



Overview of USGS National Assessment of Oil and Gas Project

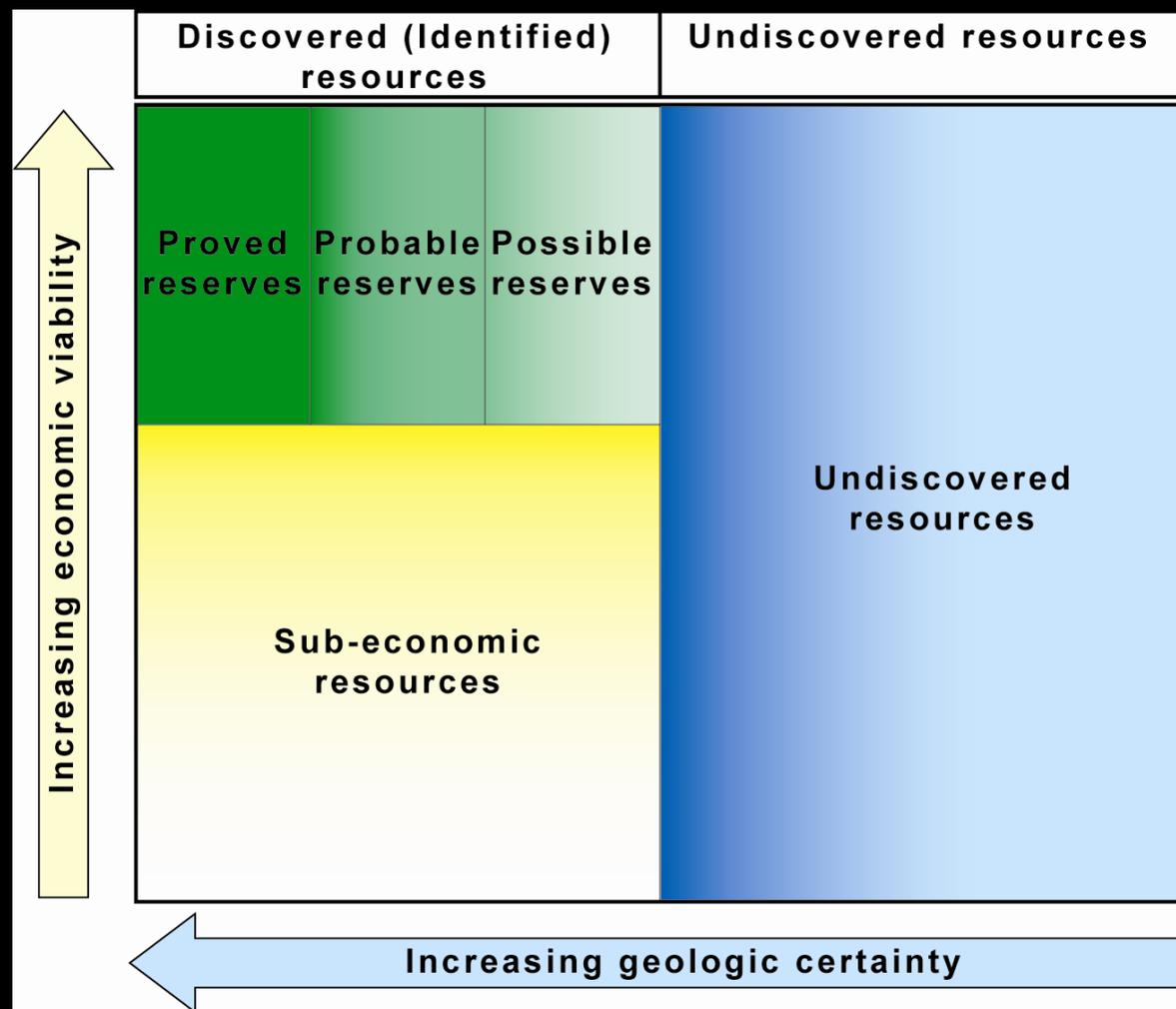
Bismarck, North Dakota
November 29, 2006

Goal of the National Assessment

- **Develop geologically based hypotheses concerning the quantities of oil and gas that have the potential to be added to proved reserves in the U.S.**

Resources vs. Reserves

**USGS
produces
estimates of
undiscovered,
technically
recoverable
resources.**



National Assessment Objectives

- **32 priority basins (~96% of resources)**
- **Petroleum Systems definition (fluids)**
- **Assessment Units (rocks)**
- **Conventional and Continuous resources**

Energy Policy and Conservation Act (EPCA) Amendments of 2000

Public Law 106–469, SEC. 604. SCIENTIFIC INVENTORY OF OIL AND GAS RESERVES.

(a) IN GENERAL.—The Secretary of the Interior, in consultation with the Secretaries of Agriculture and Energy, shall conduct an inventory of all onshore Federal lands. The inventory shall identify—

(1) the United States Geological Survey reserve estimates of the oil and gas resources underlying these lands; and
(2) the extent and nature of any restrictions or impediments to the development of such resources.

(b) REGULAR UPDATE.—Once completed, the USGS reserve estimates

and the surface availability data as provided in subsection **(a)(2)** shall be regularly updated and made publicly available.

Energy Policy Act of 2005

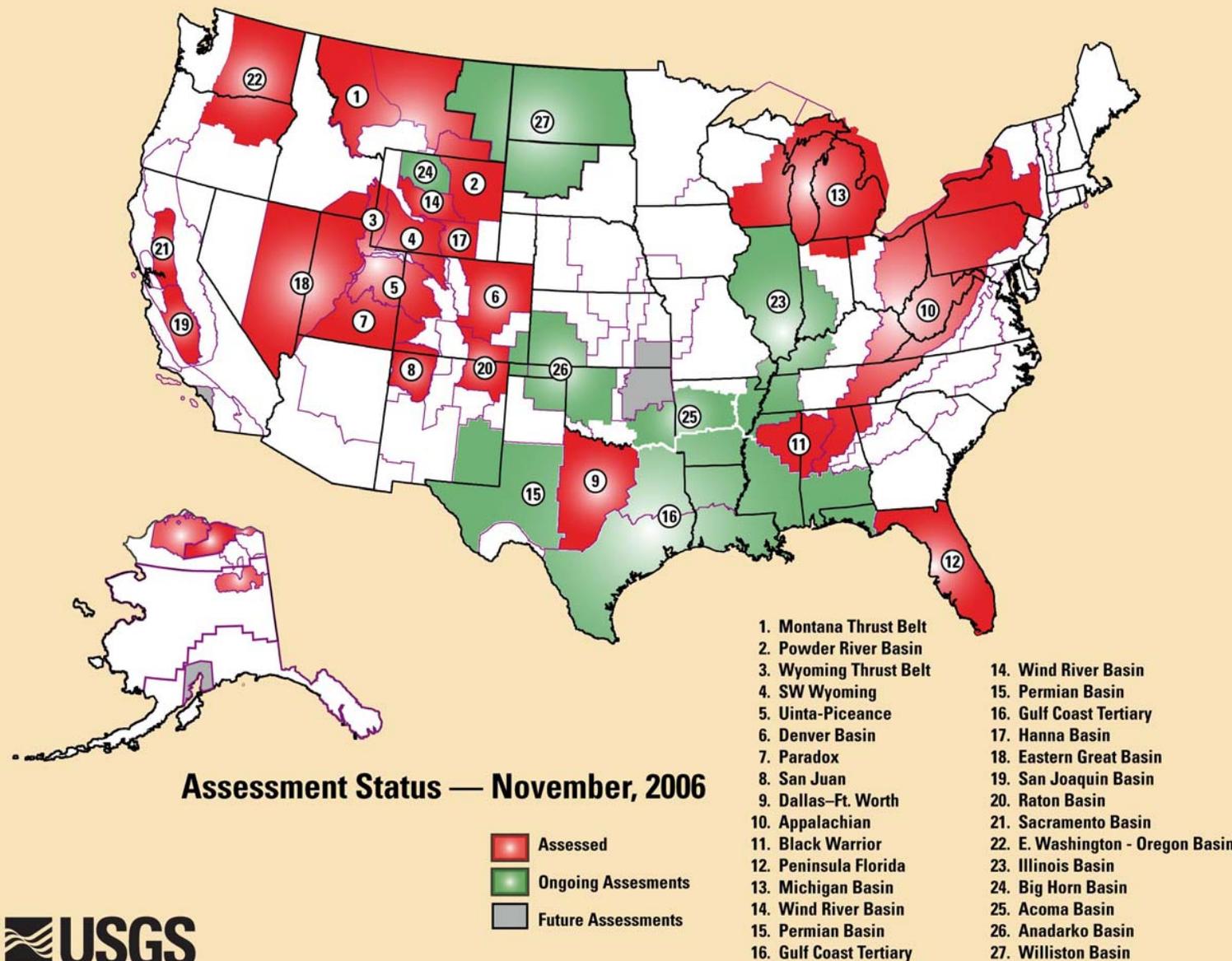
P.L. 109–58, SEC. 364.

**ESTIMATES OF OIL AND GAS RESOURCES
UNDERLYING ONSHORE FEDERAL LAND.**

(b) METHODOLOGY.—The Secretary of the Interior shall use the same assessment methodology across all geological provinces, areas, and regions in preparing and issuing national geological assessments to ensure accurate comparisons of geological resources.

Energy Policy and Conservation Act Amendments of 2000 (EPCA 2000)

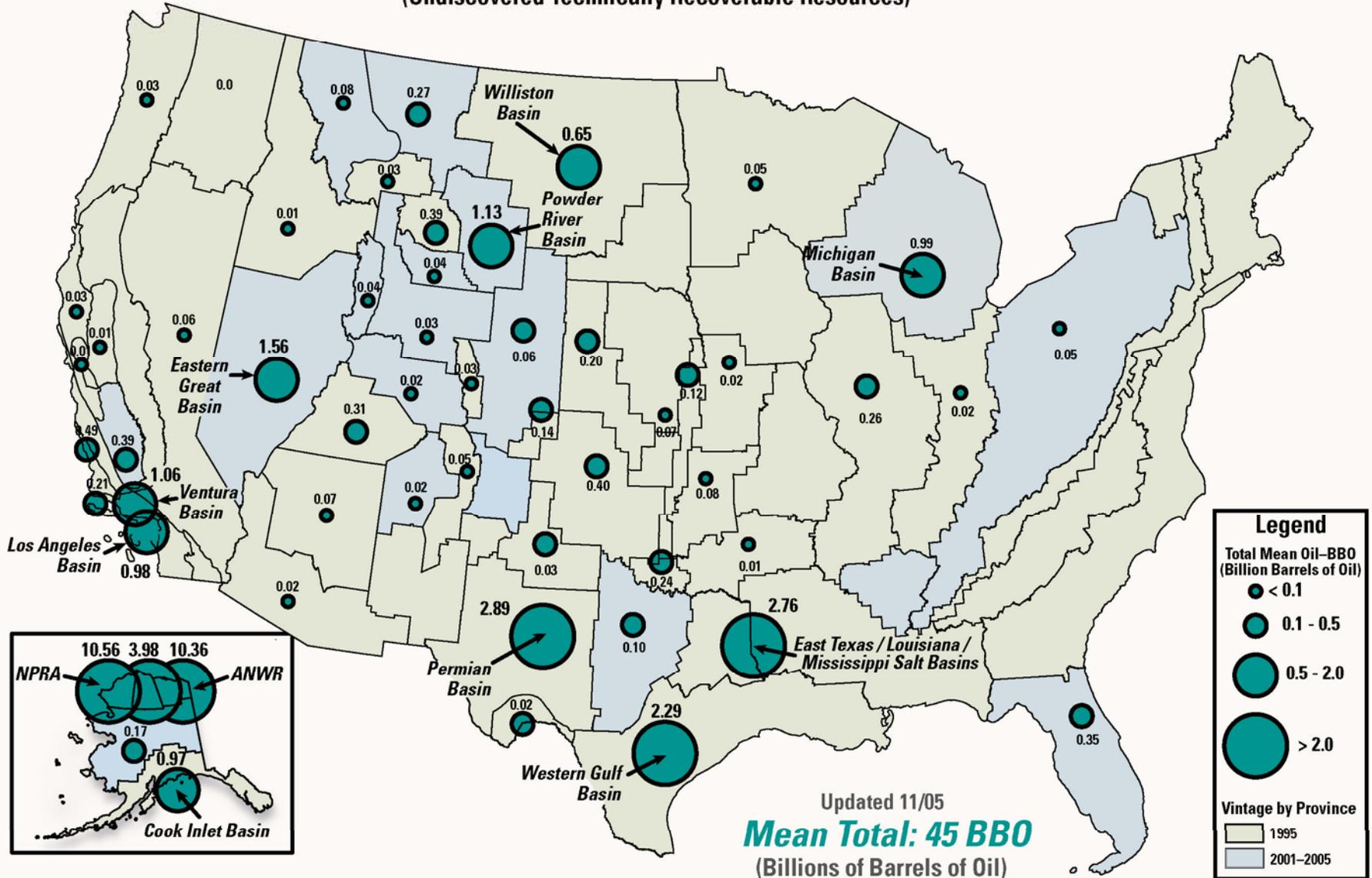
- USGS role; technically recoverable
- USGS, BLM, FS, FWS, DOE
- Assessments regardless of land status
- Assessments given to BLM for EPCA analysis
- Federal land basins are priority



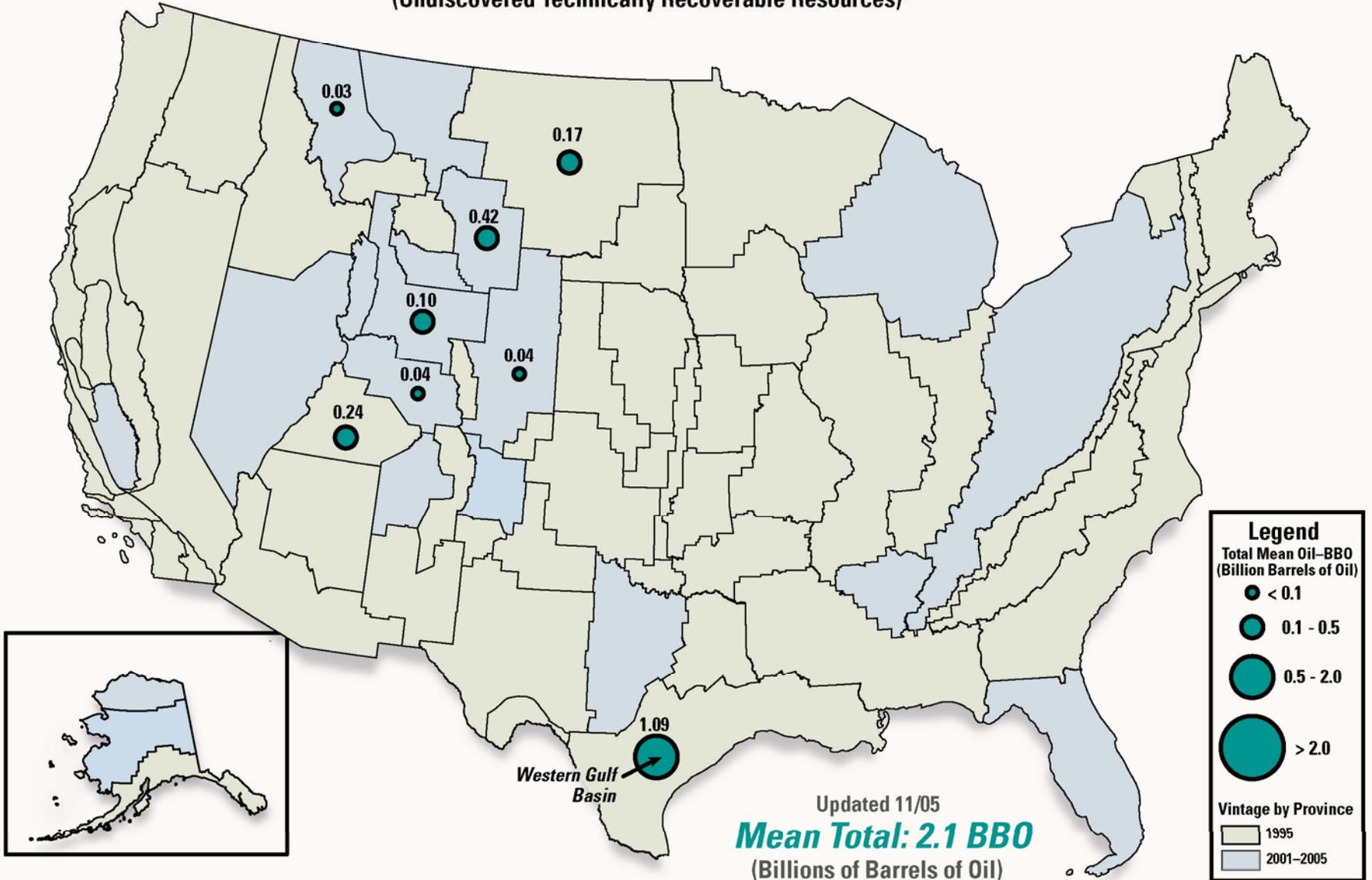
Remaining provinces will be completed in next three years

- **Gulf Coast**
- **Anadarko**
- **Arkoma**
- **Williston**
- **Cook Inlet**
- **Big Horn**
- **L.A. Basin**

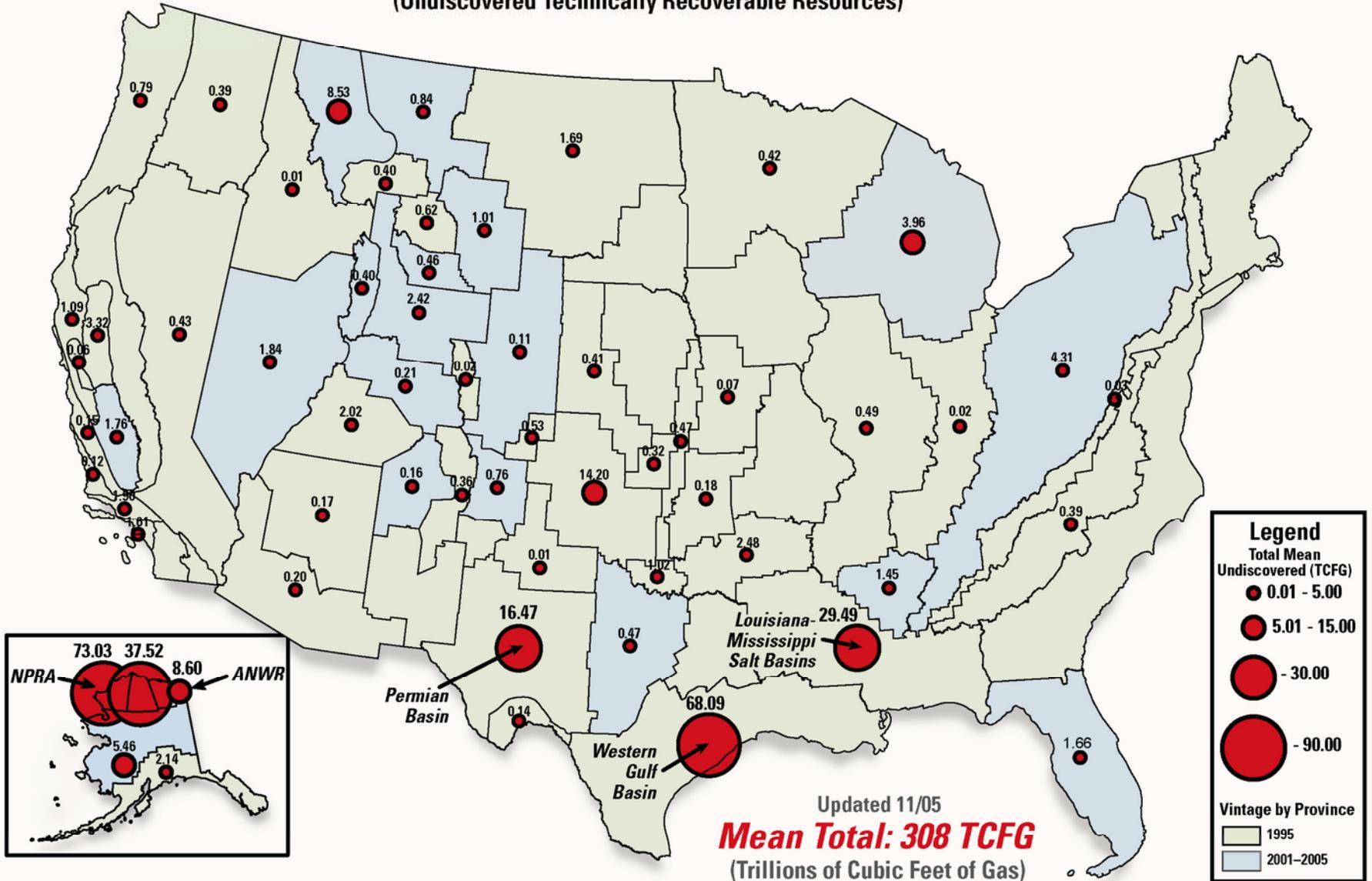
Mean Conventional Oil Resources (Undiscovered Technically Recoverable Resources)



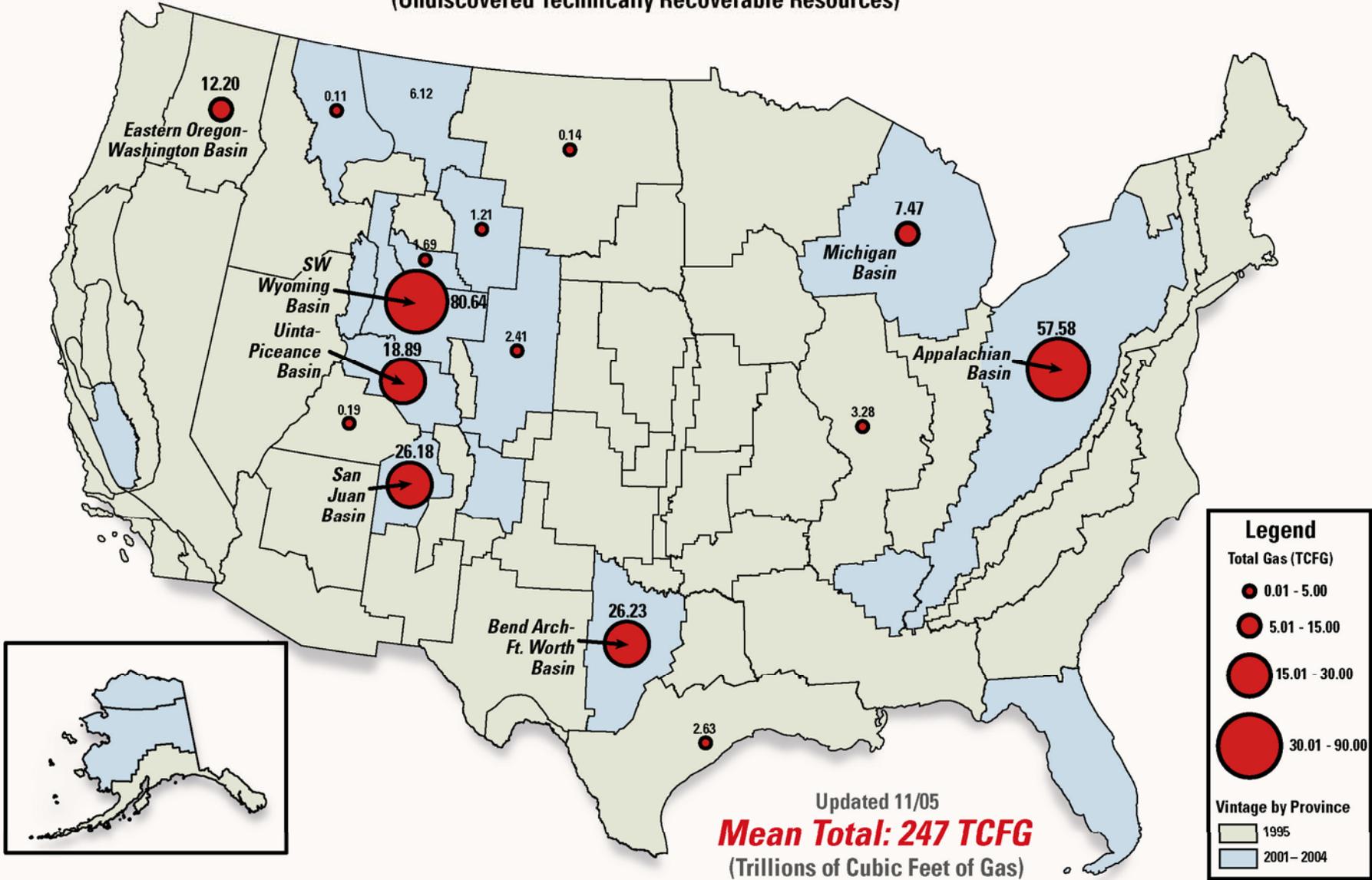
Mean Continuous Oil Resources (Undiscovered Technically Recoverable Resources)



Mean Undiscovered Conventional Gas Resources (Undiscovered Technically Recoverable Resources)



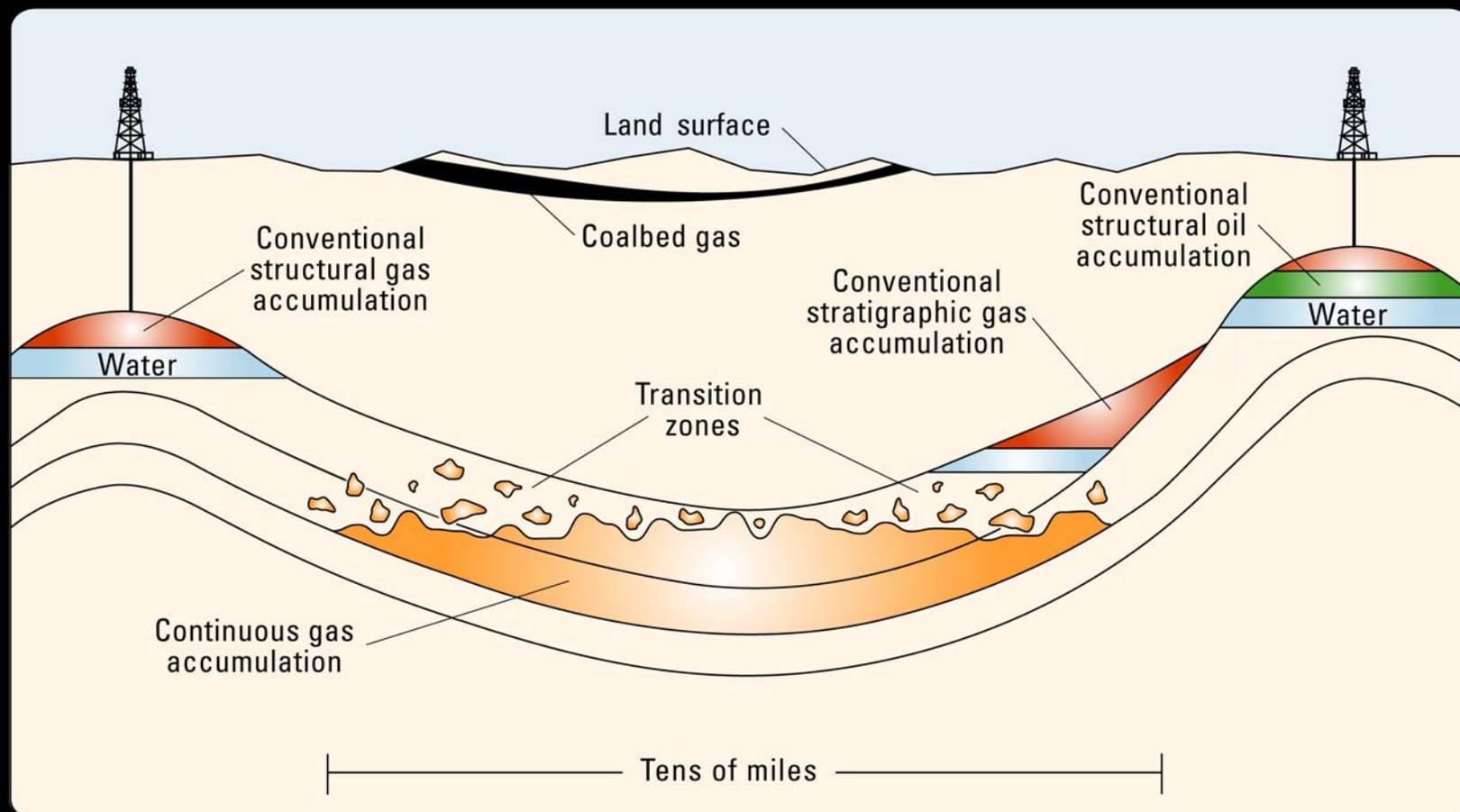
Mean Continuous Gas Resources (excluding coalbed methane)
(Undiscovered Technically Recoverable Resources)



Assessment Methodology

- **Conventional resources**
- **Continuous resources (tight gas sands, gas shales, coalbed gas, continuous oil)**
- **Quantify geologic uncertainty**

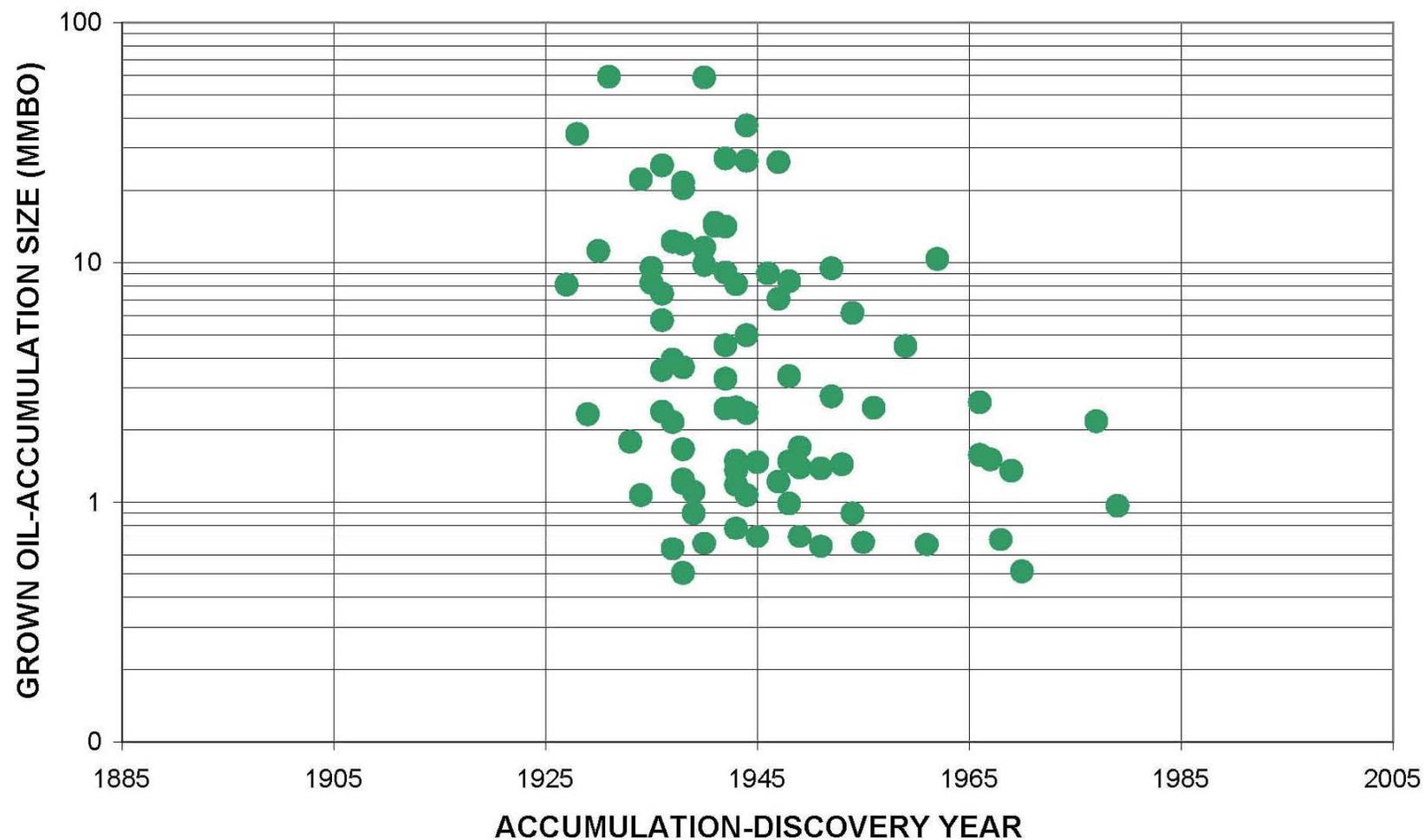
Conventional vs. Continuous Resources



Conventional Methodology

- **Sizes and numbers of undiscovered fields**
- **Geologic analysis focuses upon new reservoirs and new concepts**

Middle Devonian Carbonates, Assessment Unit 50630304



Continuous Methodology

- **Geology**
- **Engineering (Well-production performance; drainage areas)**
- **Every quantity is uncertain**

Continuous Methodology-(continued)

- **Geologic definition of assessment units**
- **Drainage areas of wells (cell sizes)**
- **Well production and performance**
- **EUR distribution**

Step 1. Geologic Definition of Assessment Unit

MINIMUM
50,000 Acres

MAXIMUM
75,000 Acres

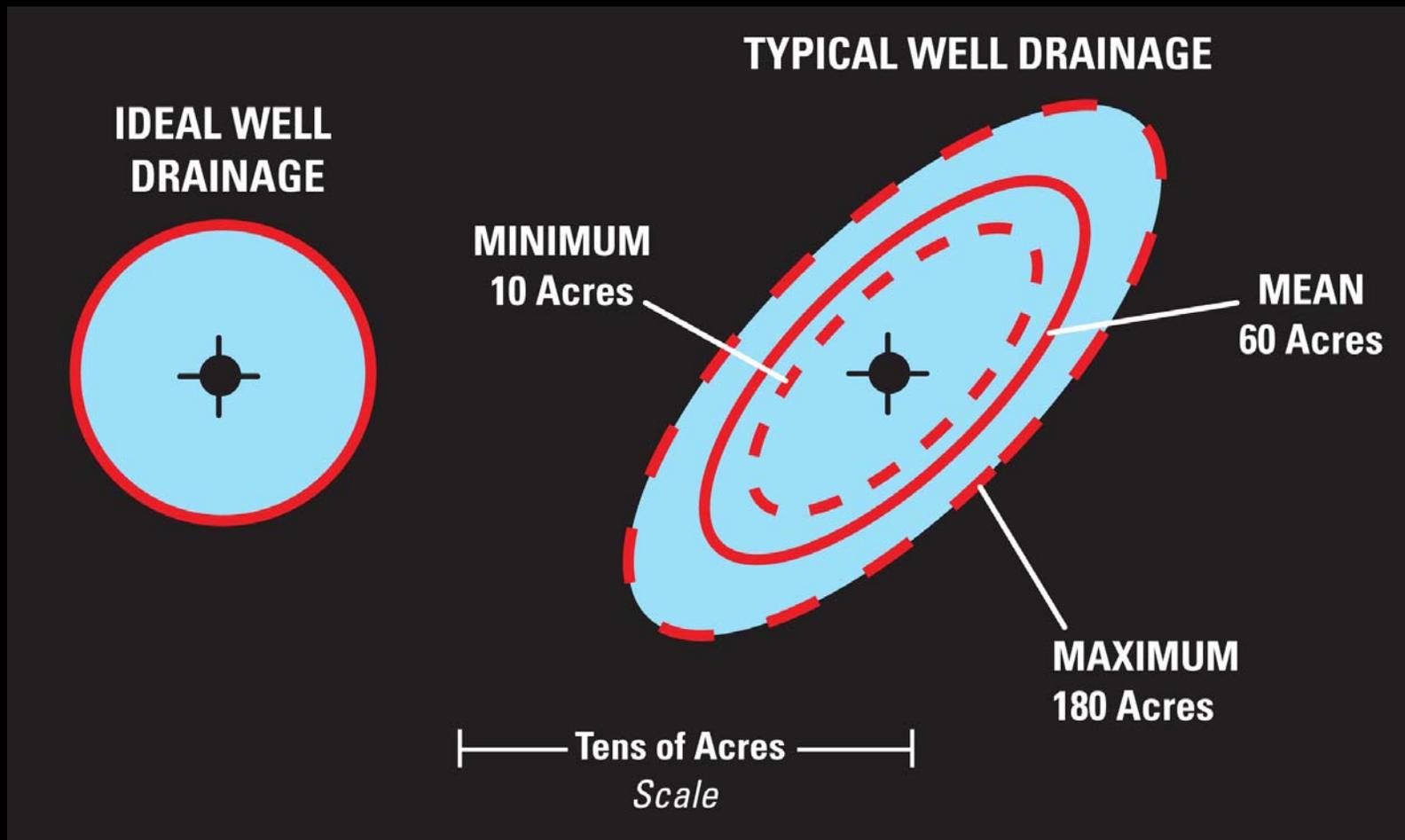
MEAN
60,000 Acres

— Tens of Miles —

Continuous Assessment Units

- May be divided based upon reservoir performance
- “Production sweet spots” – EUR distribution
- Outside of sweet spots – EUR distribution

Step 2. Drainage area estimation



Drainage Area Estimation

- Reservoir and fluid properties
- Fracturing and other stimulation techniques
- Technology of vertical vs. horizontal wells
- Single vs. multiple horizontal wells

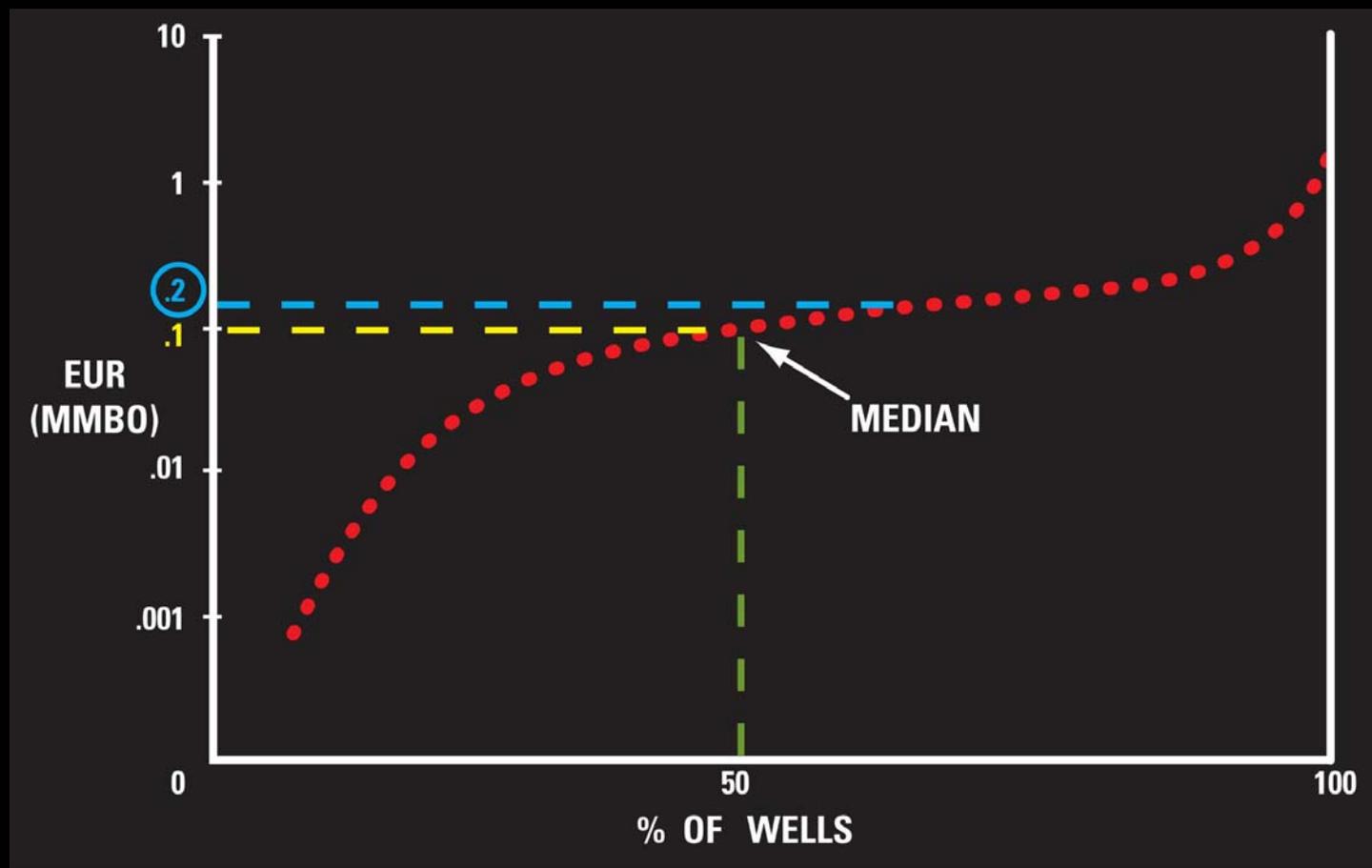
Step 3: Numbers of potential cells (mean)

- 60,000 acres (mean)
- 60 acres per cell (mean)
- $60,000 \text{ acres} / 60 \text{ acres per cell} = 1,000$ potential cells (mean)

Step 4: EUR distribution

- **EUR: estimated ultimate recovery per cell based on production data from wells within the assessment unit**

Step 4. EUR Distribution (Hypothetical)



EUR Distribution

- Using all available production data
- Integrates today's technology
- Used as a guide

Step 5: Calculation of Resources (Mean)

- 1,000 potential cells (mean)
- 200,000 barrels per cell (mean)
- $1,000 \times 200,000 = 200,000,000$, barrels
- Range: 50,000,000 – 500,000,000 barrels
(encompasses geologic uncertainty)

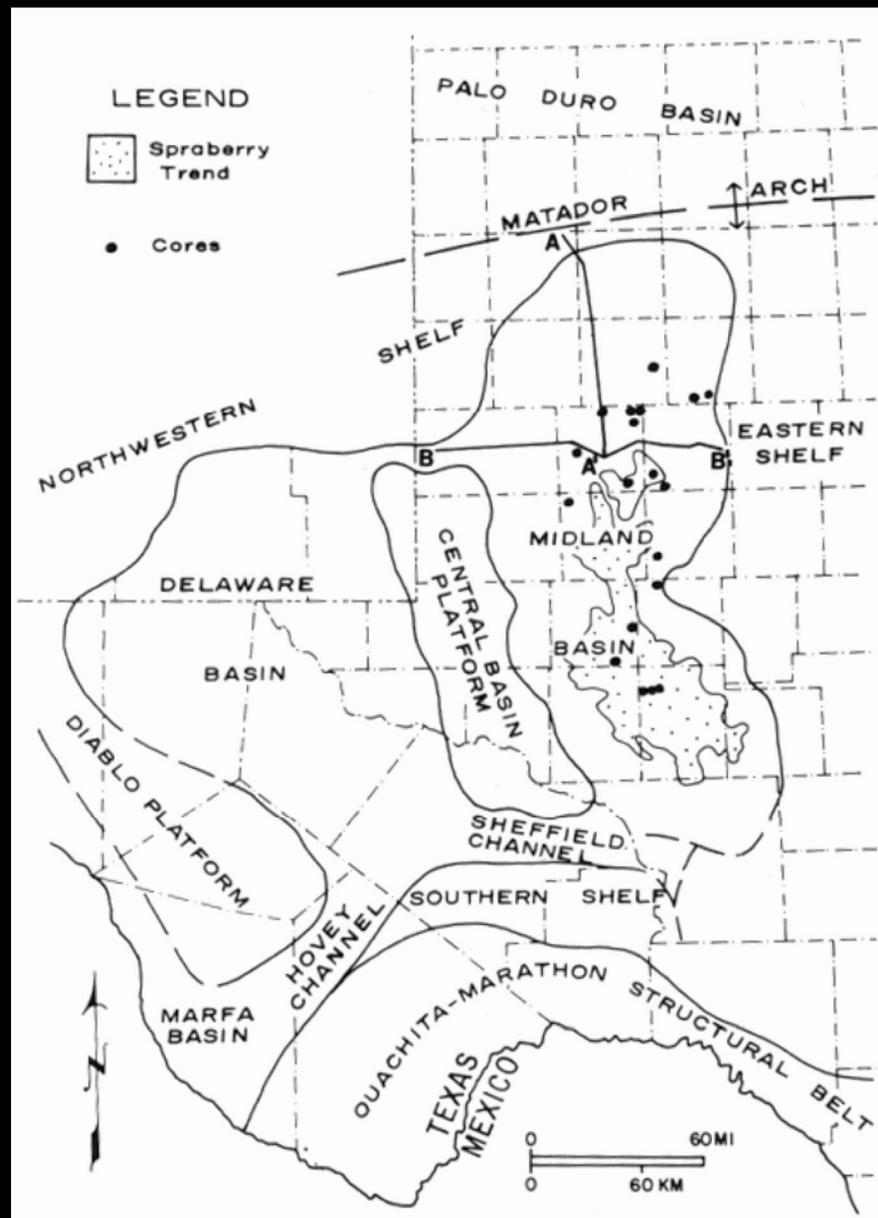
Continuous Assessment

- **Assessment based on geology, real production data, and petrophysical data**

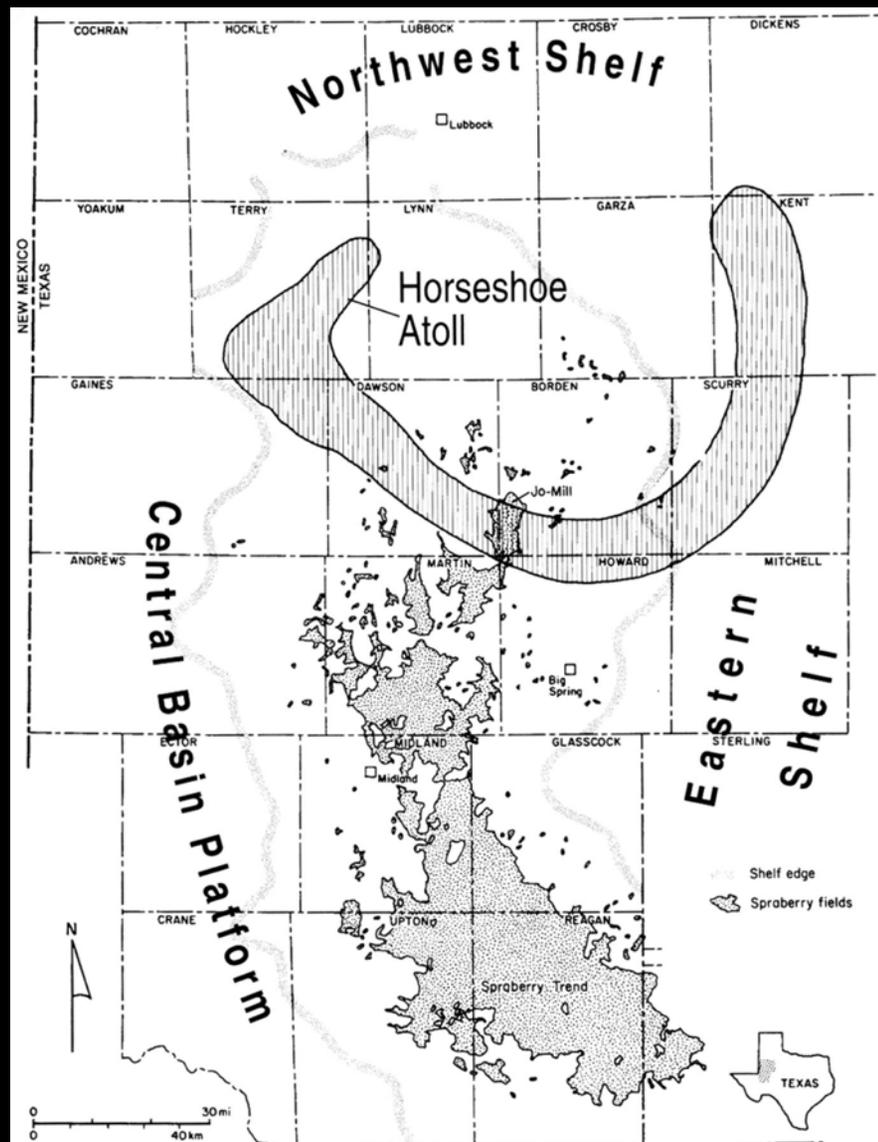
Spraberry Trend, West Texas

- Discovered in 1948
- “Largest uneconomic oil field in U.S.”
- 1954 – Began waterflooding
- Recoveries are extremely low
- Water breakthrough along fractures
- Patchy distribution of oil saturation
- 56 years of production
- ~ 1.3 BBO (cum. production + reserves)
- 20,000 to 30,000 wells

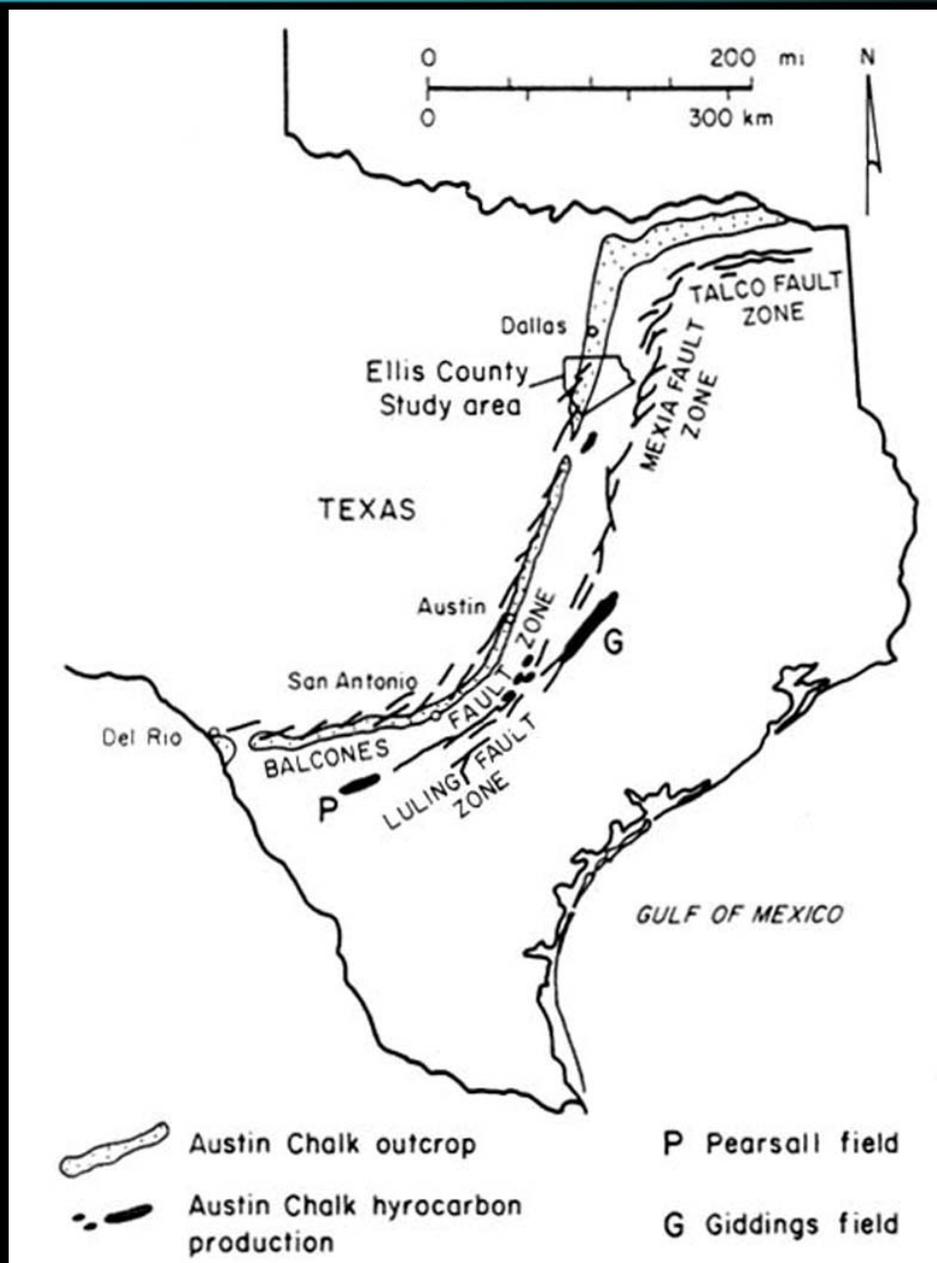
Midland Basin – Spraberry Fm.



Spraberry Production



Austin Chalk Trend, Texas



Austin Chalk Trend, Texas

- **“Discovered” in 1970’s**
- **Trend crosses the state of Texas**
- **Fractured chalk**
- **Horizontal well technology**
- **~ 650 MMBO (cum. production + reserves)**
- **Geologic sweet spots**
- **1995 - ~ 1 BBO recoverable**

Uinta-Piceance Basin

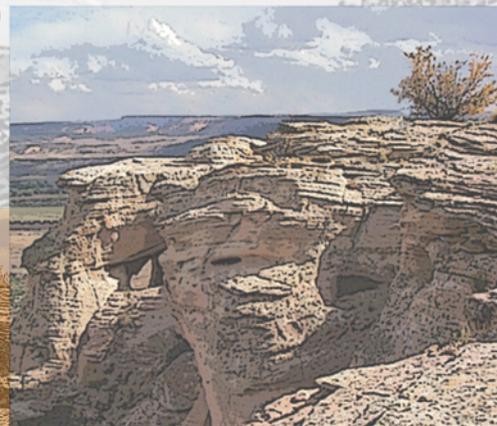
- 28-chapter CD
- Focus on continuous
- Federal lands



National Assessment of Oil and Gas Project:

Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta-Piceance Province, Utah and Colorado

*Compiled by USGS Uinta-Piceance
Assessment Team*

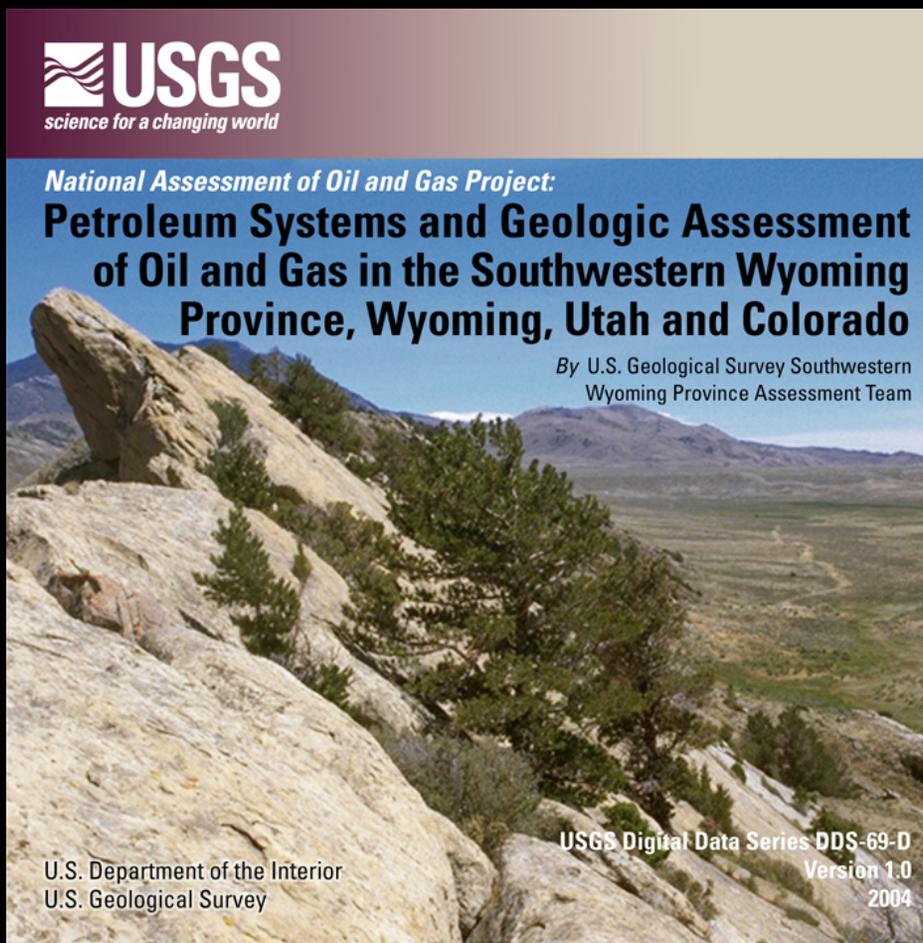


U.S. Department of the Interior
U.S. Geological Survey

USGS Digital Data Series DDS-69-B
Version 1.0
2003

Southwestern Wyoming Province

- 30-chapter CD-ROM
- “Persian Gulf” of gas; 85 TCFG
- Focal point of drilling restriction analysis by EPCA
- Tight gas sands



Summary

- **Project overview**
- **Methodology**
- **Geologically based assessments on schedule**
- **Assessments given to BLM for EPCA**
- **Technically recoverable only**
- energy.cr.usgs.gov/oilgas/noga