

# Coalbed Methane in Kansas

Presented to:

Senate Utilities Committee

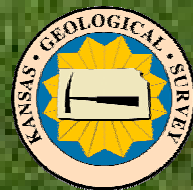
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The Chanute Publishing Co, 07/10/2002



# Outline

- **Background on the Natural Gas Markets**
- **Background on Coalbed Methane (CBM)**
- **Overview of Kansas CBM Activity**
  - Role of Geological Survey
- **Impact on Kansas**
  - Economy
- **Potential Issues**
  - Supply Problems
  - Severed Minerals vs. Surface
  - Enhanced Coalbed Methane Recovery
  - Carbon Sequestration



# Kansas Profile

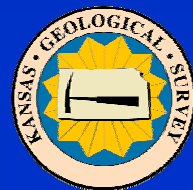
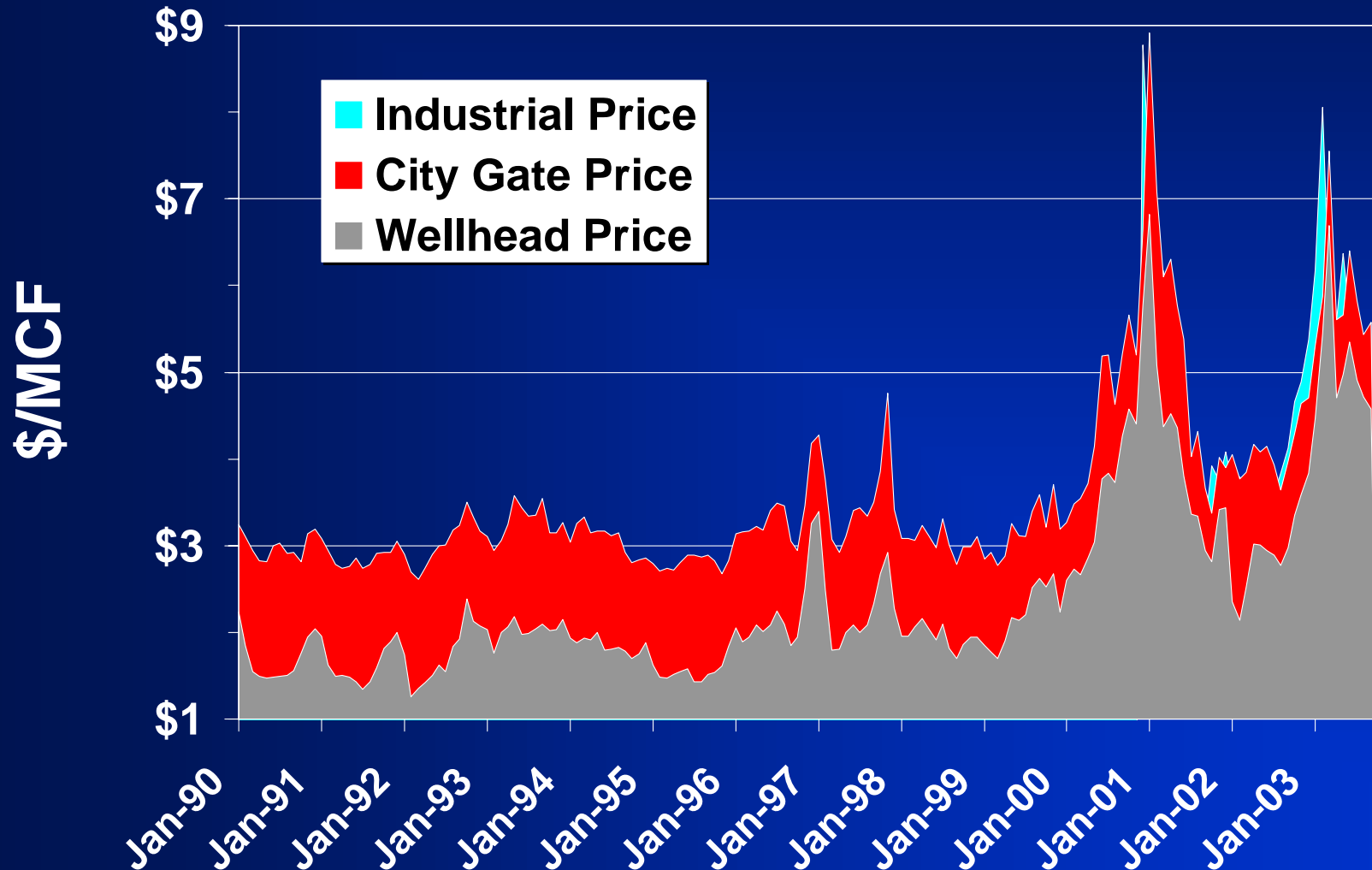
**Kansas national population and energy use rankings:**

- ***Population – 32<sup>th</sup> (2002)***
- ***Total per capita energy – 18<sup>th</sup> (2000)***
- ***Natural Gas Consumption (2002)***
  - ***Residential – 71,002 MMcf***
  - ***Commercial – 38,812 MMcf***
  - ***Industrial – 105,400\****
  - ***Electric Power – 23,126 MMcf***
- ***Natural Gas Production (2002) – 453,417 MMcf***

\*Estimated.

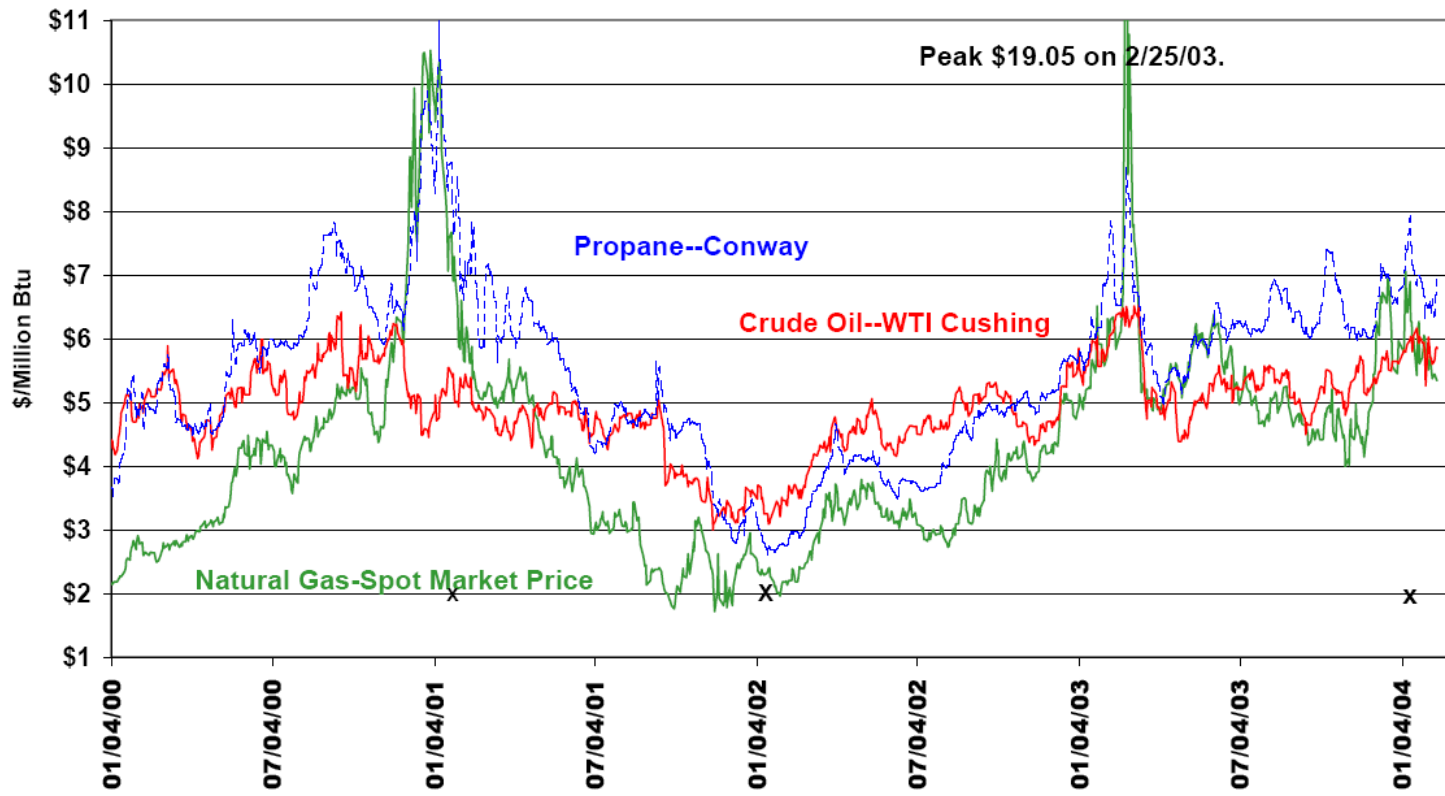


# Natural Gas Prices Continue to Be Volatile

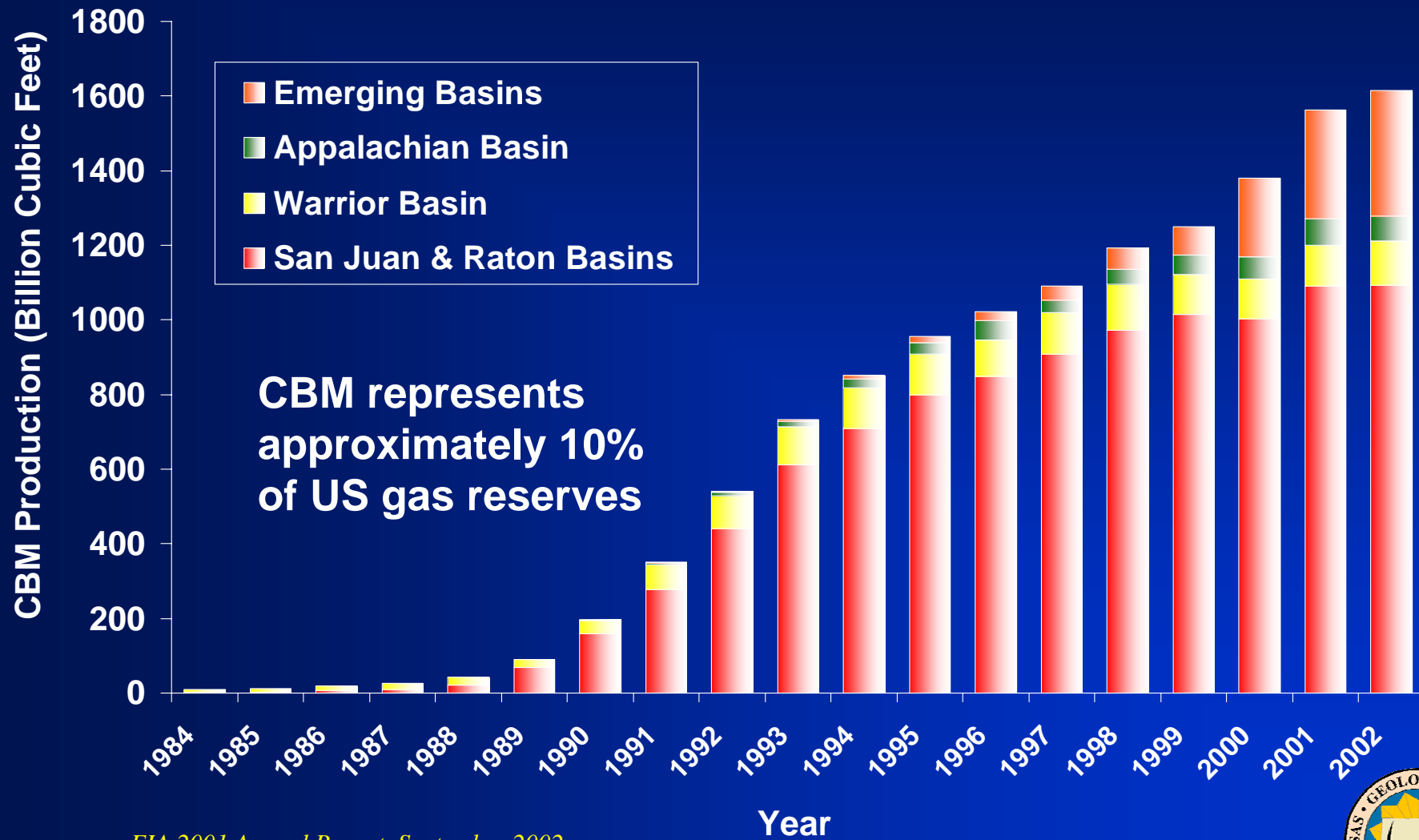


# Recent Energy Prices

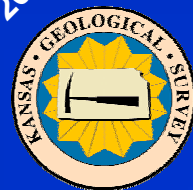
Natural Gas Prices-Henry Hub Spot Market Price  
Crude Oil--WTI Cushing  
Propane--Conway, Kansas



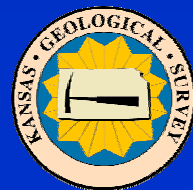
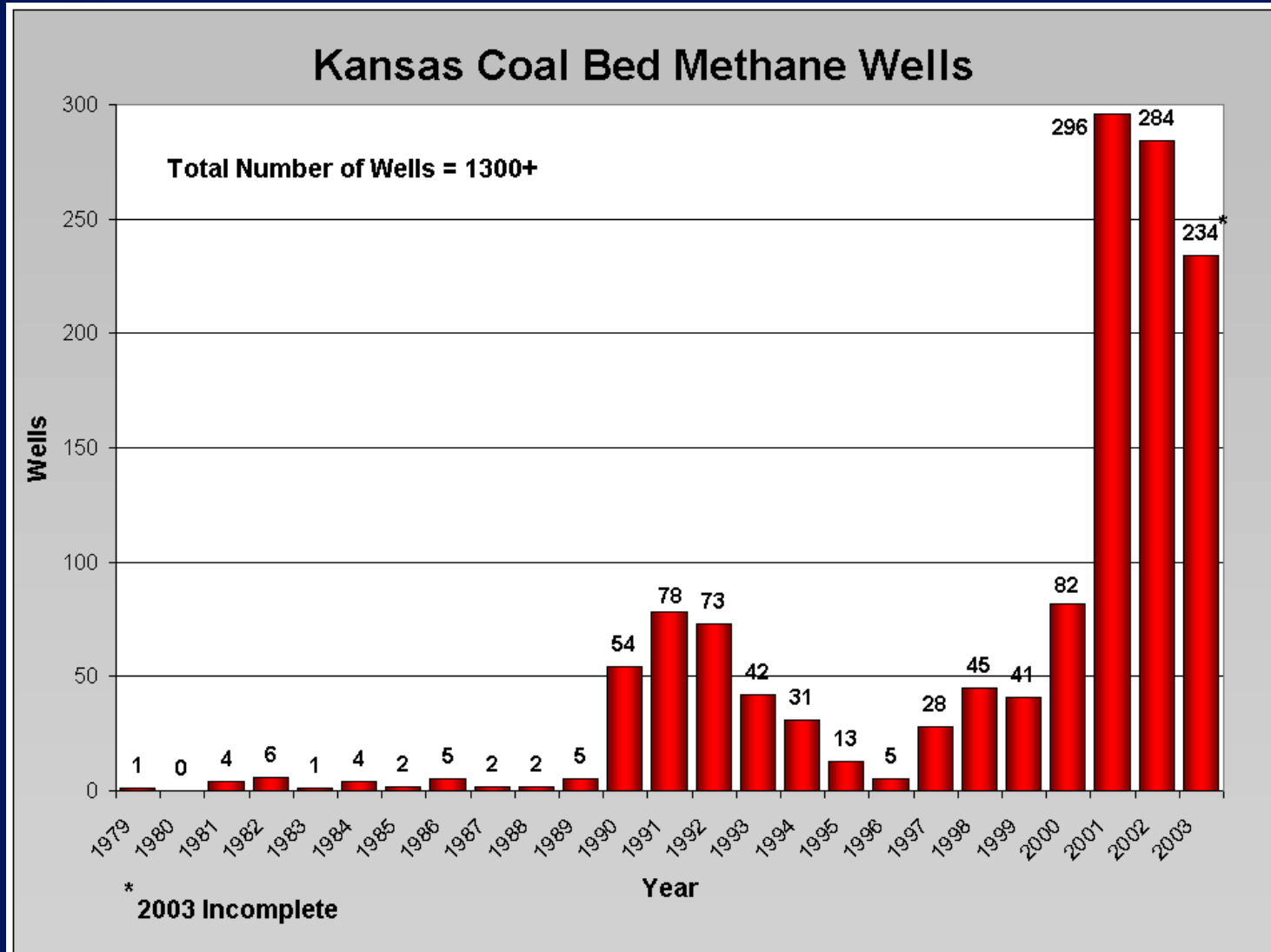
# Coalbed Methane Production from U.S. Basins



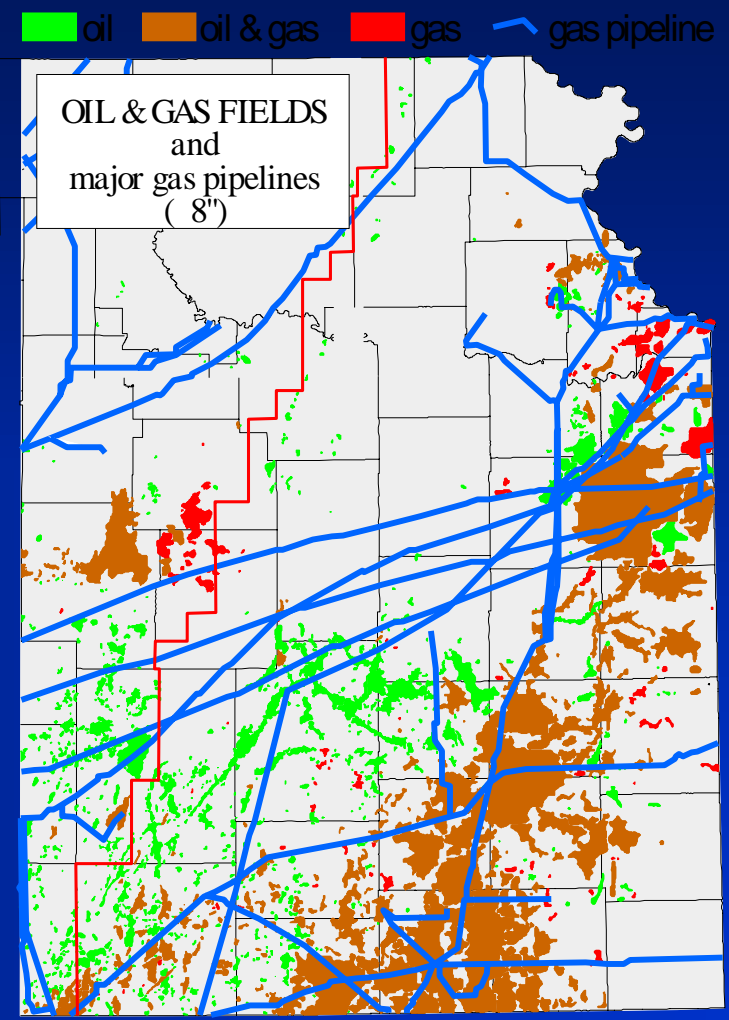
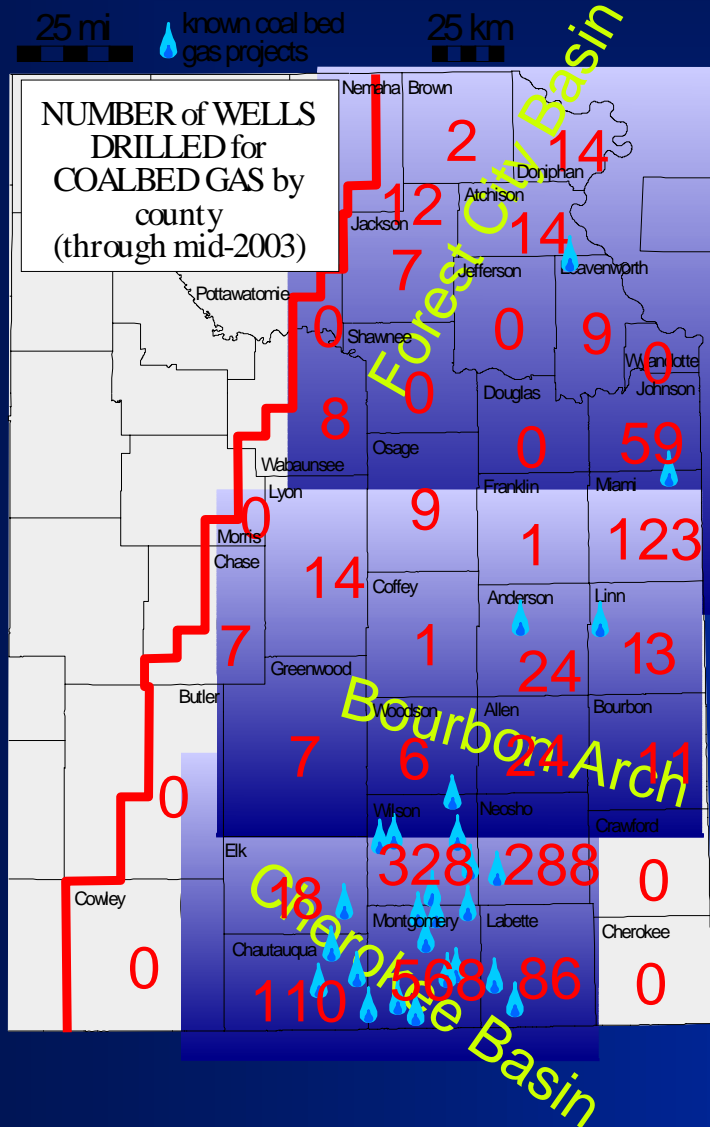
EIA 2001 Annual Report, September 2002  
 U.S. Crude Oil, Natural Gas, and Natural Gas Liquids



# Coalbed Methane Activity

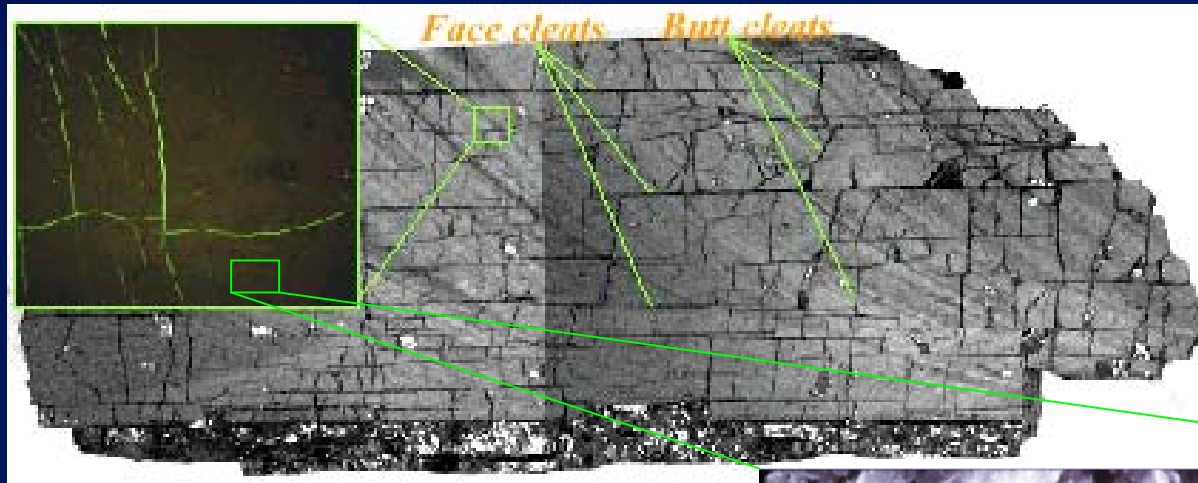


# Kansas Coalbed Methane Activity



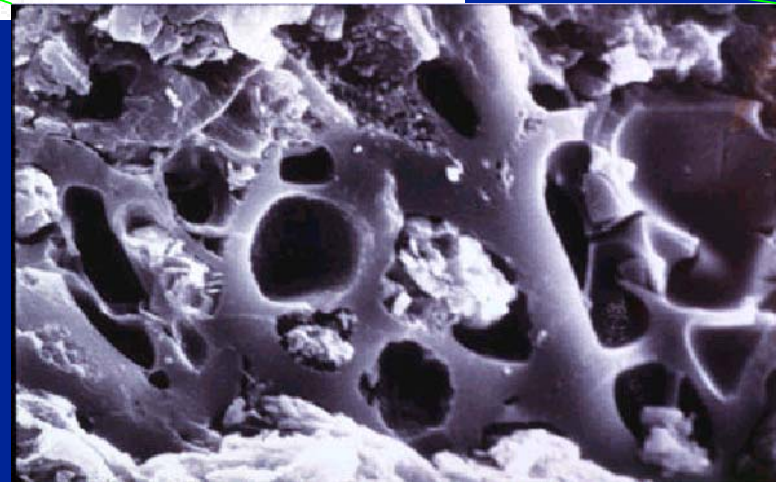


# Unconventional Reservoir

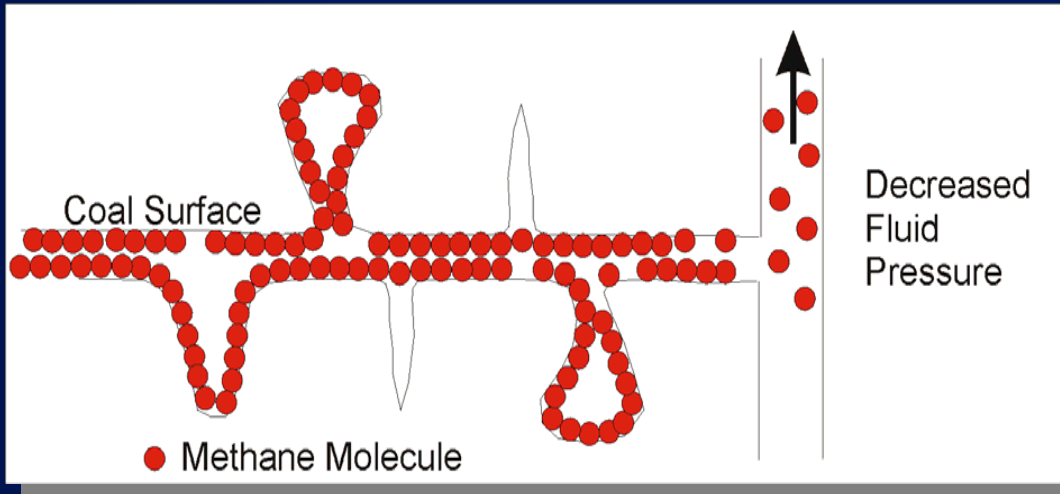


Fractured  
Reservoir

Micropores

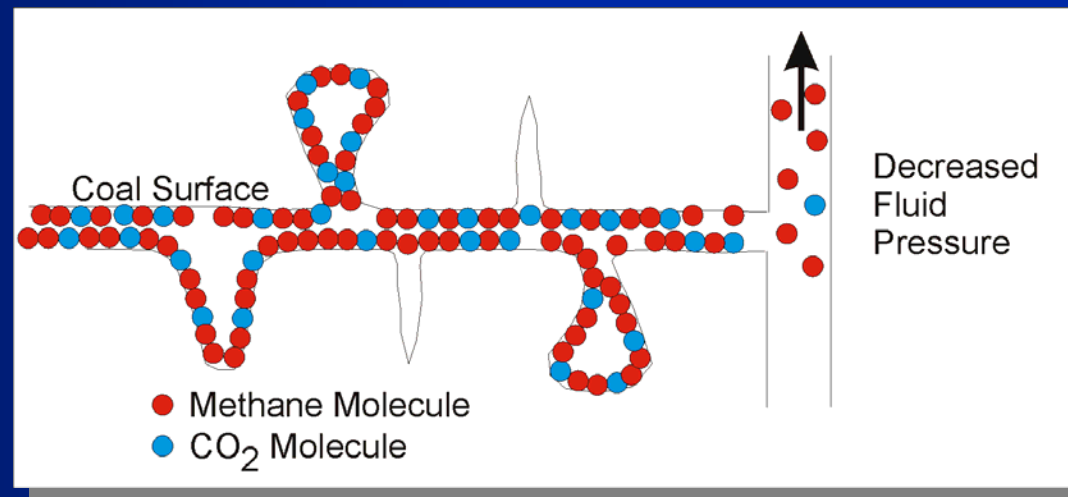


# Methane Production from Micropores

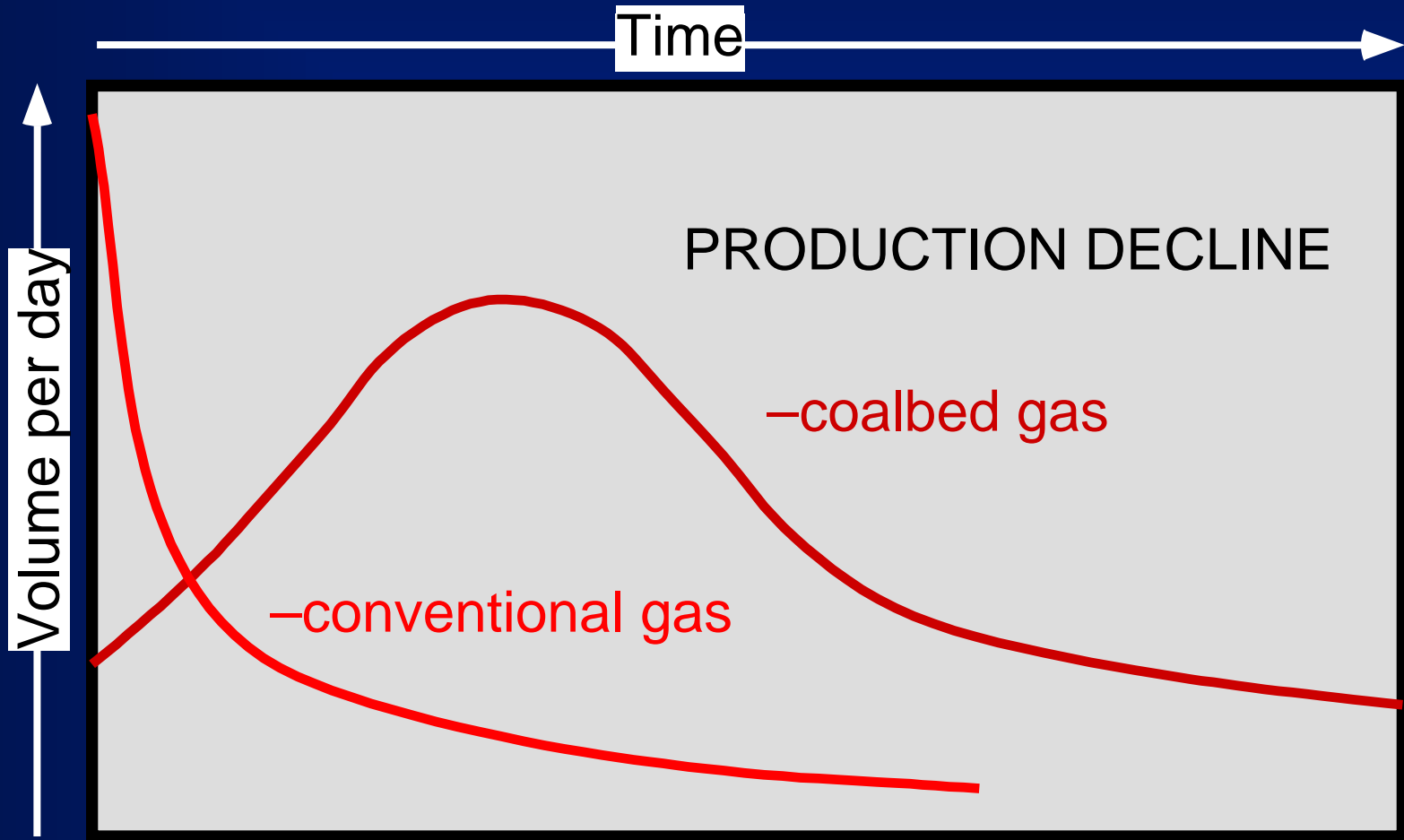


Desorption

Replacement



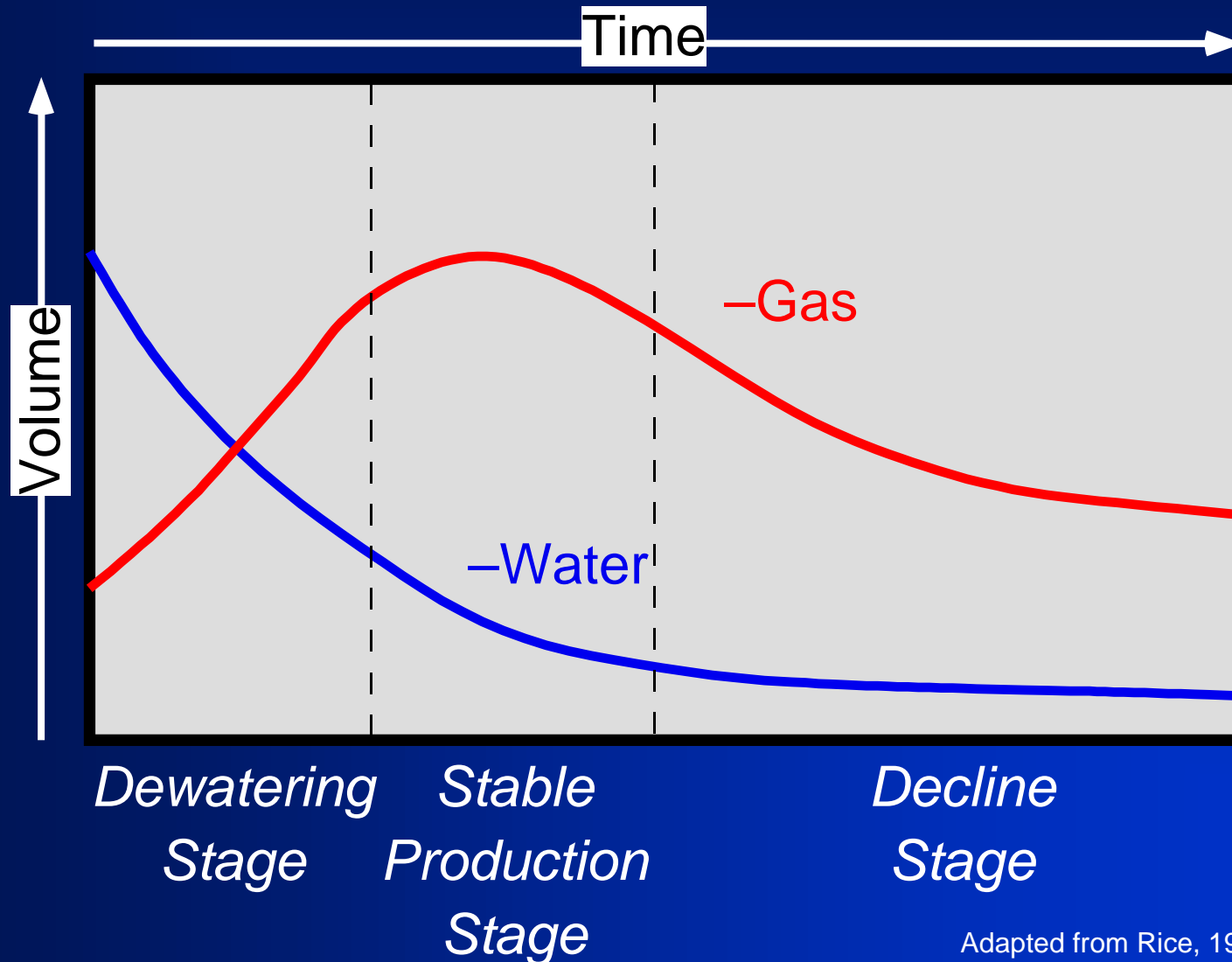
# Conventional Gas and Coal Bed Gas



Adapted from Rice, 1997



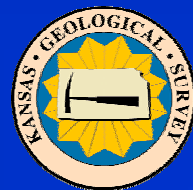
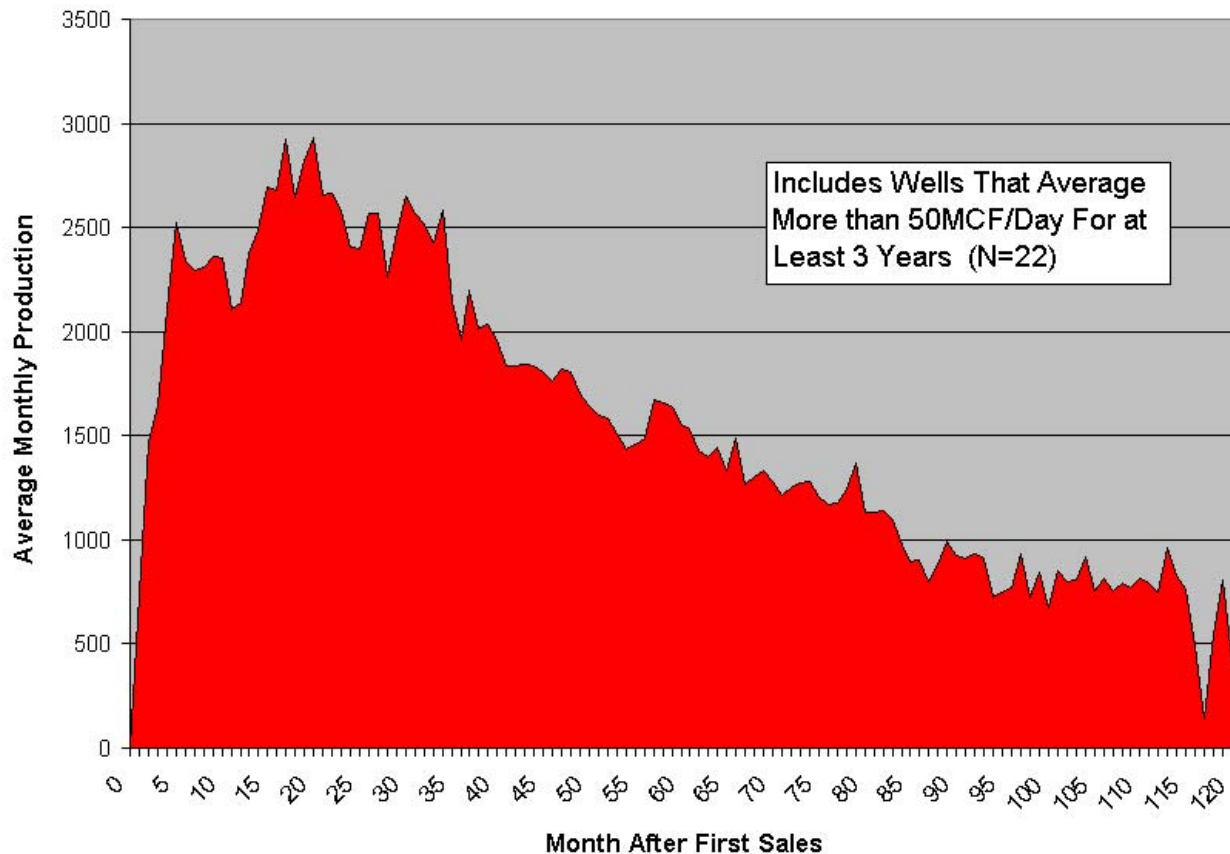
# Production Stages of a Coalbed Gas Well



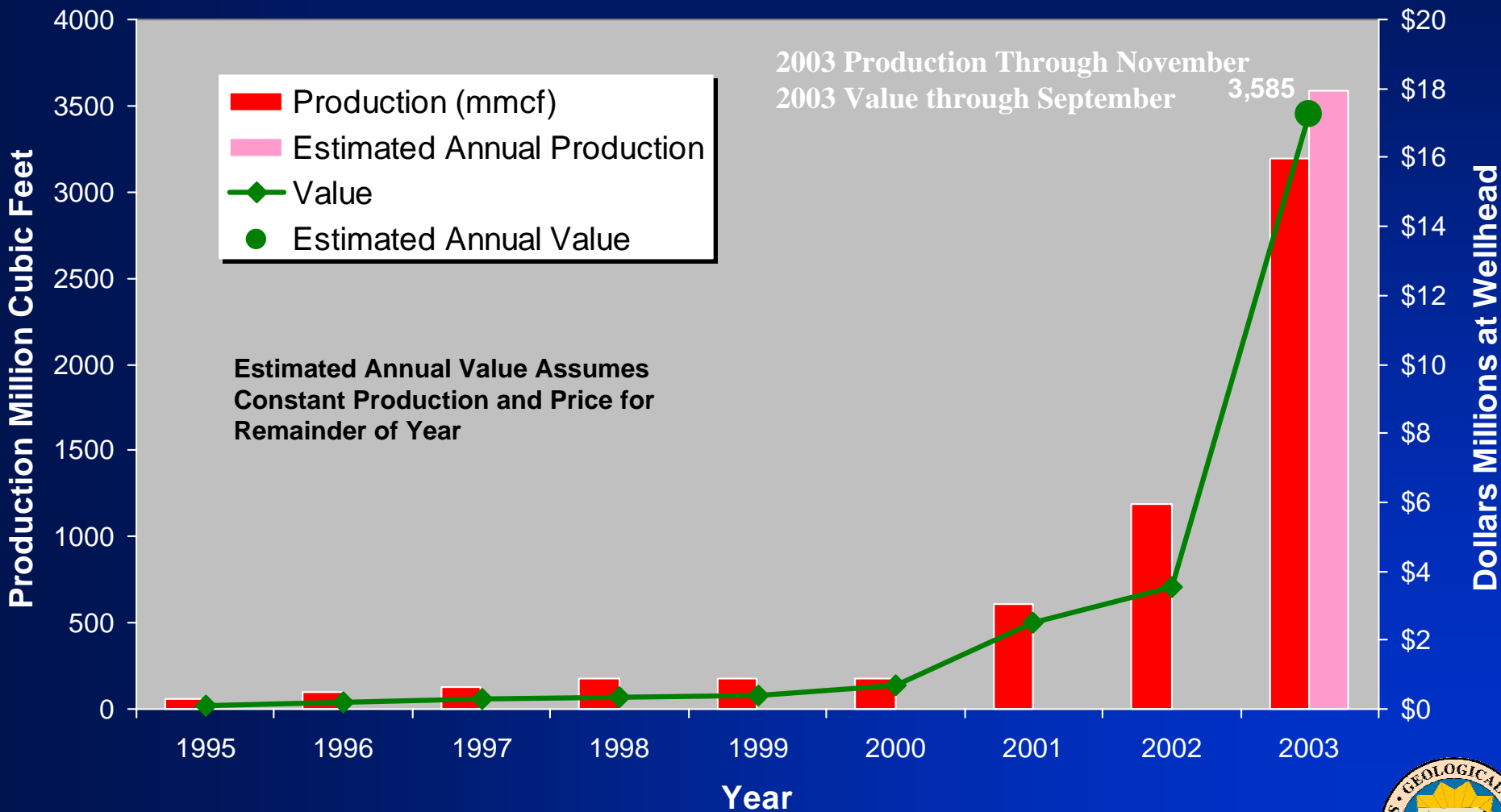
Adapted from Rice, 1997



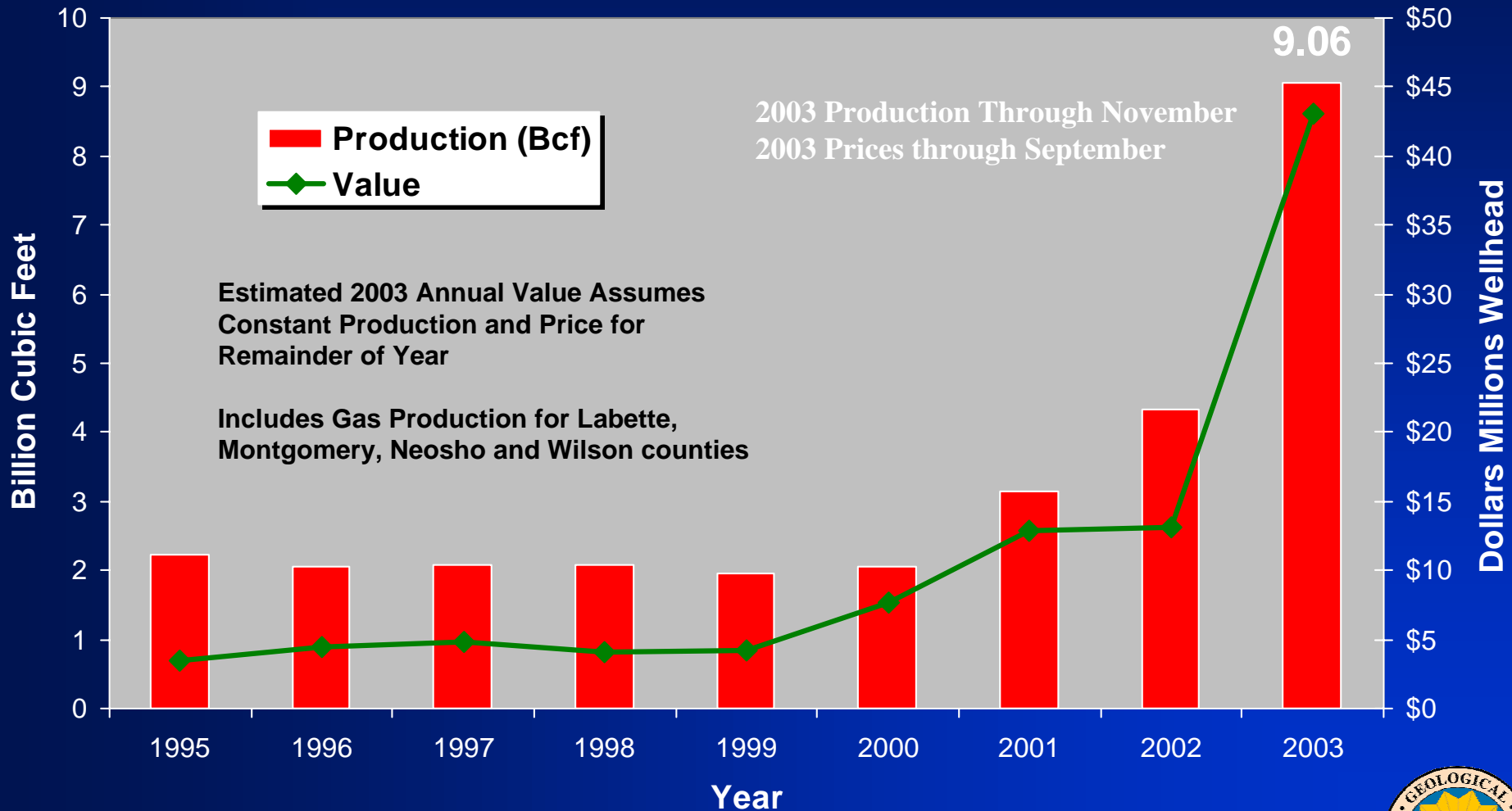
# Kansas Coalbed Methane Monthly Production



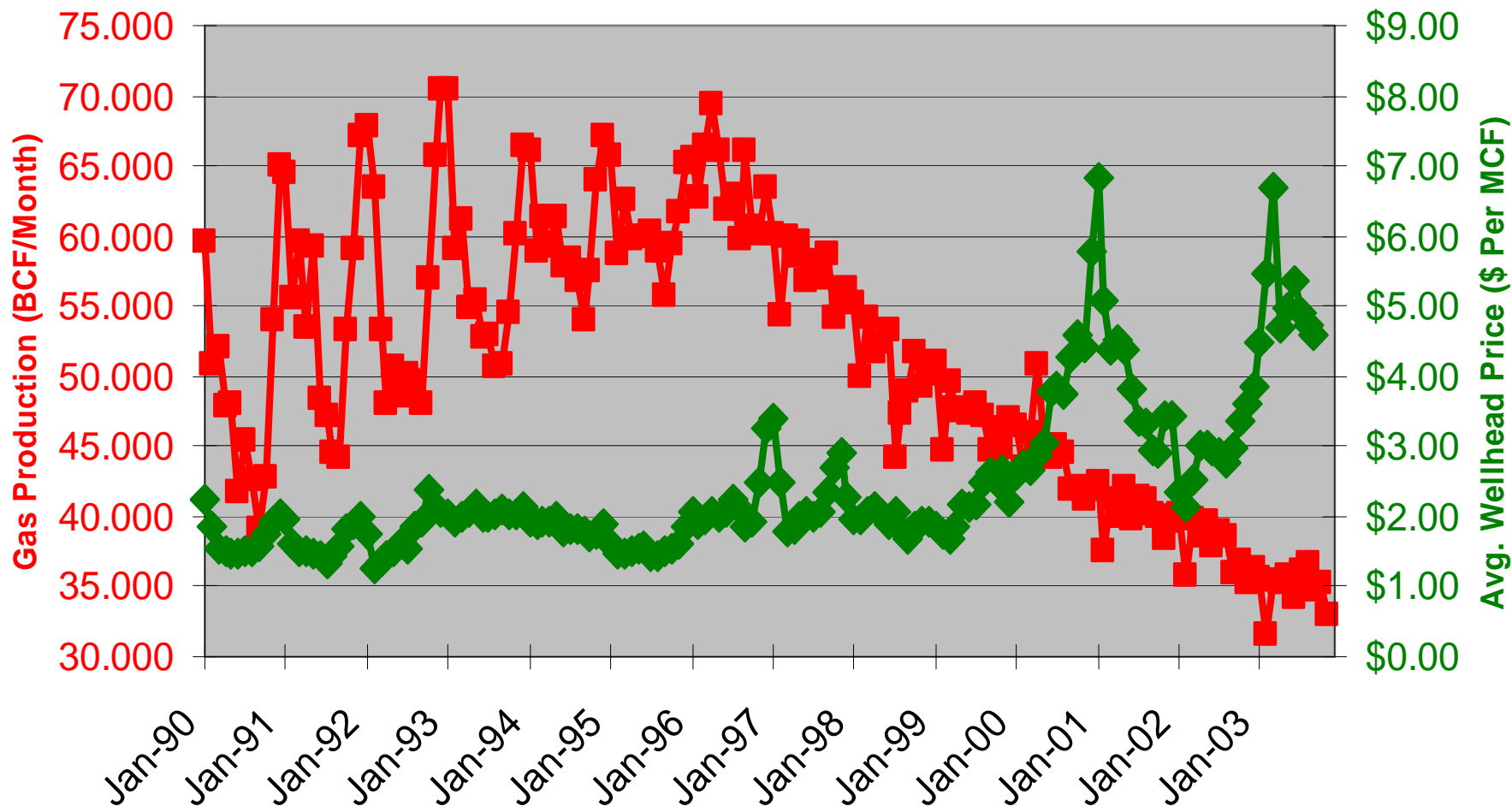
# Neosho County CBM Production



# SE Kansas CBM Production



# Kansas Gas Production

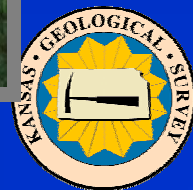
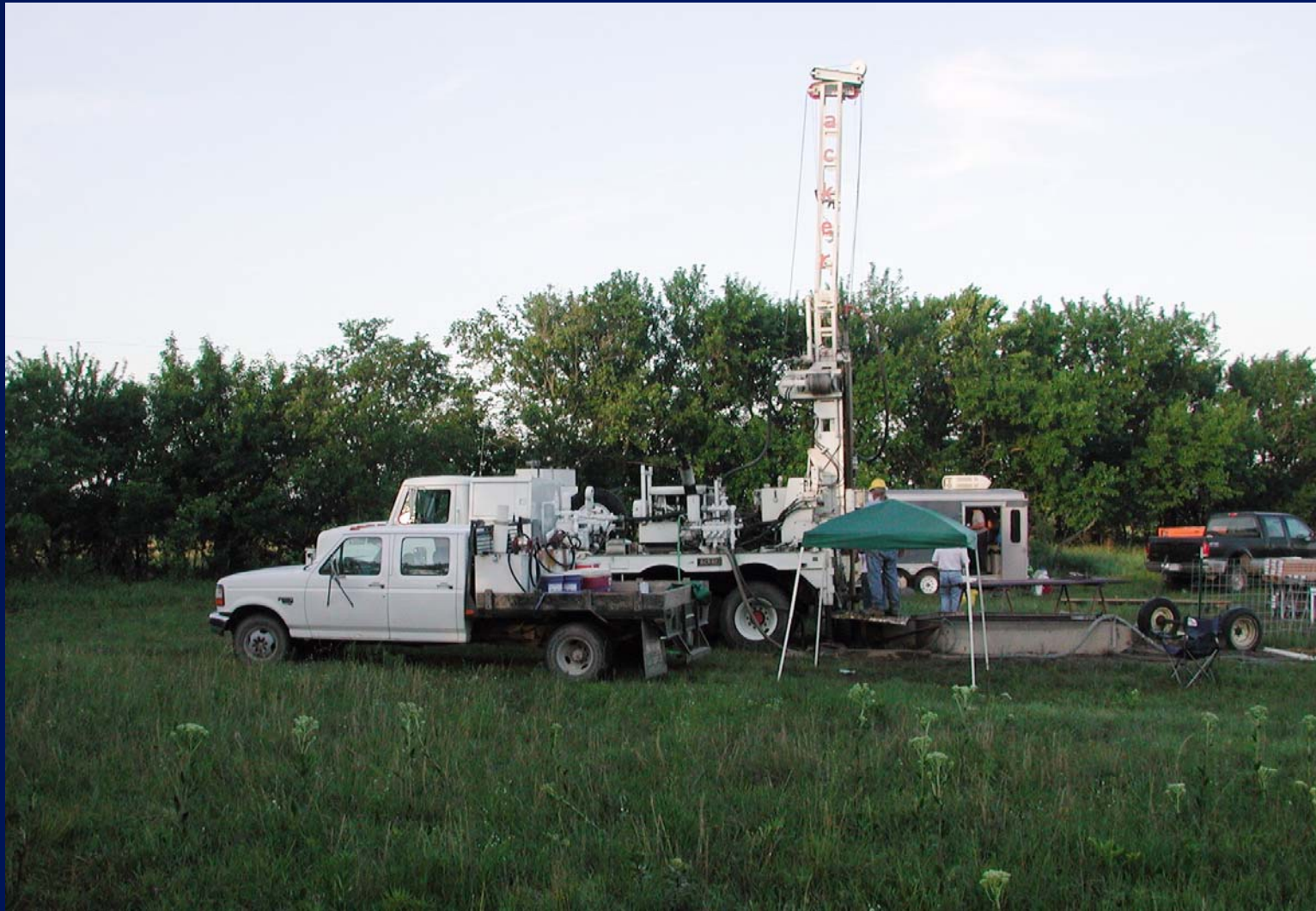


Production Through November 2003  
Wellhead Prices through September 2003





# Coalbed Methane Program



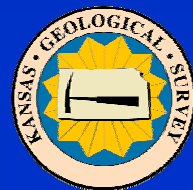
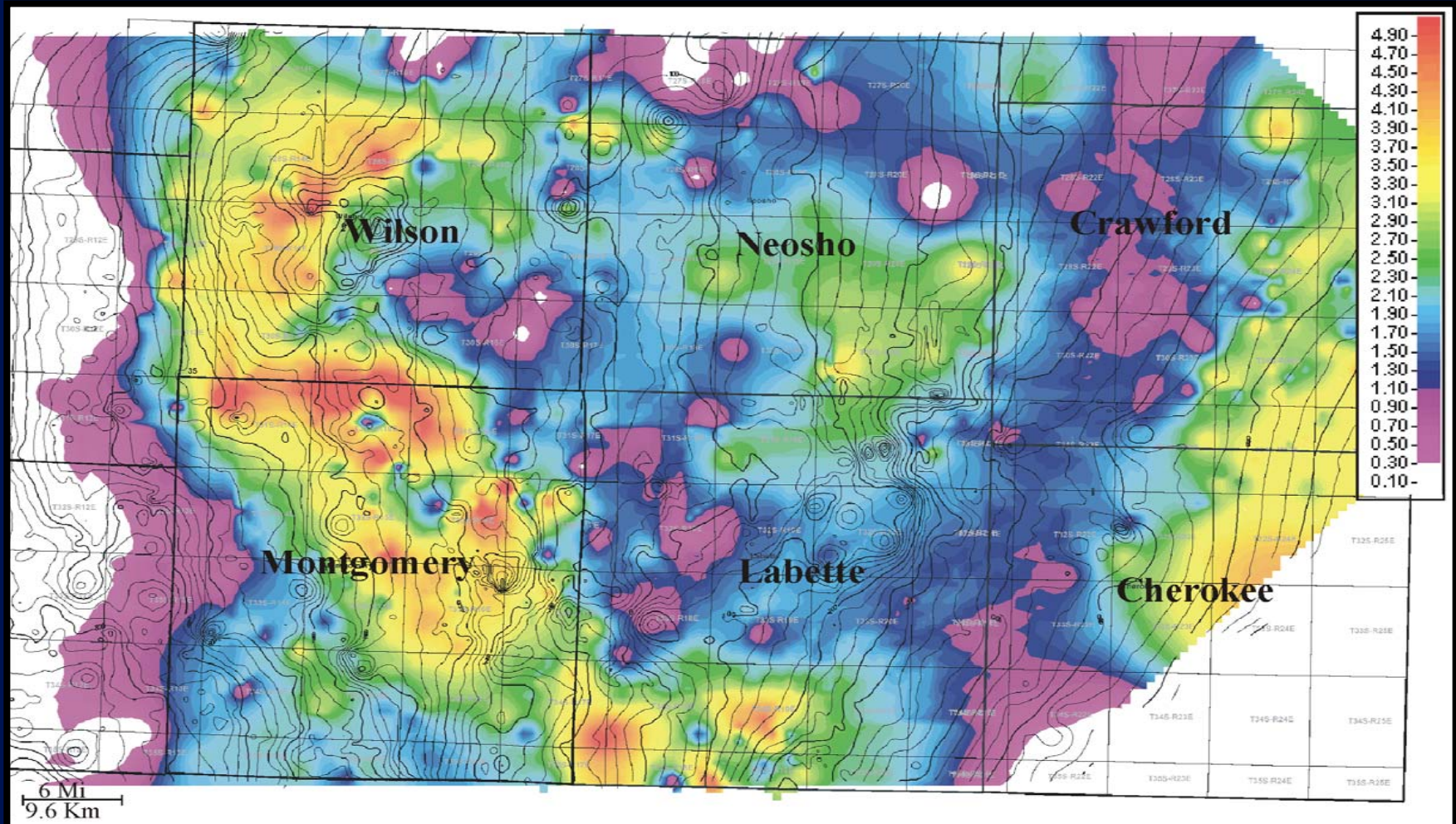
# Coalbed Methane Program



# Coalbed Methane Program

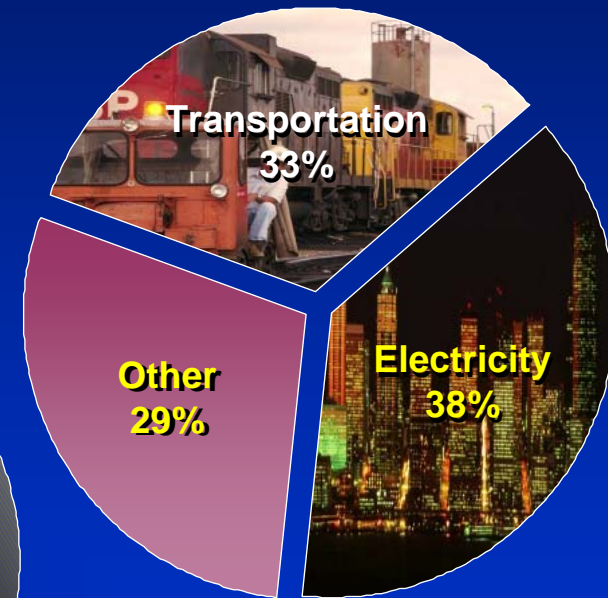
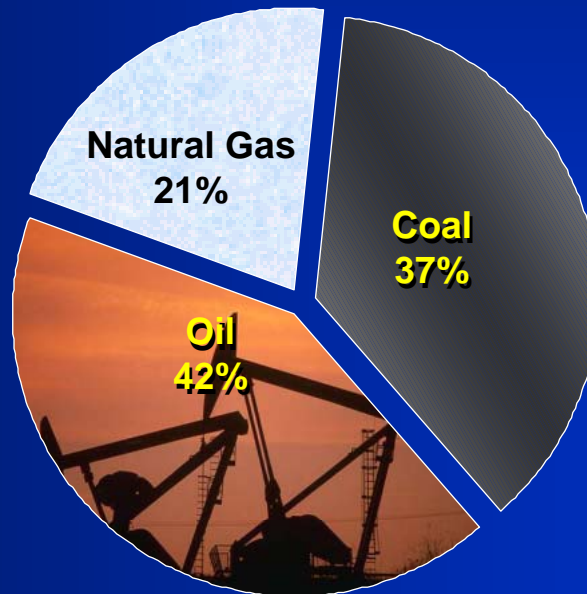
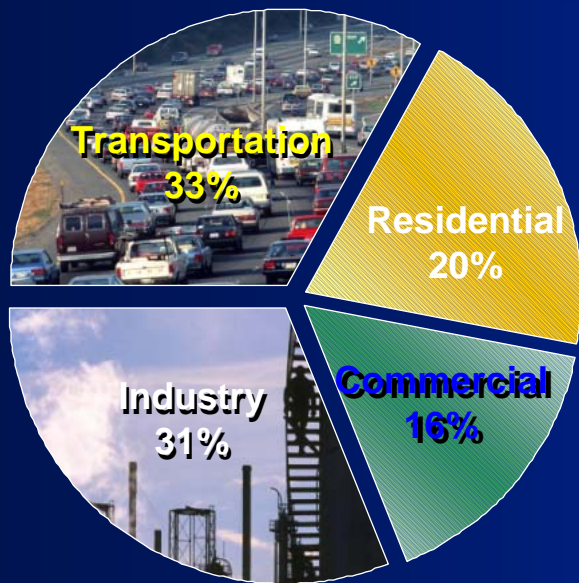


# Weir-Pitt Coal



# United States Carbon Dioxide Emissions

By Source & Sector)



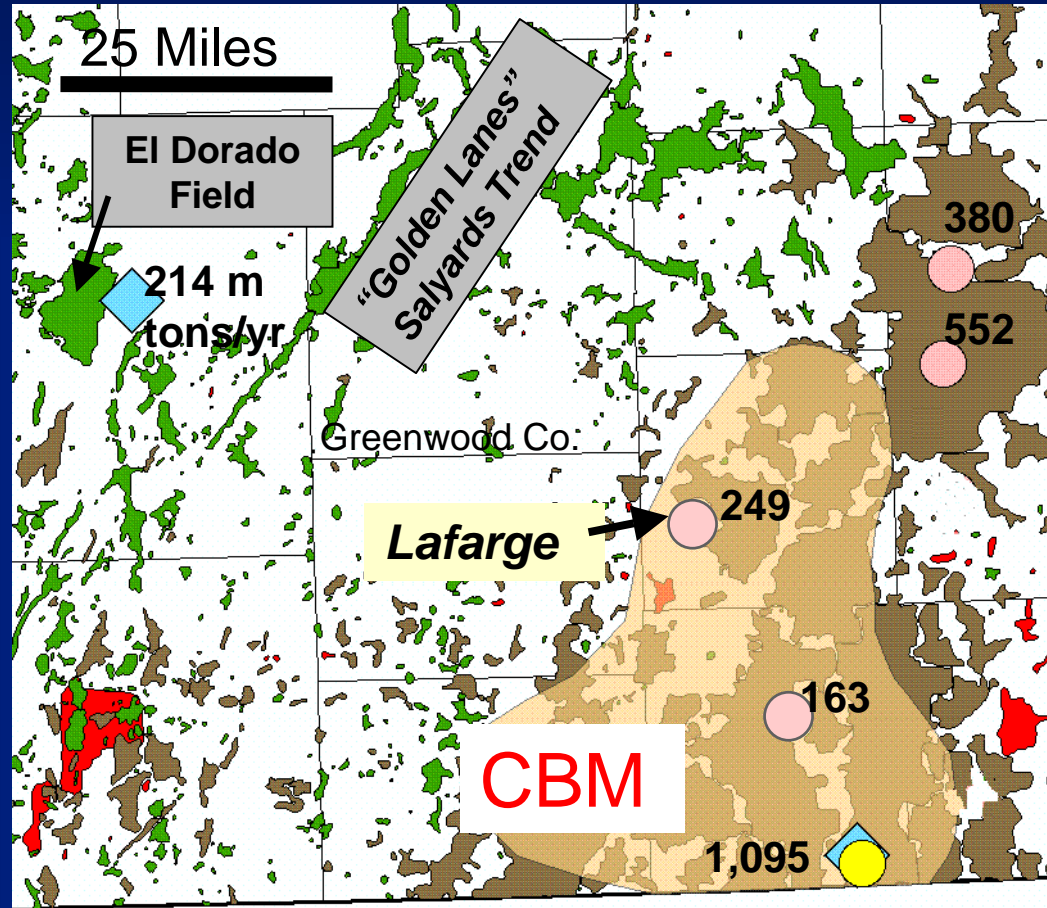
# Southeast Kansas

## Partially miscible and immiscible CO<sub>2</sub> EOR

- El Dorado
- Salyards Trend,

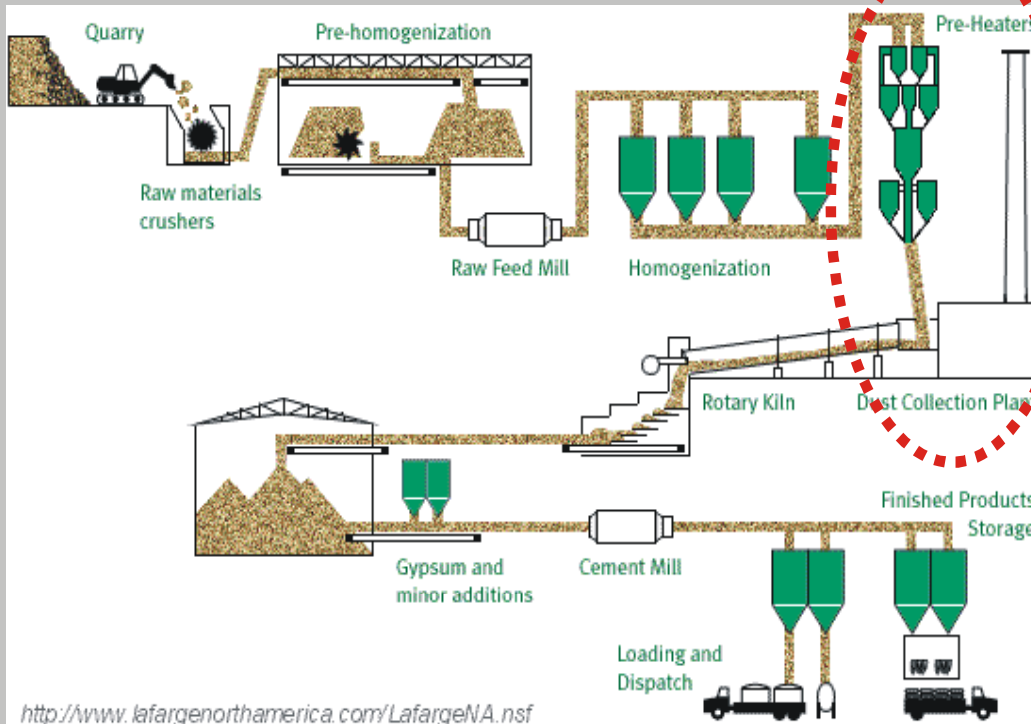
## Enhanced Coalbed Methane (N<sub>2</sub> and CO<sub>2</sub>)

Cement plant gas stream may be best suited for ECBM



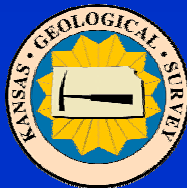
# Cement Production

## Dry Kiln Portland Cement Process

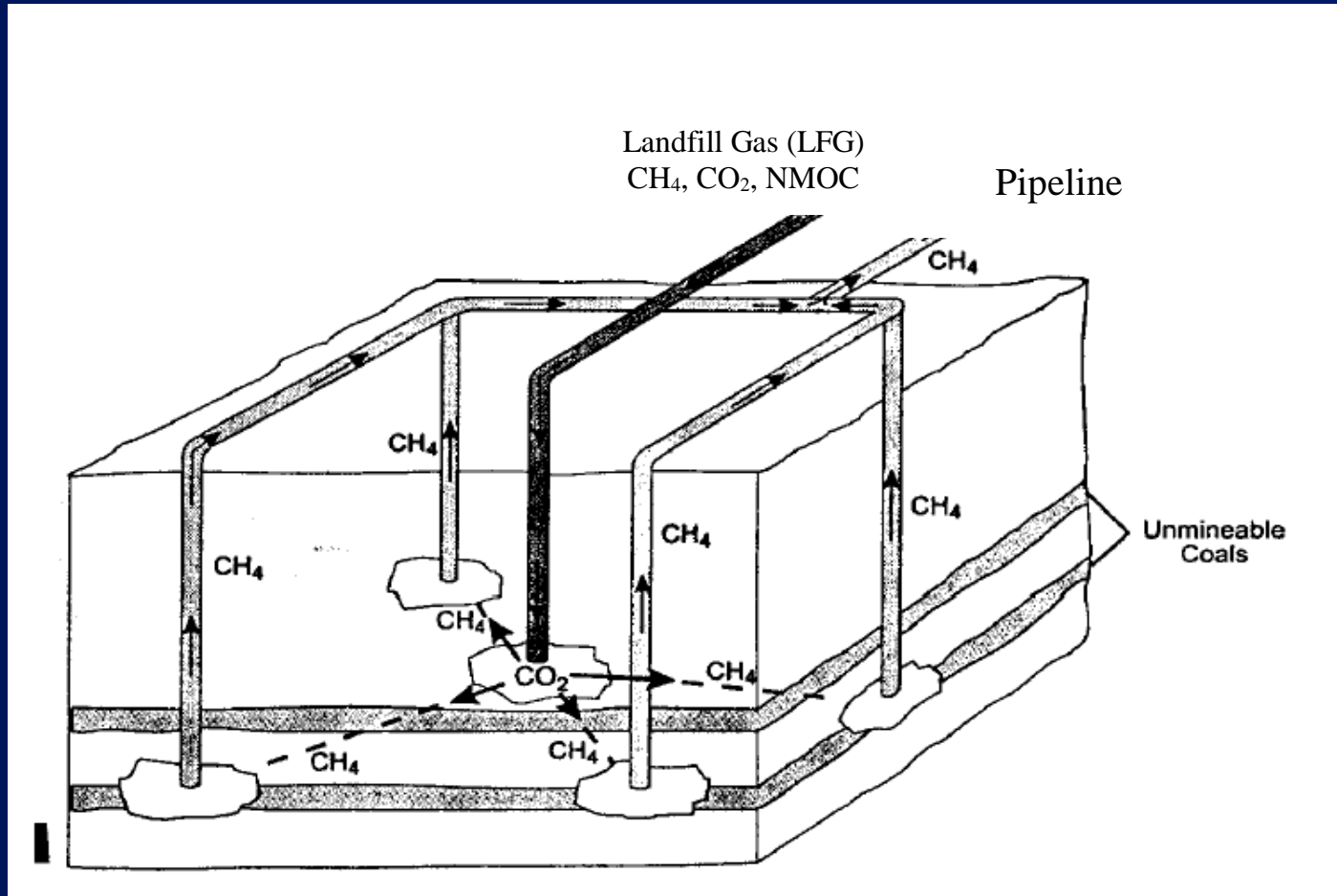


Calcination Process  
 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$   
0.51 tons  $\text{CO}_2$  / ton  
cement

$\text{CO}_2$  and  $\text{N}_2$  kiln gas  
mix may be suitable  
for ECBM with little  
processing



# Landfill Gas





# Kansas CBM Summary

- **Expect CBM Production Increase to Continue**
- **Continued Exploration Expected**
  - **Extent Dependent on Outcome of Pilots**
    - › Geological Survey Working to Provide Information
  - **Northward Spread**
  - **Significant Impact on SE Kansas Economy**
  - **Potential Significant Impact on Kansas Economy**
- **A Substantial Boost in US Supplies will take Time**
  - **US Market Controls Kansas Gas Price**
  - **Kansas is Vulnerable to Energy Price Spikes**

