Shale Gas Development in Northwest PA – Where are we now?

Penn State **Extension**


JESUS HATES FRACKING
DON'T FRACK...
JUST DIE
LIKE TEXAS?
GO BACK
SUBARU
OUTBACK

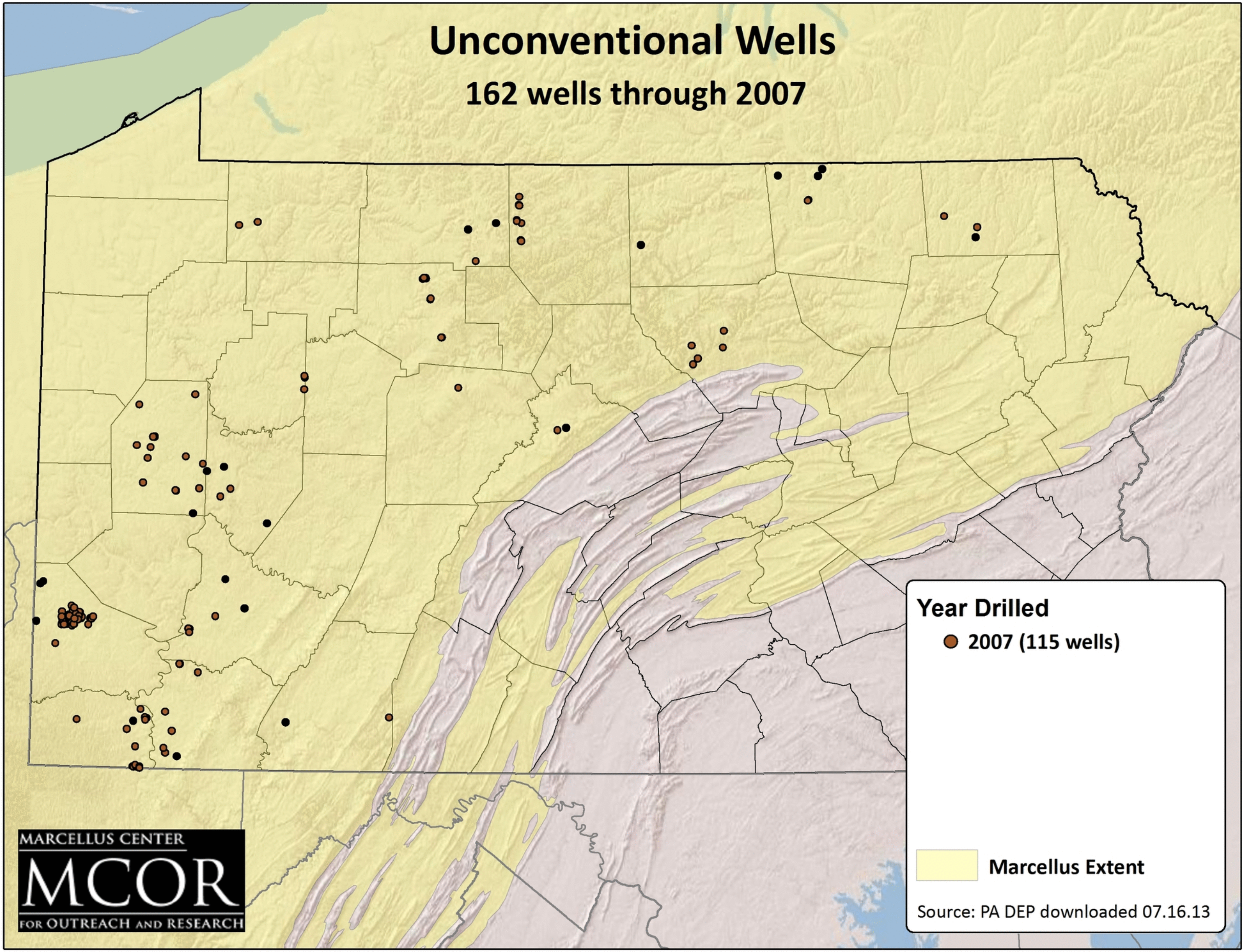

DRILL
BABY
DRILL
McCAIN
PALIN

What's Occurring Now?

- Sustained depressed price of natural gas
- Leasing activity is at a trickle
- Still a lot of land to lease
- HBP conventionals
- Some pipeline activity
- Energy companies reducing CAP EX to cash flow and/or selling assets to focus their efforts
- Drilling costs going down
- Fewer gas drill rigs in the gas fields more drilling for NGLs & oil elsewhere
- No one seems in a hurry to develop NW PA

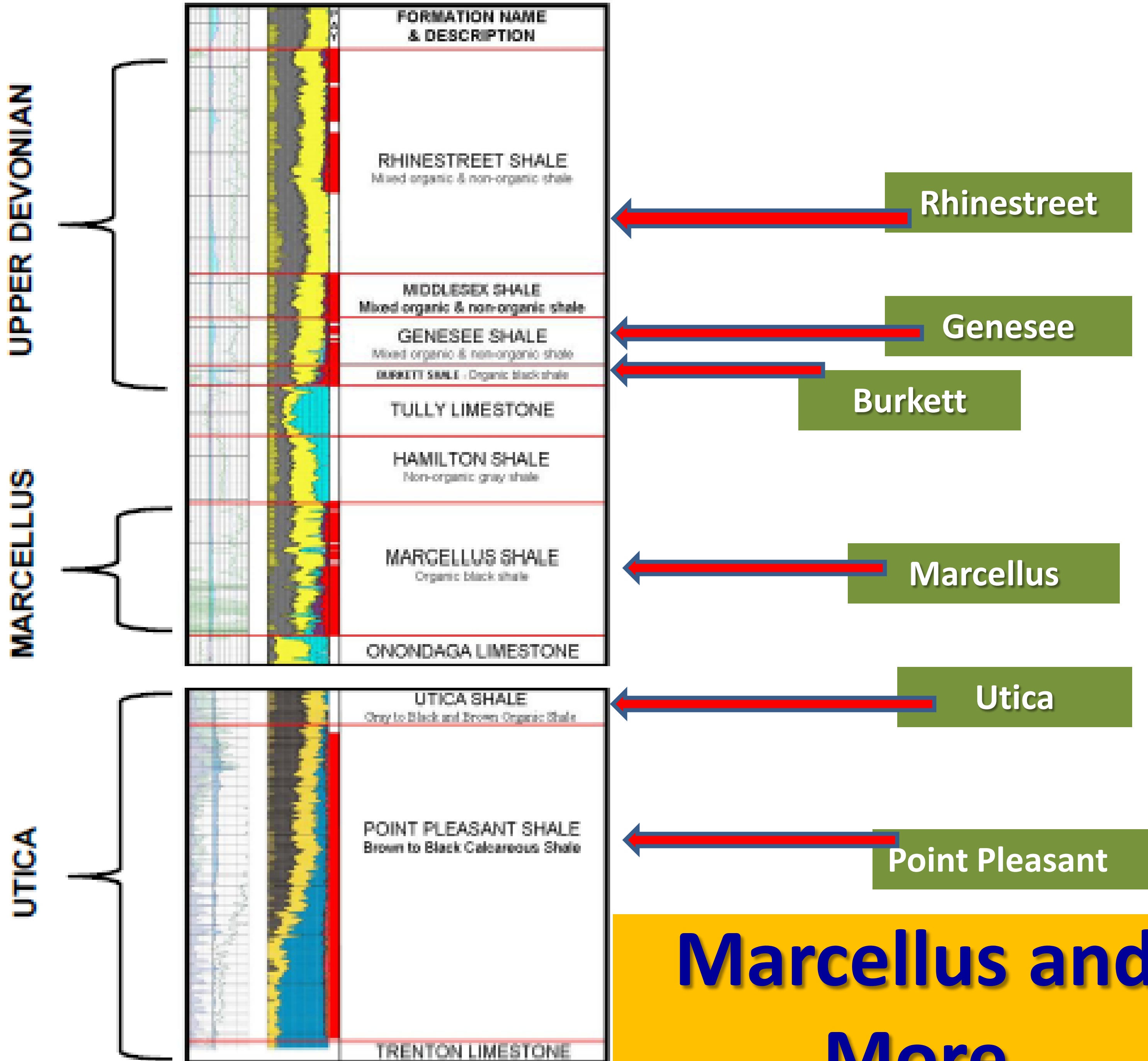
Unconventional Wells

162 wells through 2007



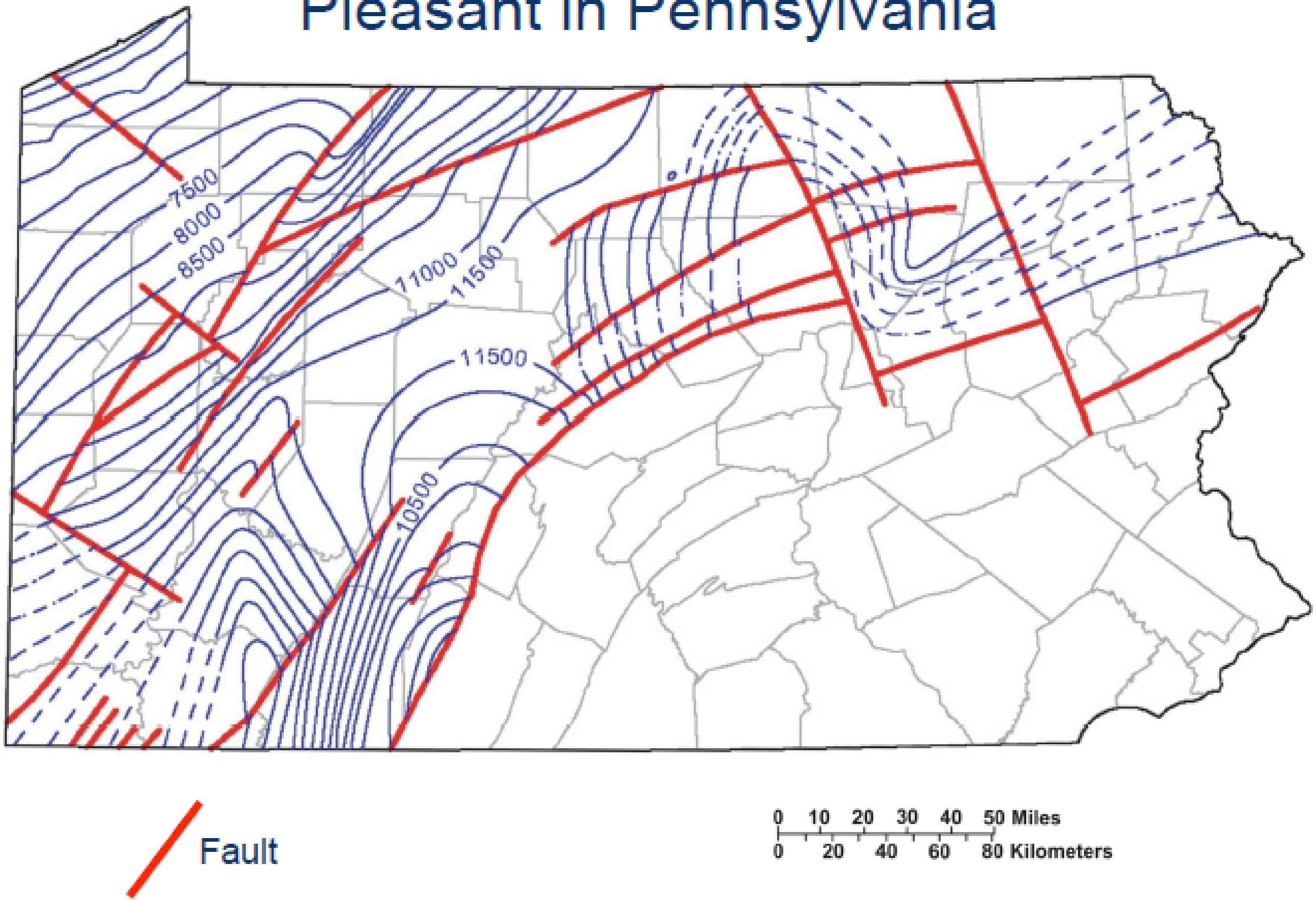
Marcellus Holds Key. . . .

- The *Wall Street Journal reported June 9 that analysts say the Marcellus Shale – and more specifically, when its production stops increasing – holds the key to when natural gas prices will once again reach $5 per MMBtu. Analysts say despite fewer new wells being drilled, Marcellus production is still rising and is expected to reach 10 Bcfpd this year, largely due to a huge backlog of previously-drilled wells being completed and connected to pipelines.*



Marcellus and More

Drilling Depth to the Base of the Utica/Point Pleasant in Pennsylvania



DITIONAL INFORMATION ON THE ACTIVE RIGS, CONTACT RIG DATA

Contents

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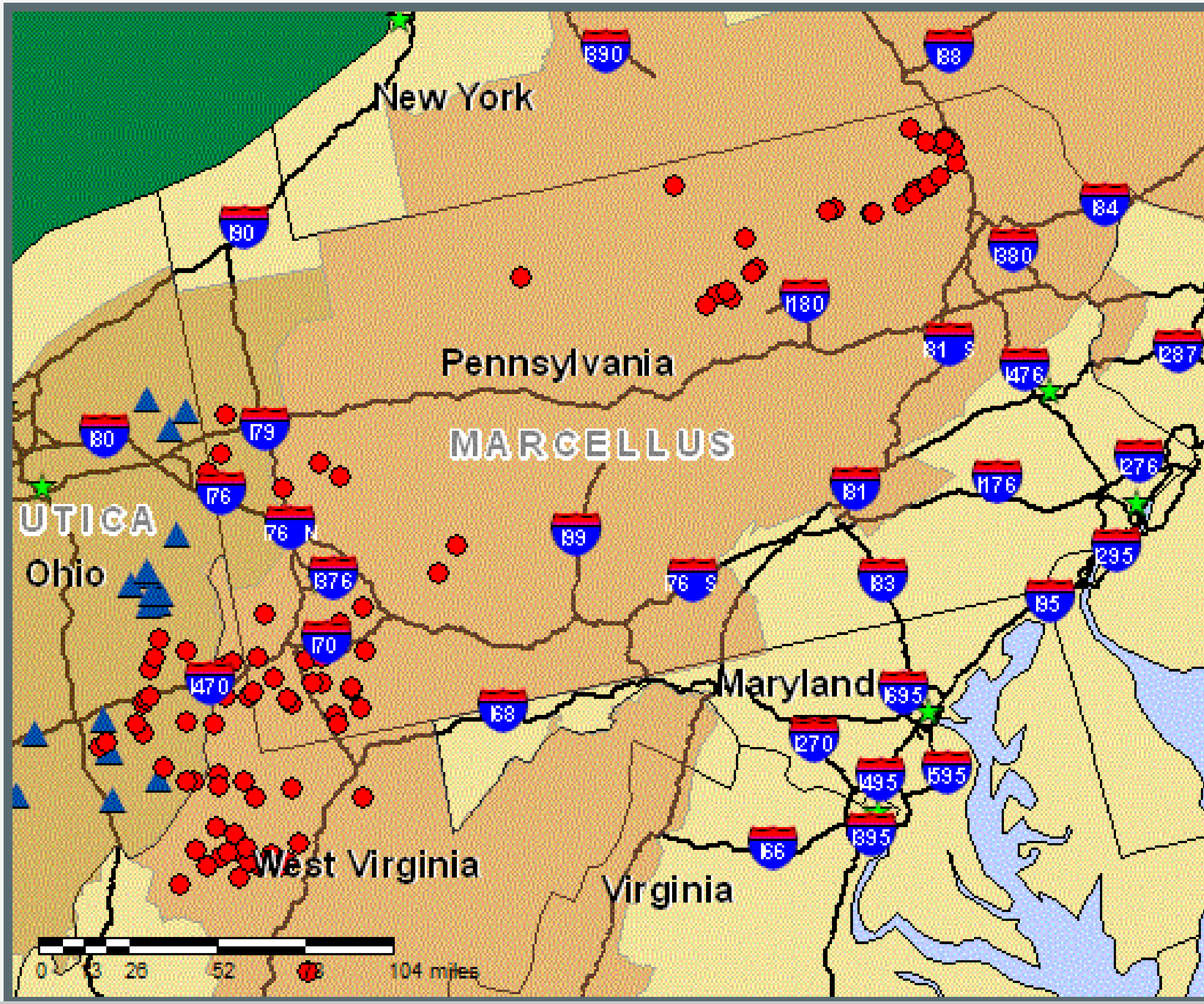
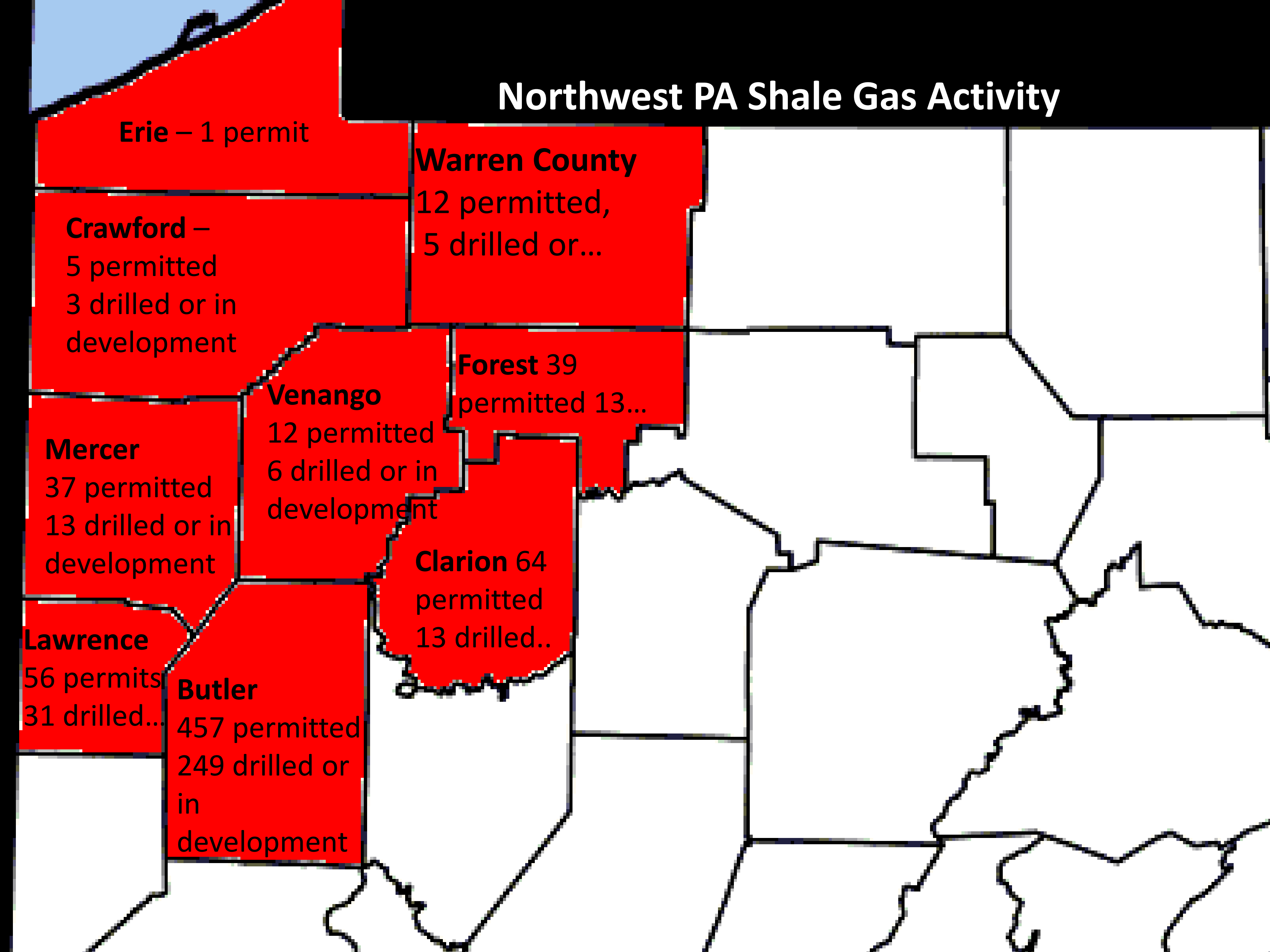
- Current Week
  - Drill For
    - Gas
      - Gas
    - Oil
      - Oil
    - Thermal
      - Thermal
  - Trajectory
  - Depth
  - Well Type
  - Location
- Cultural
  - Major_Cities
  - Imagery
  - Basins
  - Geology
  - Counties



Northwest PA Shale Gas Activity



How Much Drilling?

- **Total Wells**
  - **58,800** – 90,800 total wells (35% drillable)
  - 117,600 – **196,000** total wells (70% drillable)

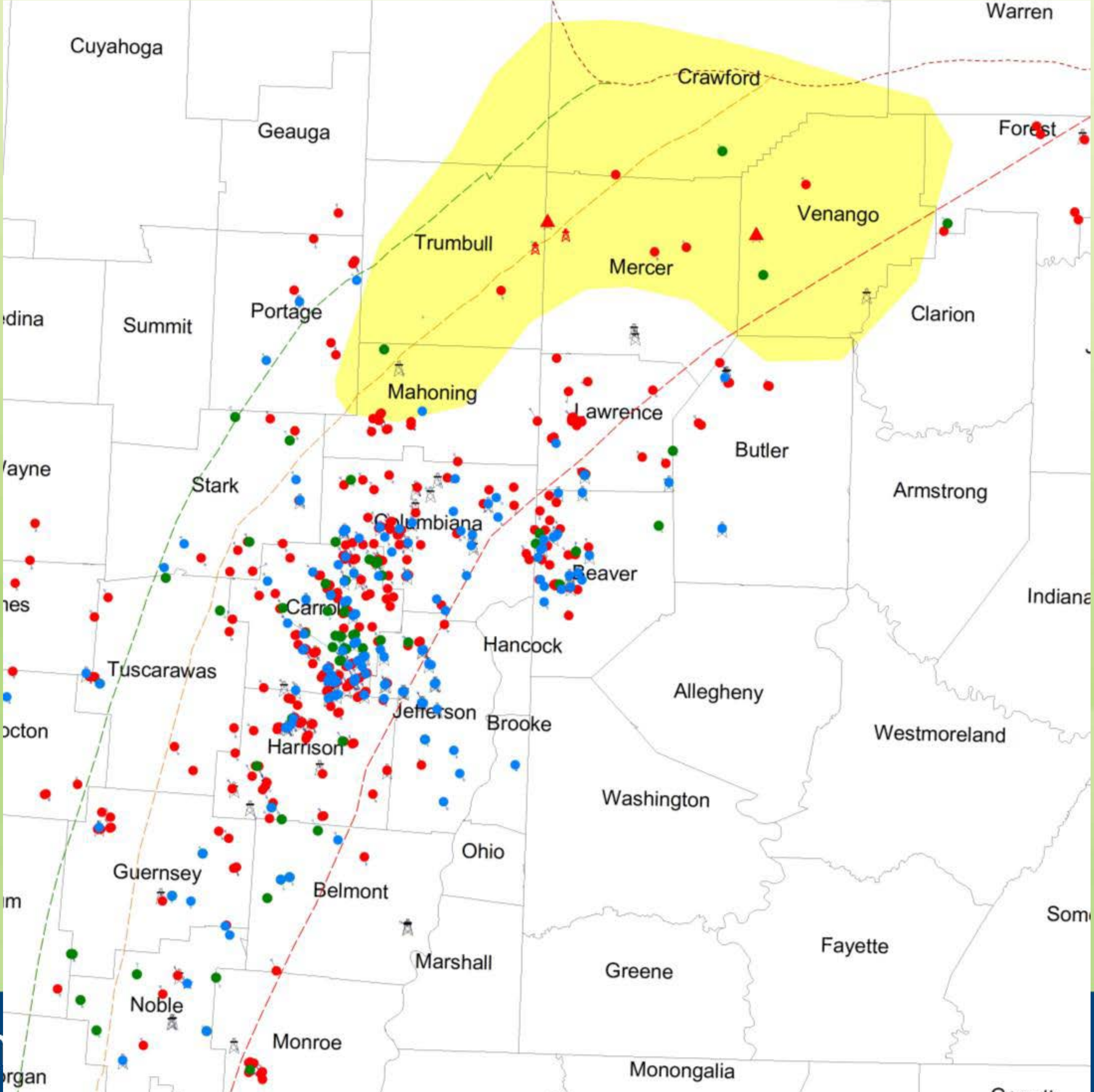
The above example is provided as an illustration of scale, not as a forecast of future activity

- **Current Activity**
  - 6,900 Unconventional wells in PA
  - 2,100 Marcellus wells in WV (est.)
  - 200 Utica wells in OH Source: Pa DEP & WV DEP

What Would Full Development Look Like in Northwest PA?

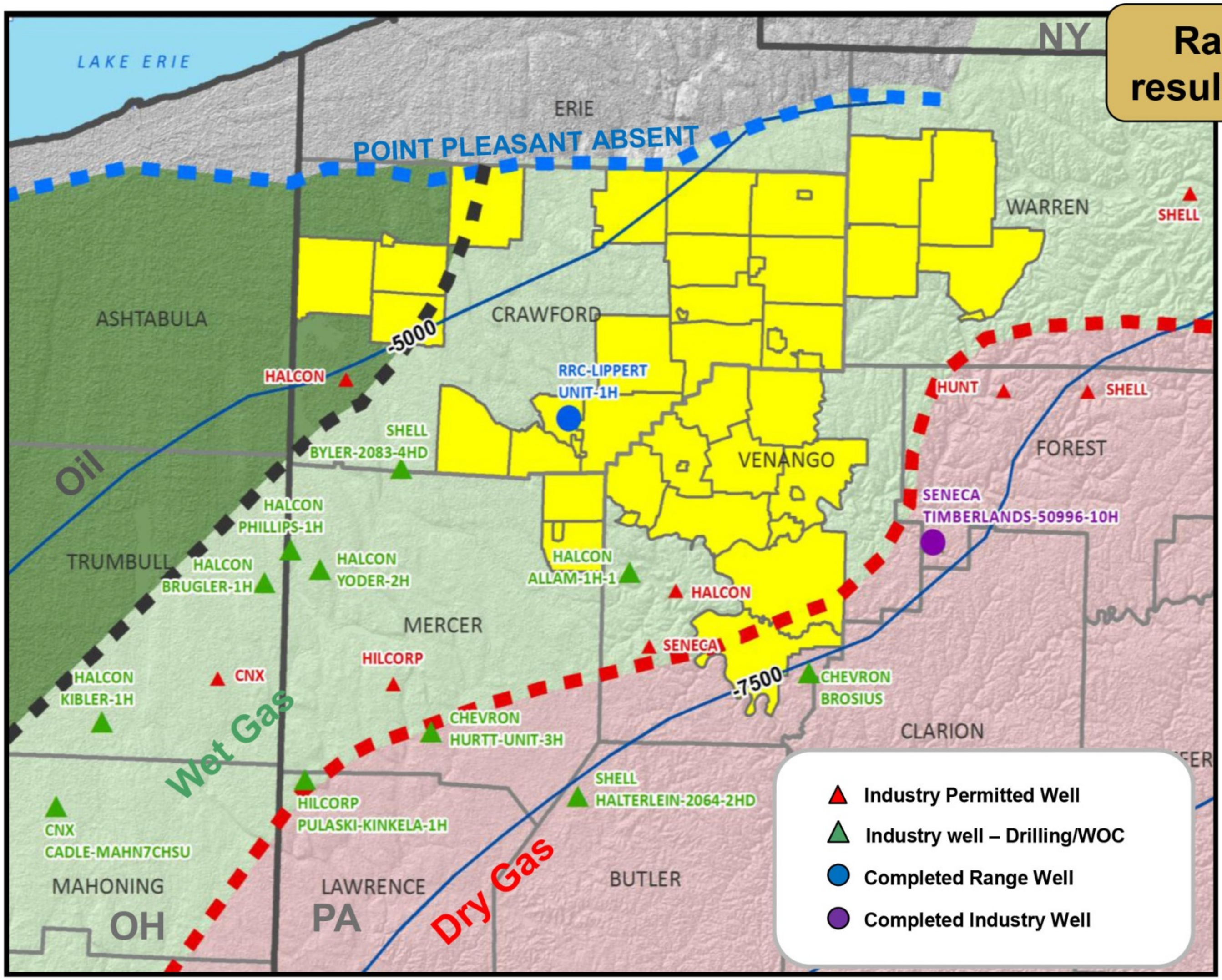
- Clarion – 2,300 to 4,400 wells?
- Crawford – 4,000 to 7,500 wells?
- Forest – 1,600 to 3,100 wells?
- Mercer – 2,600 to 4,900 wells?
- Venango – 2,600 to 4,900 wells?
- Warren – 3,500 to 6,500 wells?
  - Totals 16,600 to 31,300
  - Estimated cost of full development = $100 billion to $290 billion, not counting infrastructure

** These are projections/estimates assuming full development – which is far from reality at this point.


Warren
Cuyahoga
Crawford
Geauga
Forest
Trumbull
Venango
Mercer
Portage
Summit
Clarion
Mahoning
Lawrence
Butler
Stark
Armstrong
Columbiana
Beaver
Indiana
Carroll
Hancock
Tuscarawas
Allegheny
Jefferson
Brooke
Westmoreland
Harrison
Washington
Ohio
Guernsey
Belmont
Fayette
Marshall
Greene
Noble
Monroe
Monongalia

Penn

Northwest PA – Wet Utica/Point Pleasant



Note: Townships where Range holds ~3,000+ acres are shown in yellow

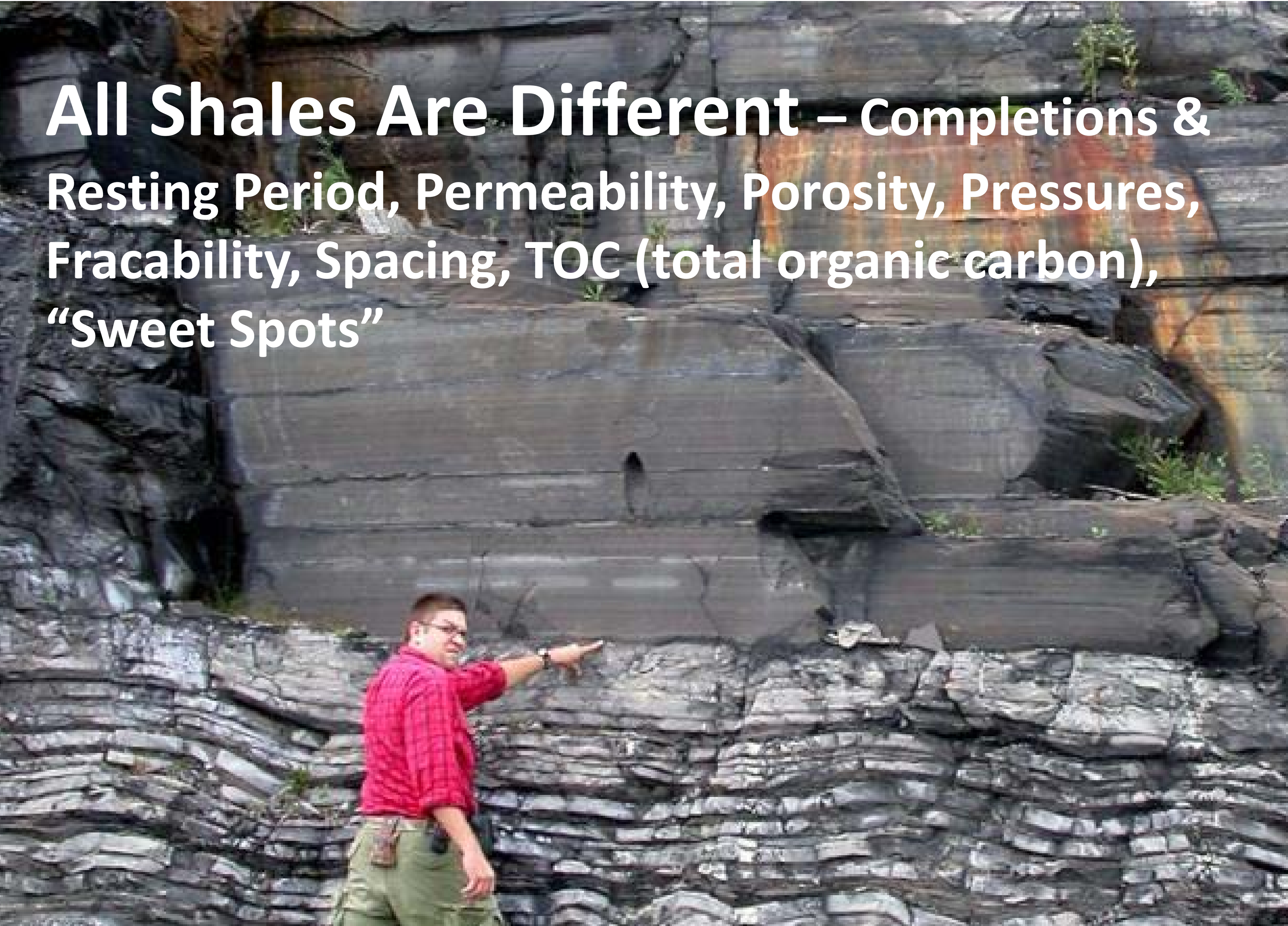
Range Lippert Unit 1H test results for Utica/Point Pleasant

- Net Utica/Point Pleasant Thickness = 285 feet at a depth of approx. 7,000 ft
- Gas Btu of 1200 to 1250 with 63 gravity condensate
- Reservoir pressure gradient of approx. 0.55 psi/ft
- Initial flow test of 1.4 Mmcfed
- Well not effectively stimulated. Will spud a second test

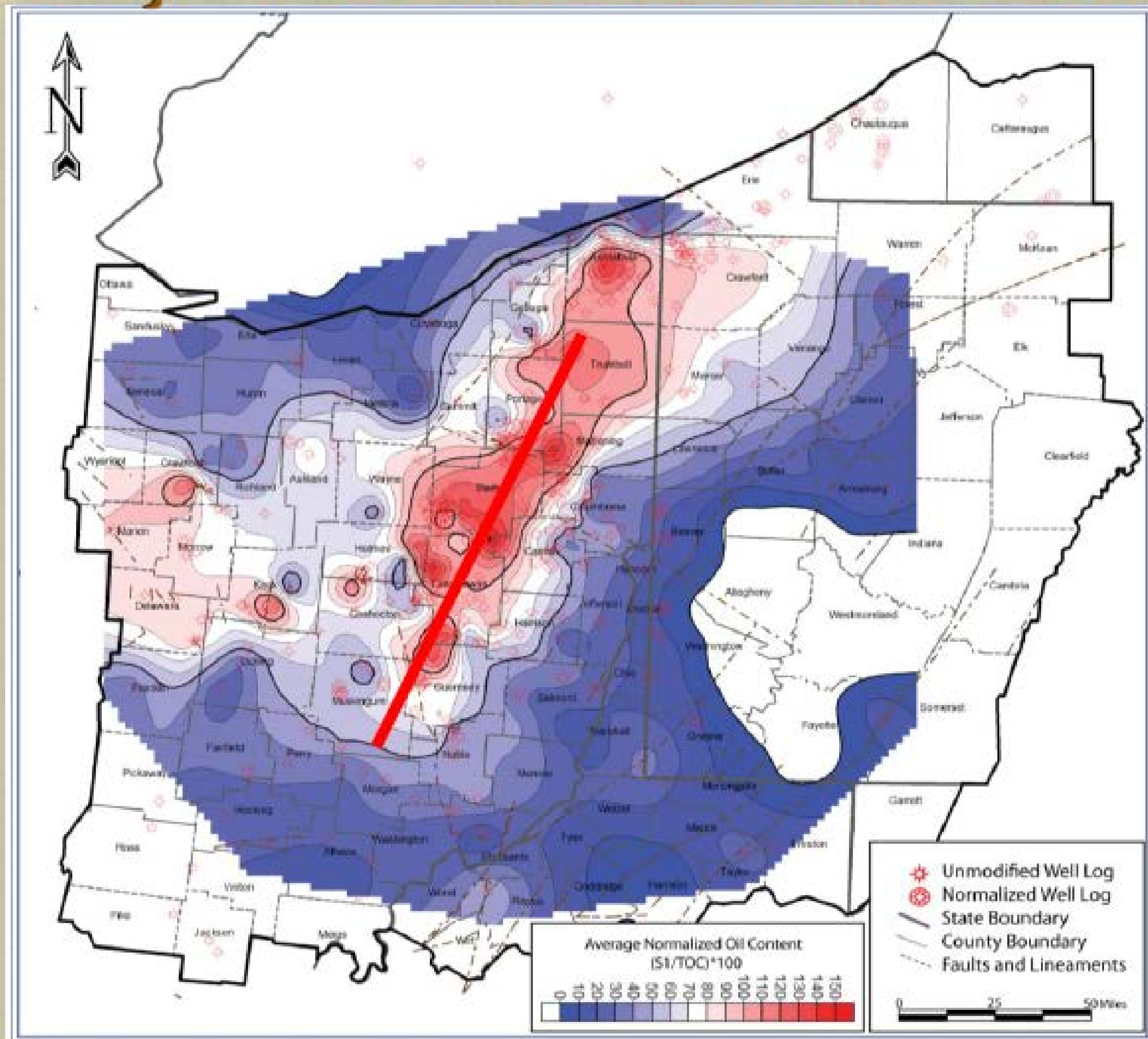
Managing Expectations

- The investment community had high expectations of Utica Shale – now that numbers are coming in, they seem ready to bash it
- Expecting some Jed Clampett moments
- Marcellus results have been stunningly good; anything less is deemed a failure?
- "Line of Death" in Utica Shale?
- Oil region of Utica?

All Shales Are Different – Completions & Resting Period, Permeability, Porosity, Pressures, Fracability, Spacing, TOC (total organic carbon), "Sweet Spots"



Maturity - Normalized Oil Content



Still in R&D Stages?

- In the press release, Halcón emphasized the significant amount of "science work" that it has performed on the acreage. The company has also made numerous data trades with offset operators and has joined several industry data consortiums.
- Range – We're going to let someone else do the experiments right now

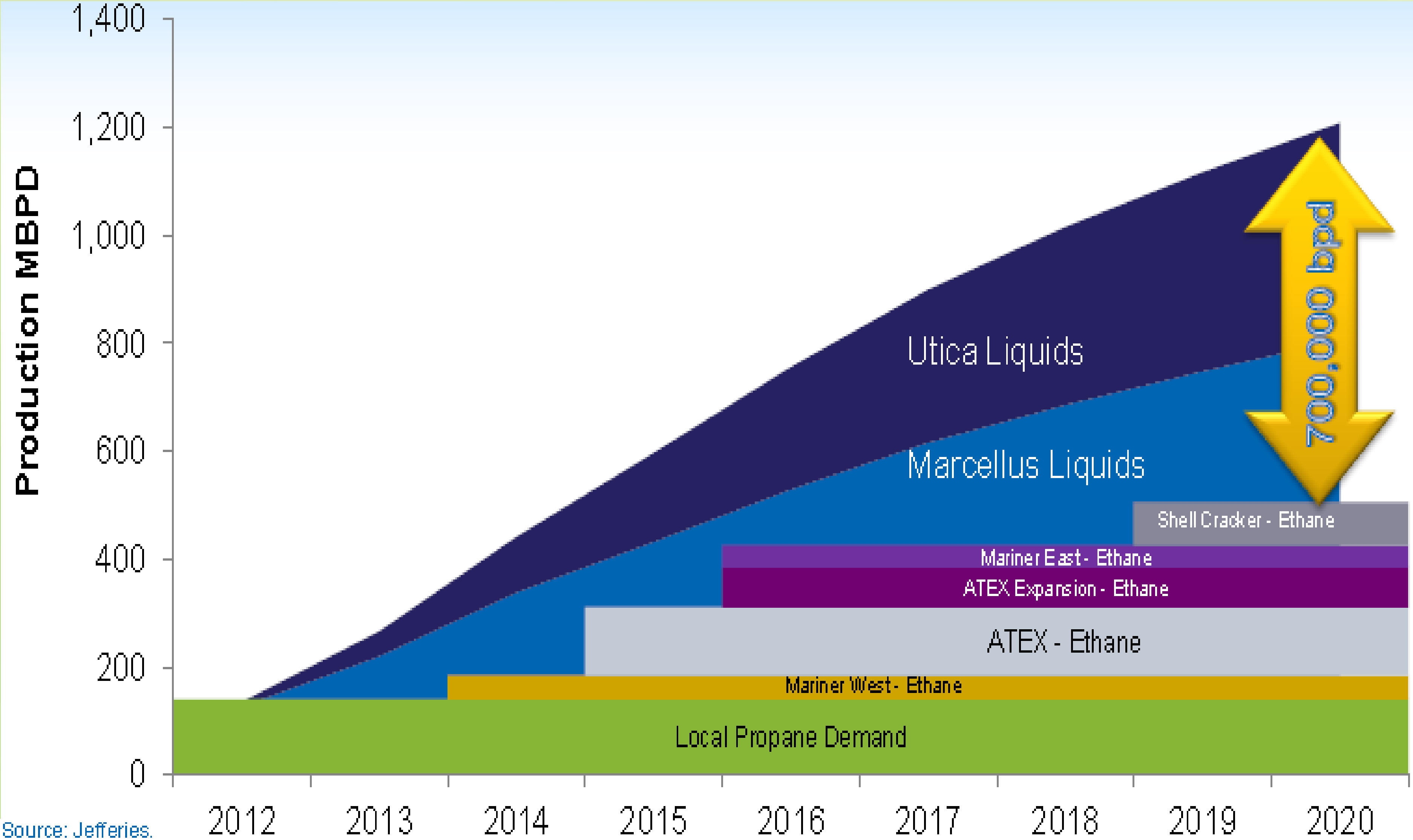
Pipeline and other Infrastructure

We currently don't have the pipeline infrastructure to move gas. If development is to occur in Northwest PA, we can expect a lot of building. NGL infrastructure will also need to develop.

Infrastructure Solutions?

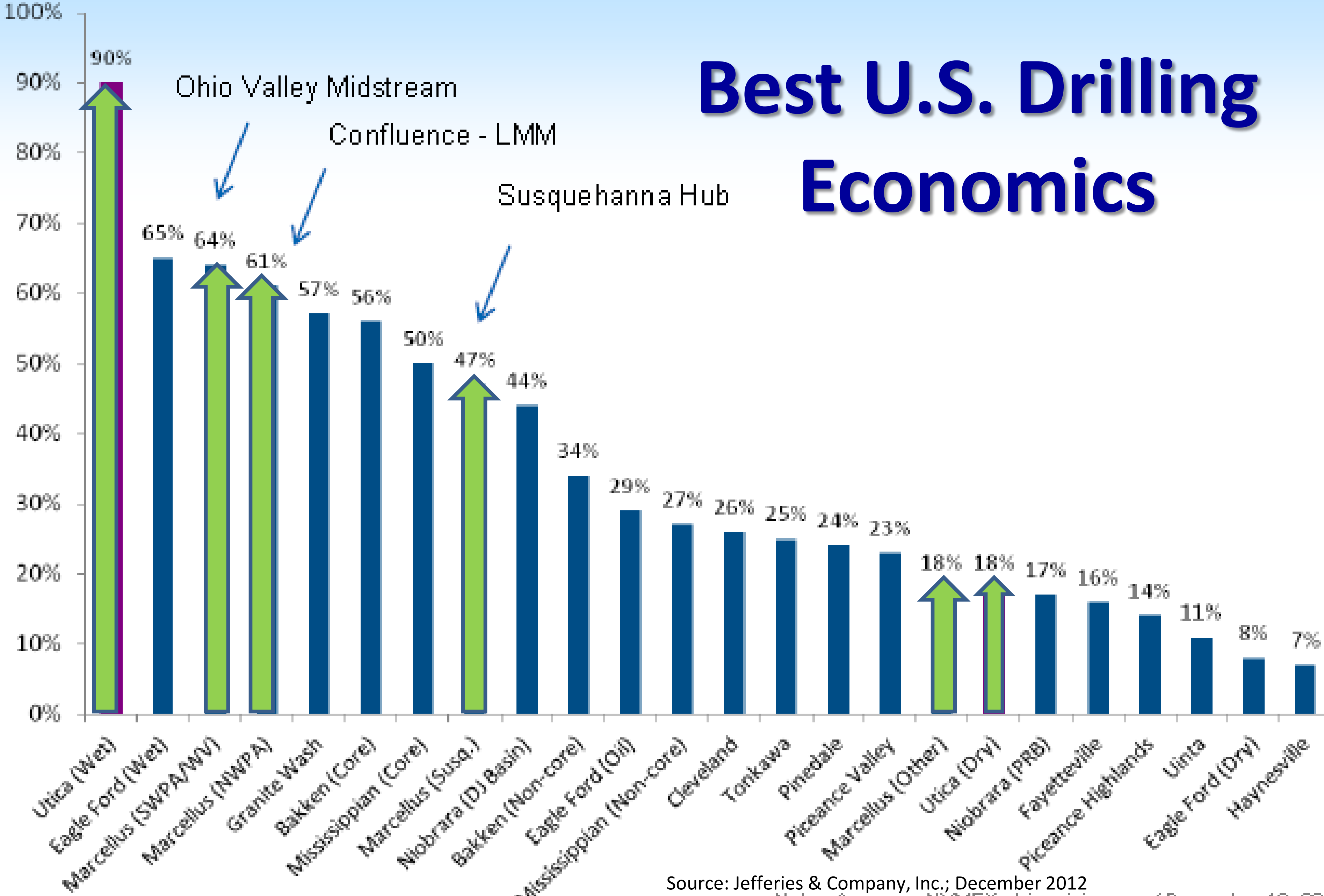
"Whack-A-Mole"
(Marcellus-Utica NGL Challenge)

NGL Volumes Grow; Cracker, Pipelines



Source: Jefferies.

Best U.S. Drilling Economics



Source: Jefferies & Company, Inc.; December 2012

Note: Assumes NYMEX strip pricing as of December 12, 20

Uncertainties that could affect the development of Shale Gas

- Risk appetite of industry participants
- Infrastructure and technology
- Environmental constraints
- Economics, politics and timing of methane and ethane markets
- Public Perception
- The economy

Penn State Cooperative Extension Resources

•Website & e-newsletter
www.naturalgas.psu.edu

- Primers
  - Marcellus Shale: What Local Government Officials need to Know
  - Natural Gas Exploration: A Landowner's Guide to Leasing Land in Pennsylvania
  - Natural Gas Exploration: A Landowners Guide to Financial Management

- Short Fact Sheets