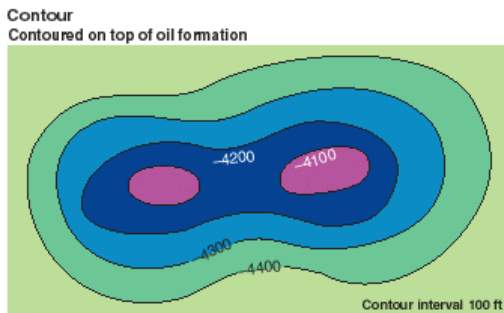
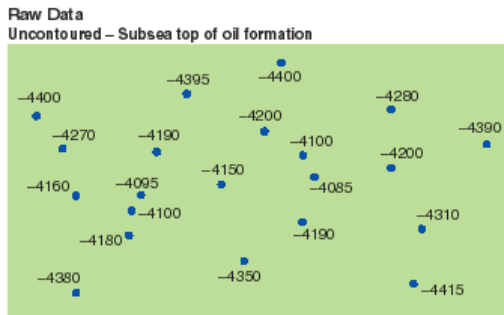


Unconventional Oil and Gas Development: Definition, Challenges and Considerations

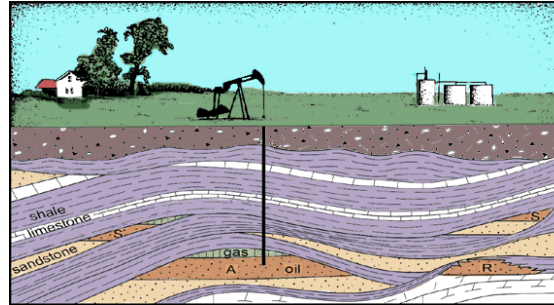
Shari Dunn-Norman

Petroleum Engineering, Missouri S&T

Conventional (Historical) Oil and Gas Development



Schlumberger glossary:
Structural Trap



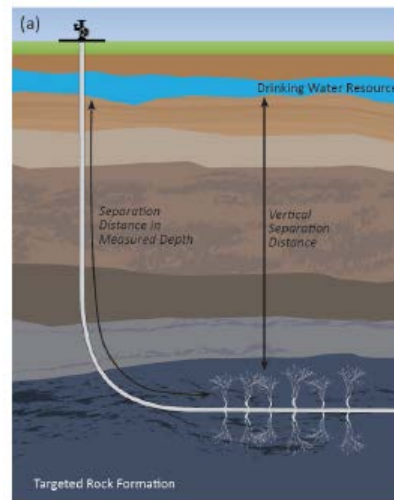
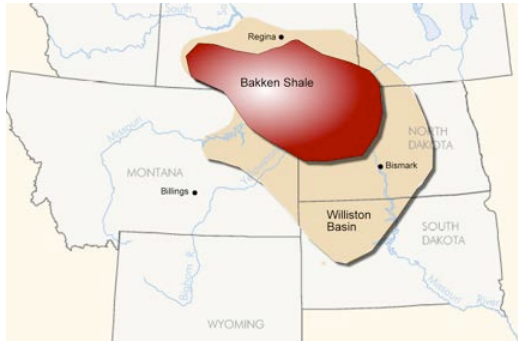
http://www.geosci.usyd.edu.au/users/prey/ACSGT/EReports/eR.2003/GroupD/Report2/web%20pages/hydrocarbon_deposits.html

- Oil and gas found in distinct 'traps' with limited aerial extent meant fewer populations were in contact with oil and gas operations
- Rock properties sufficient to allow oil and gas to flow through porous space of the rock and to the surface with minimal intervention



Oil in pores of rock. Energy.gov

Unconventional Oil and Gas Development



Aerial view of UOG in Fort Worth Basin, Texas. Credit Jeremy Buckingham.

- Oil and gas exist in the fabric of 'source rock' found in wide swaths across multiple U.S. regions
- Extremely low permeability source rock (e.g., shale) requires horizontal wells combined with multi-stage fracture stimulations to provide surface area necessary to produce economically
- The widespread distribution of low permeability source rock means that people are increasingly in contact with oil and gas operations



Montney Shale, Trican Well Service

UOGD: we're talking about more than just exposure to hydraulic fracturing

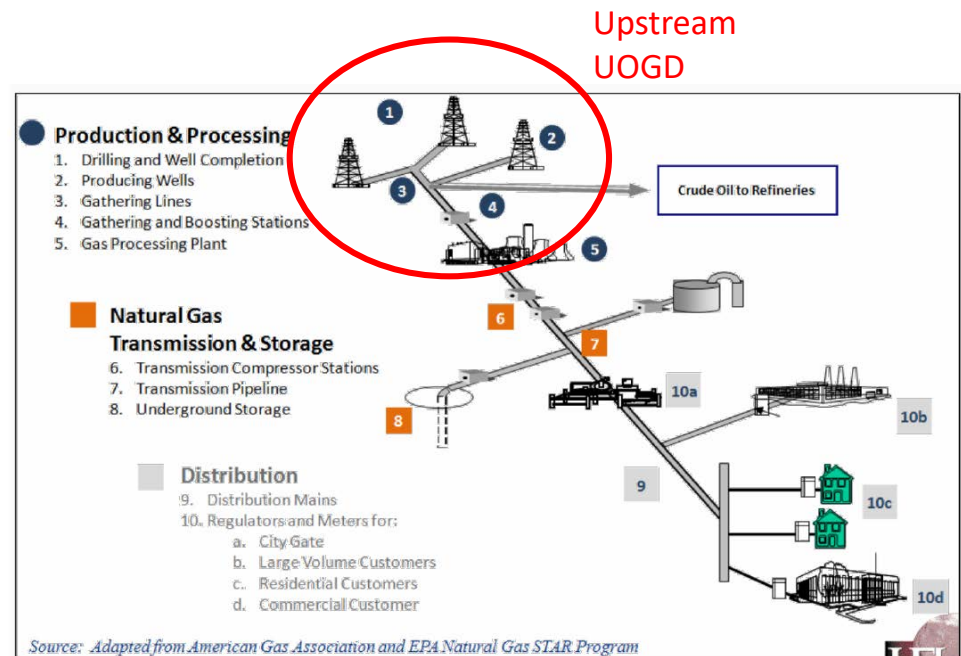


Photo courtesy of Schlumberger

UOGD as defined in HEl's Energy Research Program

UOGD includes:

- **Development:** exploration, site preparation, vertical and horizontal drilling, well completion, and management of wastes
- **Production:** extraction, gathering, processing, and field compression of gas; extraction and processing of oil and natural gas condensates; management of produced water and wastes; and construction and operation of field production facilities
- **Post-production**



What challenges will researchers find?

- UOGD has evolved over a period of time making the differentiation between UOGD and historical oil and gas production (as well as other industries, traffic emissions, etc.) challenging yet important. Locations with historical production may overlap locations with UOGD.
- Researchers cannot rely solely on well geometry to define UOGD in databases (e.g. Piceance Basin)
- Industry practices change in response to identified problems and technological innovation. These changes are not documented for researchers.
- Researchers are chasing a moving target with respect to changes in technology and practices in the industry.

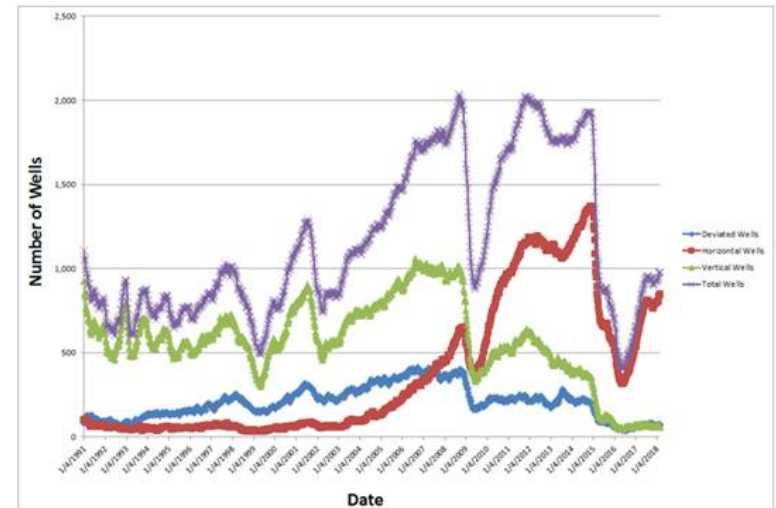


Figure 3. North American well geometry since 1991, showing the increasing prevalence of horizontal wells over time (Courtesy: L.K. Britt 2018)

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Panel Preview

Case Studies Show The Way: Field-Proven Strategies That Could Change Fracking, Flaring and Remediation

Tuesday, July 17 (1:30 pm – 3:00 pm)