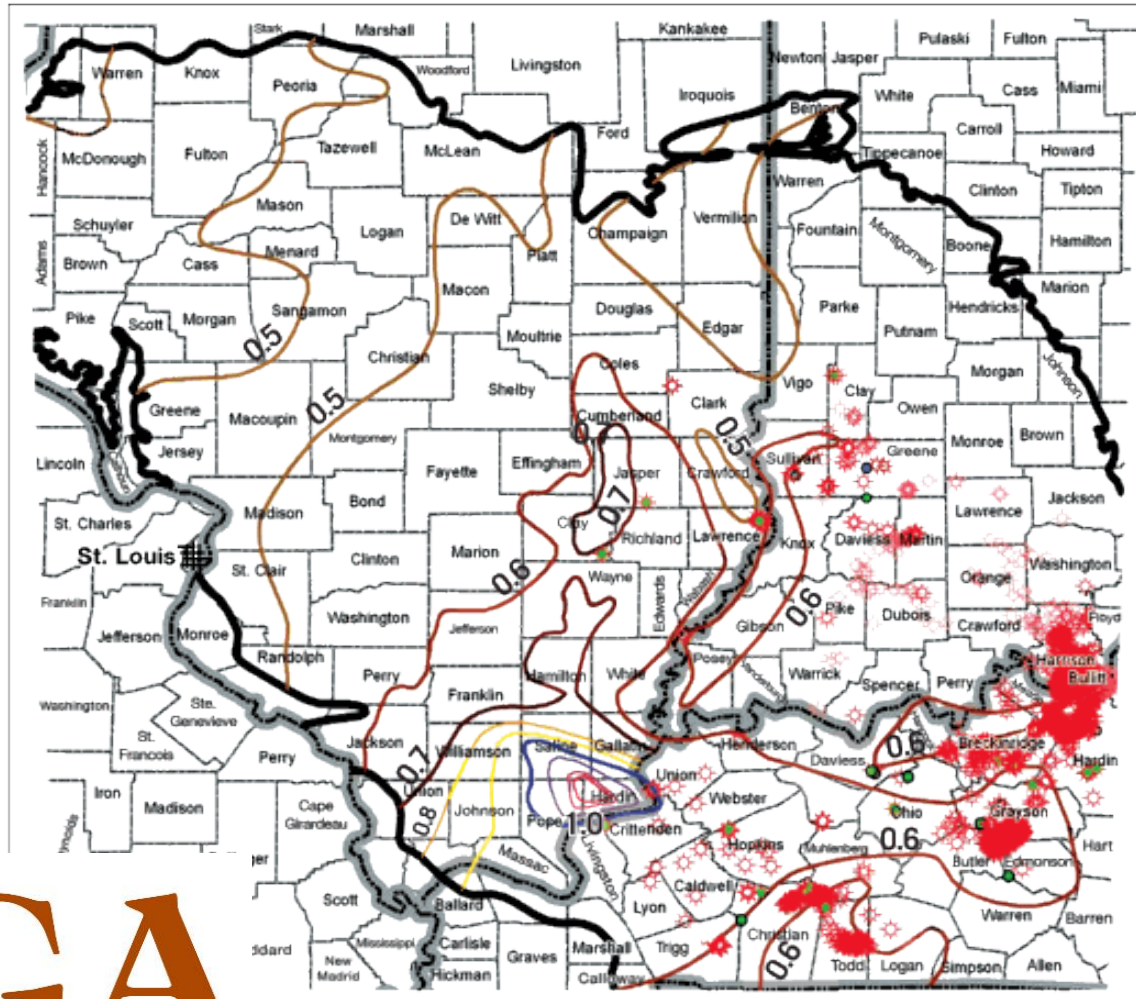
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Primary Production ■ Secondary Recovery

New Albany Shale

NEW ALBANY VITRINITE REFLECTANCE MATURITY²⁴

FIG. 4

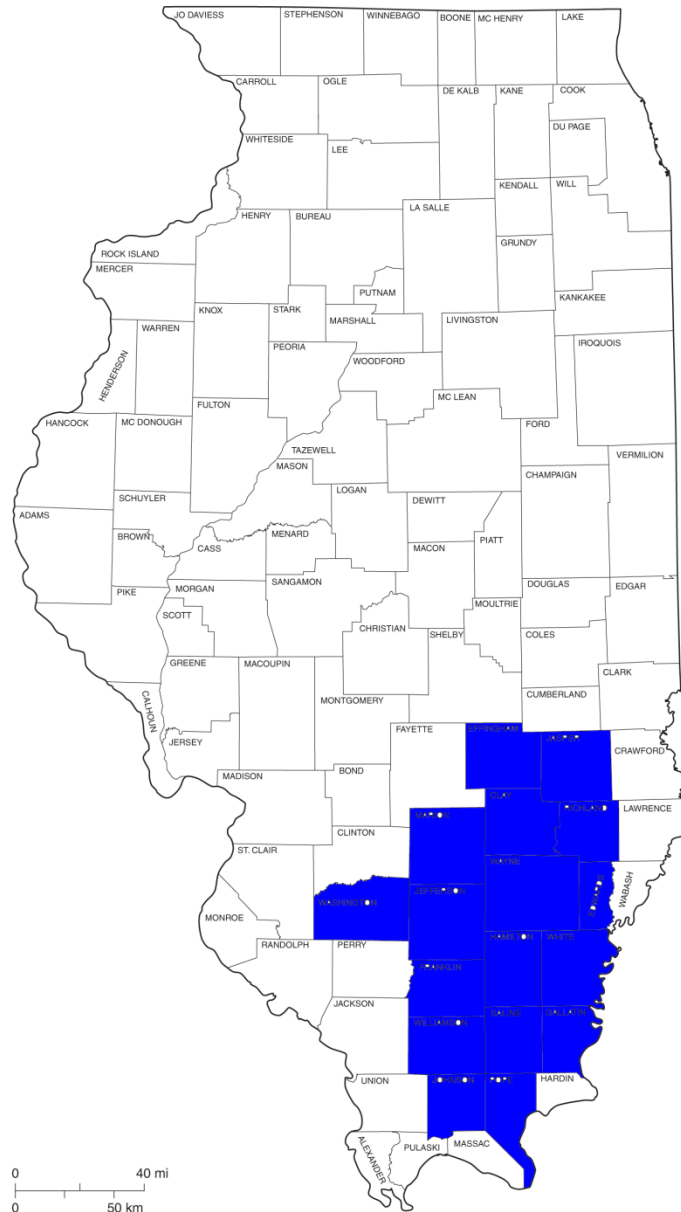


24. For more information on the maturity scale, please refer to the maturity scale and maturity scale chart, 1994.

Illinois Counties

Leasing in 19 counties

- Clay
- Edwards
- Effingham
- Franklin
- Gallatin
- Hamilton
- Jasper
- Jefferson
- Johnson
- Lawrence
- Marion
- Pope
- Richland
- Saline
- Wabash
- Washington
- Wayne
- White
- Williamson



New High Volume Hydraulic Fracturing Regulations

Setbacks and Prohibitions

- 500' from schools, houses and hospitals Setbacks from mapped aquifers deleted
- 1,500' from any public water intake point
- 300' from streams, rivers, lakes and ponds
- 750' from any nature preserve
- 500' from any water well serving humans or livestock



New High Volume Hydraulic Fracturing Regulations

Permit Requirements – Section 35

- Completion activity requires a permit
- Operators engaging in HVHFF must register with the state and provide proof of environmental liability insurance and summary of any violations of an HF related statute incurred in the last five years (nationwide)
- Application must include list of chemicals “anticipated” to be used
- Operator must submit a report to the local county identifying the primary roads that will be used by truck traffic servicing the well site
- Plan identifying how flowback will be managed and disposed
- Permit application fee - \$11,000 to IDNR; \$2,500 to IEPA



New High Volume Hydraulic Fracturing Regulations

Permit Processing

- Permits must be processed and approved/denied within 60 days of submittal (excluding delays attributable to public hearings)
- Notice of application must be sent to all property owners within 1,500' of well site; Notice must direct them to website where details of permit application can be found
- 30 day public comment period per each well application; Public comment period occurs during IDNR 60 day review period
- Individuals “adversely affected” by the well site can request a public hearing to protest the permit



New High Volume Hydraulic Fracturing Regulations

Bonding Requirements

- Operator must maintain a \$500,000 statewide bond; Bond can satisfy all other bonding requirements if the \$500,000 level exceeds the level of other requirements

Well Construction Requirements – Sec. 70

- Prescriptive well construction and operation standards must be adhered to



New High Volume Hydraulic Fracturing Regulations

HF Operations – Sec. 75

- Use of tanks required for managing all wastes; Use of unlined pits allowed for fresh water and non-oil based cuttings only
- Flowback must be tested once per well site for VOCs, metals, etc.
- Secondary containment for well sites and facilities required
- Report on how flowback was transported and disposed must be included in the well file; Annual report on how produced water is managed must be filed with IDNR
- Emissions must be minimized during flowback in accordance to USEPA green completion requirements (apply to oil and gas wells); Production flares must meet 98% efficiency standard per CFR 60.18 by 2015



New High Volume Hydraulic Fracturing Regulations

Water Testing – Section 80

- Pre and post activity water testing required
- Work plan must be submitted to IDNR
- Testing required for all water resources within 1,500' of well site
- Post activity testing required 6, 18, and 30 months after HF operation is completed

Reclamation

- Surface reclamation and removal of all facilities must be completed within 12 months of plugging the last well on a well site
- Prior to conducting HF operations, operator shall cause any unplugged well to be plugged if it is within a 750' radius of the well site and the bottom hole location occurs within 400' of the stimulated zone



Summary

- The combination of horizontal drilling and high volume hydraulic fracturing in hydrocarbon source rocks has transformed the oil and gas industry in the United States and may soon transform the Illinois oil and gas industry
- In Illinois, concerns over the environmental impacts of high volume hydraulic fracturing have led to a new comprehensive regulatory scheme.

Summary

- Those who suggest we must choose between the environment and this type of oil and gas development are presenting a false choice. Responsible oil and gas development can fuel our economy and reduce our dependence on foreign oil.