

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT



Using GIS to Define Federal Oil and Gas Availability

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Presented to the Twenty-Seventh
Annual ESRI International User
Conference

San Diego, California

June 19, 2007



The EPCA Inventory

The background of the slide is a photograph of an oil pumpjack in a desert landscape. The pumpjack is a large, mechanical structure used for extracting oil from a well. It is situated in a flat, arid area with sparse, dry vegetation. The sky is clear and blue, and the overall scene is brightly lit, suggesting a sunny day. The pumpjack is the central focus of the background image, with its long, vertical beam and counterweight clearly visible.

- What is the EPCA Inventory?
- Phase II Inventory
 - Study Area Delineation
 - Spatial Data Needs
 - GIS Methodology
 - Results
 - Additional GIS Analytical Techniques
- Lessons Learned
- Conclusion

Legislative Mandate

Energy Policy and Conservation Act (EPCA) of
2000, Sec. 604

As amended by the Energy Policy Act of 2005,
Sec. 347

Requires Interior (lead delegated to BLM), to consult with Agriculture (USFS) and Energy, to conduct an **inventory of onshore Federal lands** identifying the USGS estimate of the **oil and gas resources and any “restrictions or impediments” (constraints)** to their development.

EPCA Steering Committee

❖ Department of the Interior

- Bureau of Land Management – Oil and Gas Management Prescriptions
- Geological Survey – Undiscovered Resources



❖ Department of Agriculture

- Forest Service – Oil and Gas Management Prescriptions



❖ Department of Energy

- Office of Fossil Energy – Technical Assistance
- Energy Information Administration – Reserves Growth



Contractors



Advanced Resources International

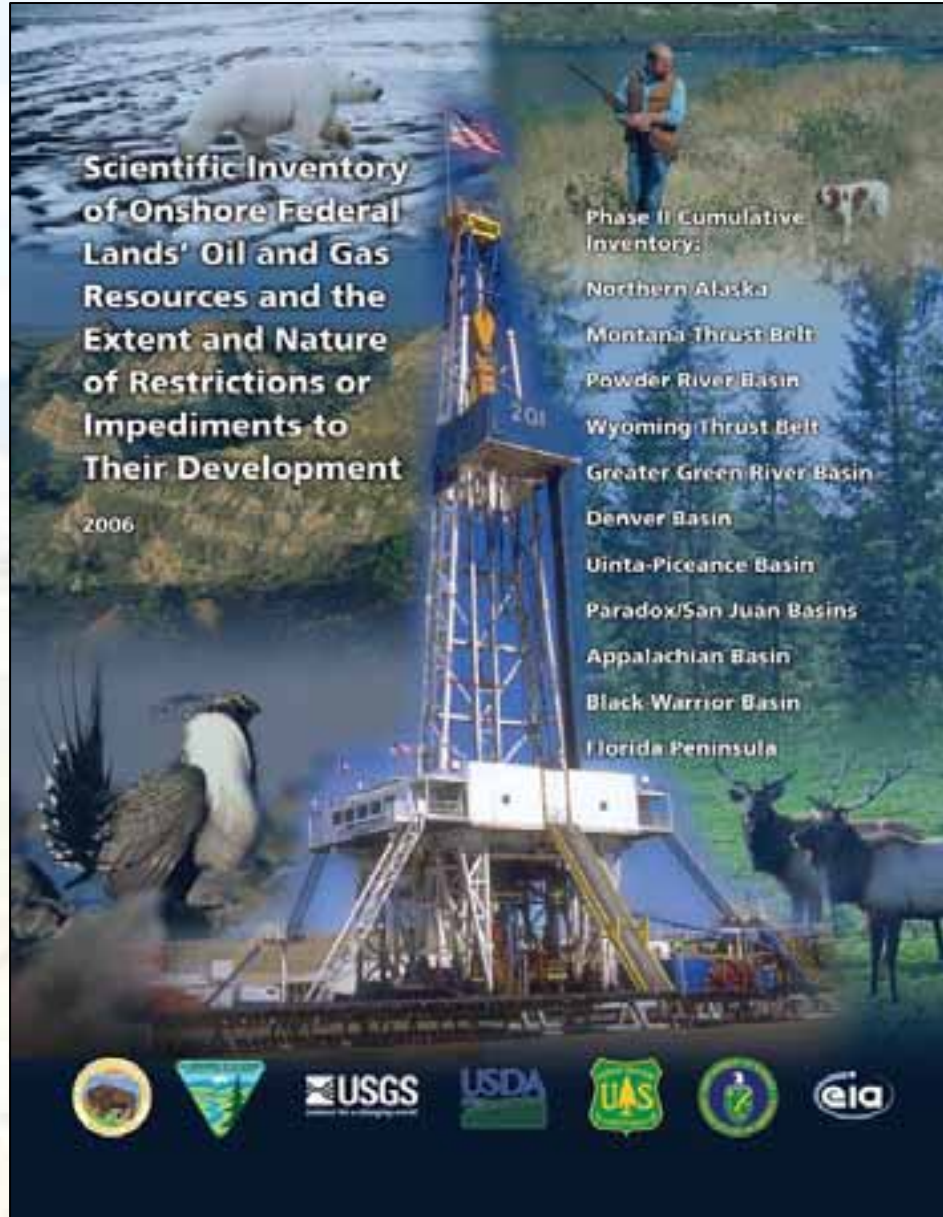
(now Enegis, LLC)

Arlington, VA



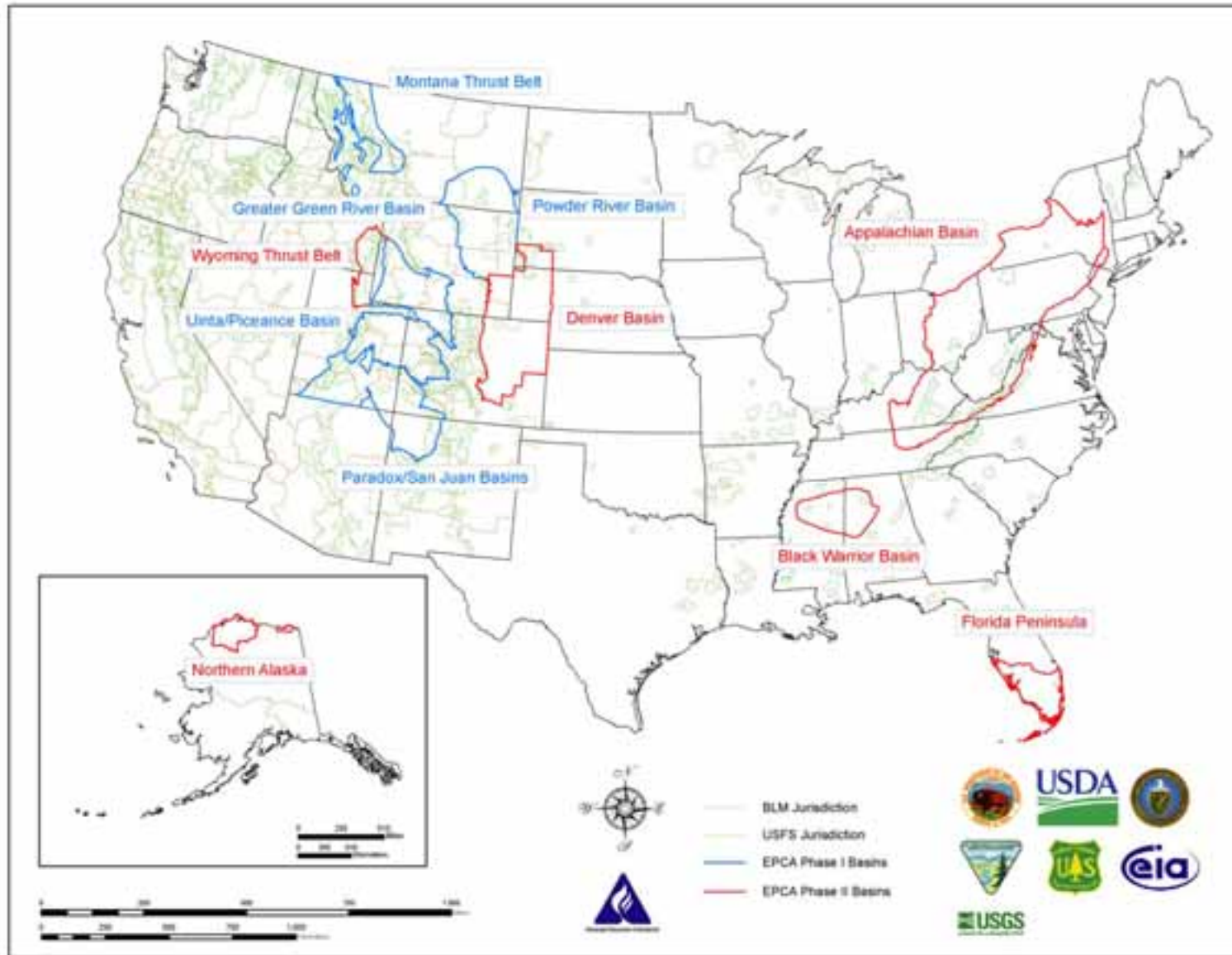
Premier Data Services

Englewood, CO



Phase II
Inventory
Released
November
2006

EPCA Phase II Study Areas



Spatial Data Needs



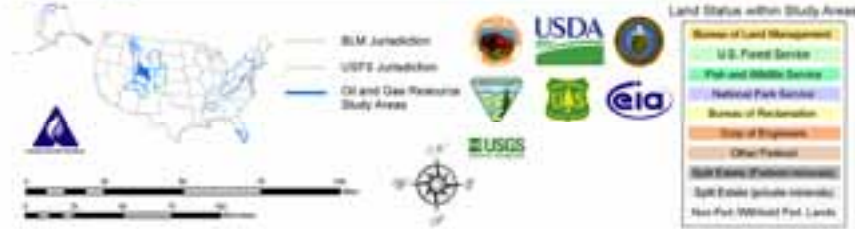
- Layer

- Onshore Federal Mineral (Oil & Gas) Ownership
- Undiscovered Resources and Reserves Growth
- Oil & Gas Lease Stipulations

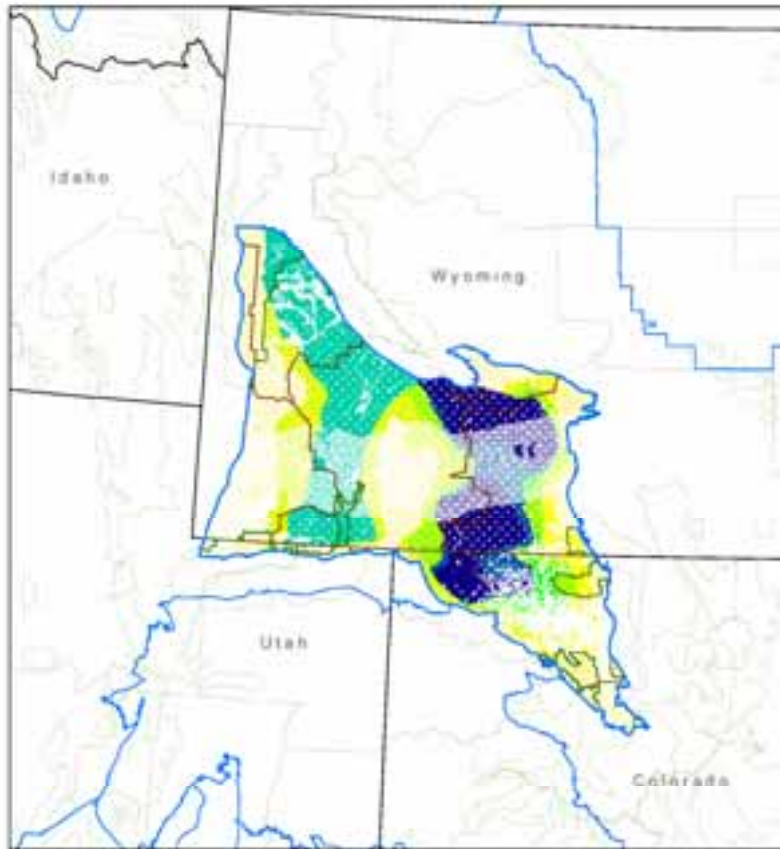
- Source

- BLM
- USGS/EIA
- BLM/USFS

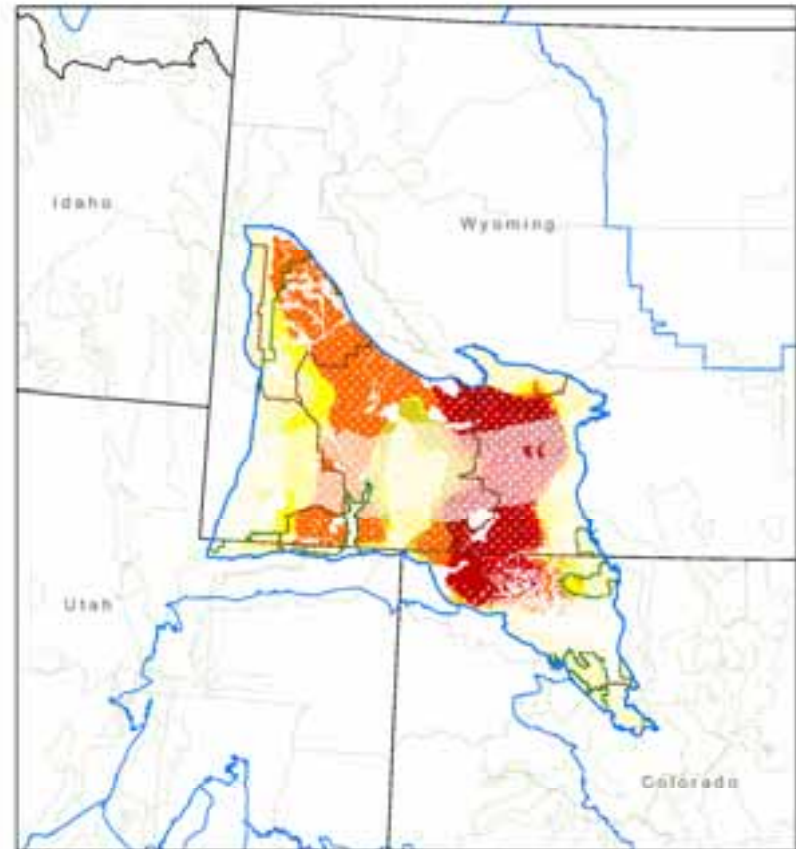
Greater Green River Basin Federal Lands



USGS Undiscovered Technically Recoverable Resources



Oil



Gas

Northern Alaska Resources

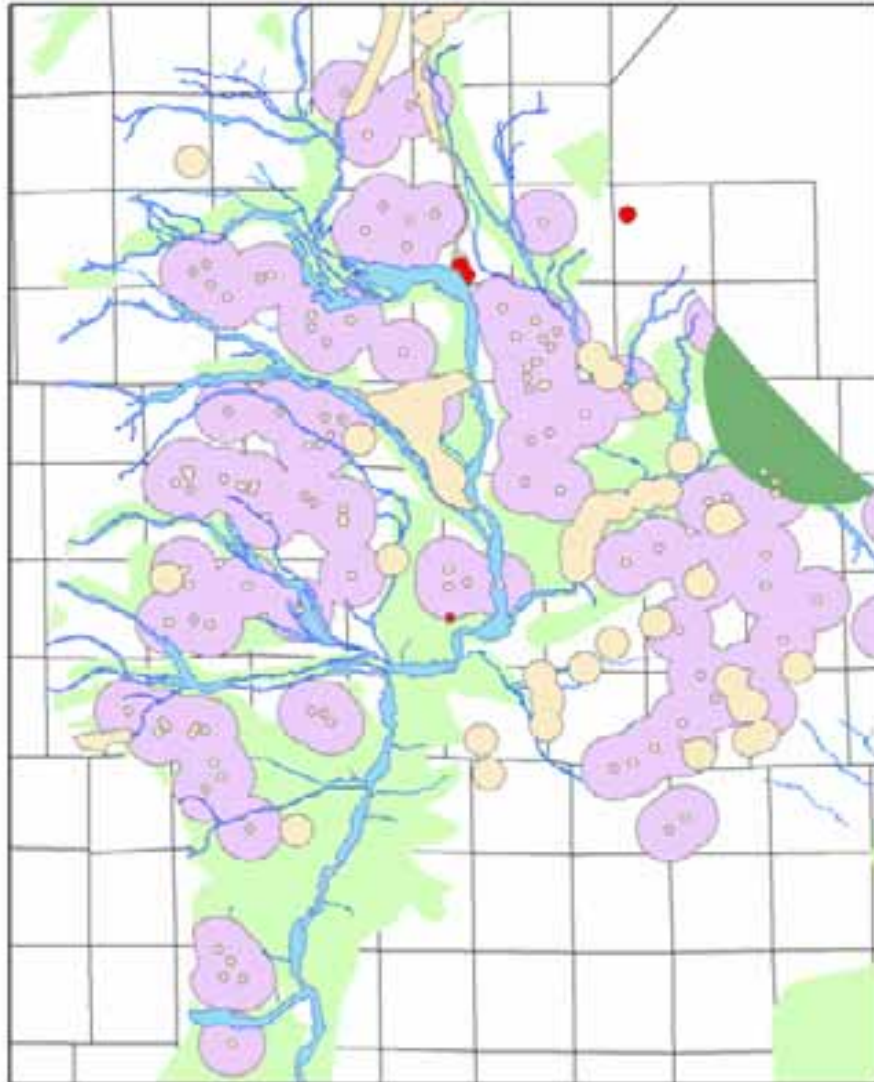
Oil: 18.1 BBbl

All Lands

Gas: 66.9 Tcf



Stipulations (Constraints)



Complex Overlapping Polygons



Oil and Gas Lease Stipulations
Pinedale Field Office

Legend

- NSO - National Register Sites
- CSU - Sage Grouse, Raptors, ACEC
- NSO - Campgrounds
- NSO - Flood Hazard or Perennial Water
- TLS - Sage Grouse Nesting
- CSU - Flood Hazard
- TLS - Big Game Winter Range
- Townships

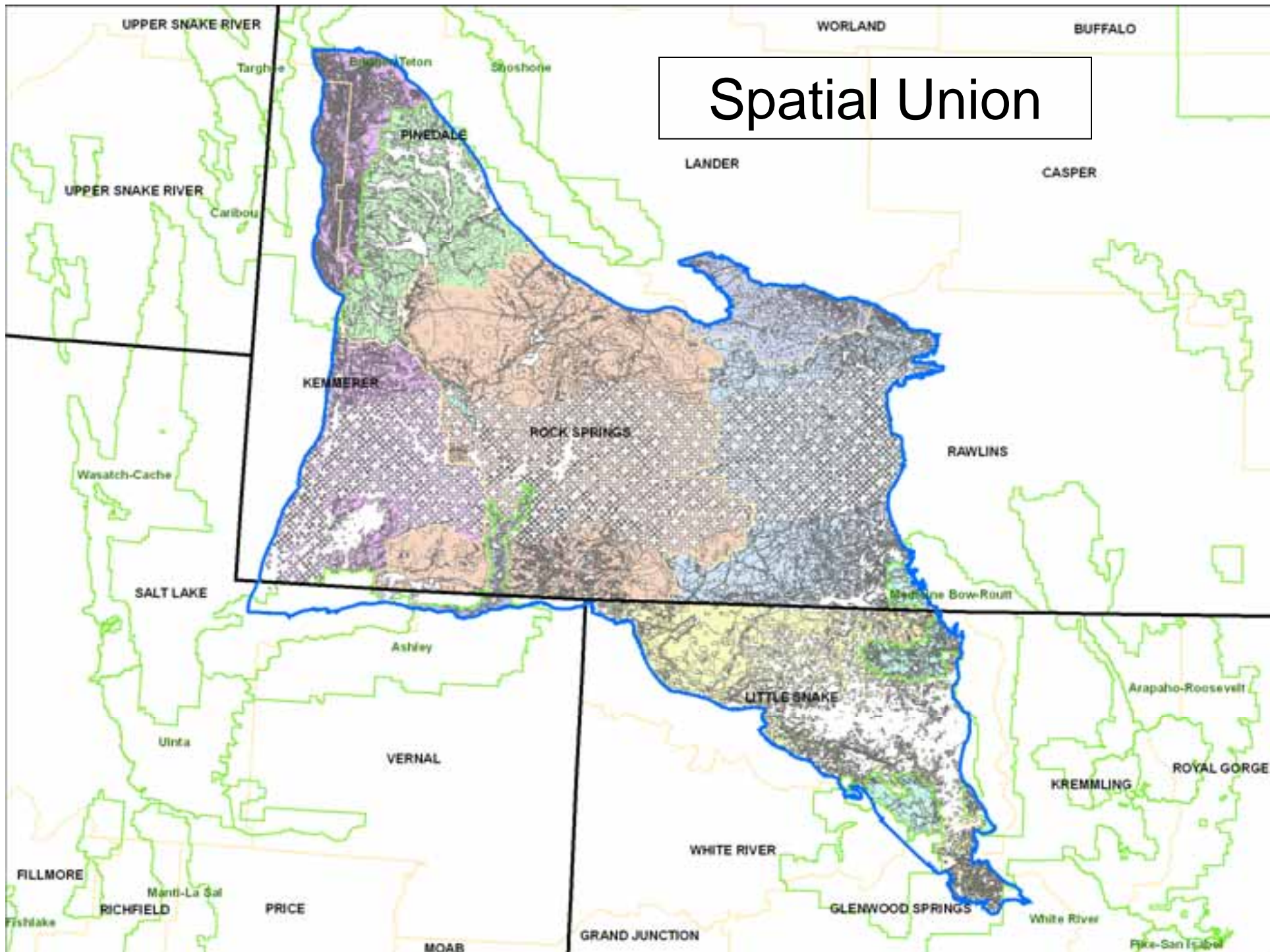


Accessibility Categories

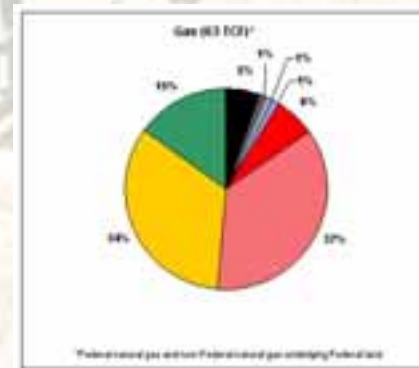
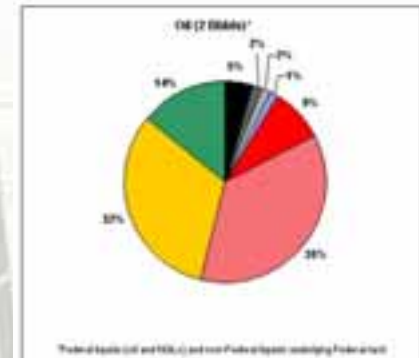
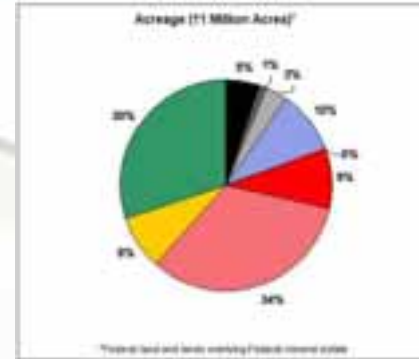
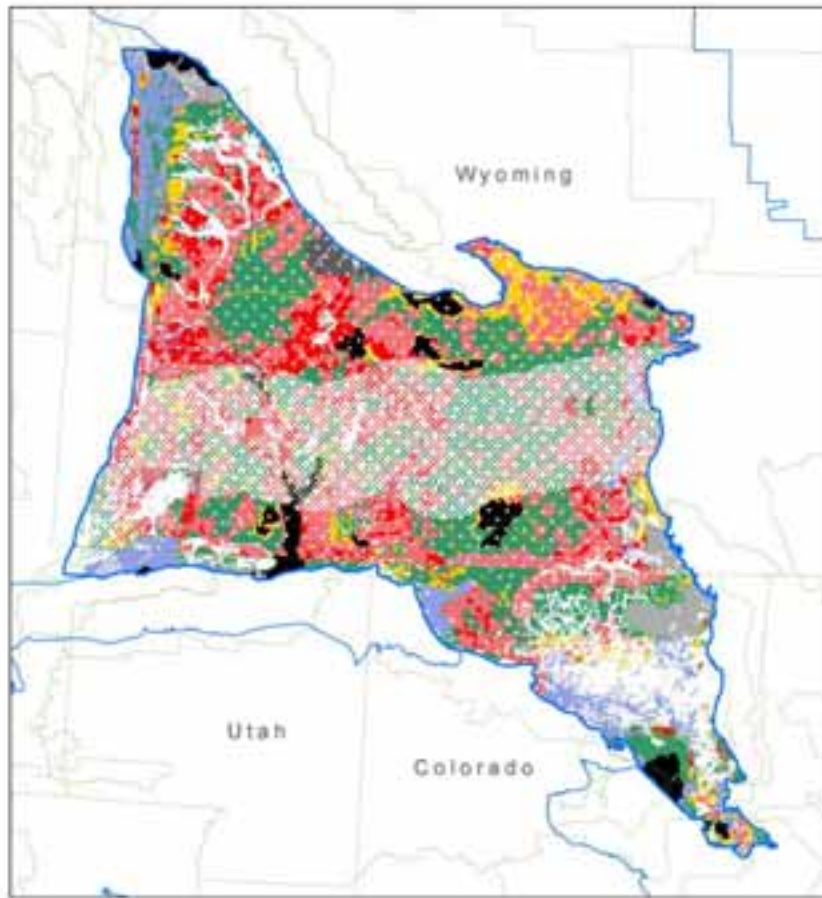
Developed from Land Use Plans and NEPA Documents

	Level	Access Category	Comments
Inaccessible (No Leasing)		NL (Statutory/Executive Order)	
	1	No Leasing (Statutory/Executive Order), (NLS)	Status set by Law or Executive Order; drilling prohibited
	2	No Leasing (Administrative), general category (NLA)	Status set by Federal surface management agency; drilling prohibited
	3	No Leasing (Administrative), Pending Land Use Planning or NEPA Compliance (NLA/LUP)	Status set by Federal surface management agency; drilling prohibited pending planning
Available with Restrictions	4	No Surface Occupancy	Not accessible for drilling except for resources within an extended drilling zone
	5	Leasing, Cumulative Timing Limitations (TLs) on Drilling >9 Months	Categorized by the cumulative effect of seasonal leasing stipulations during which drilling is prohibited, generally for protection of wildlife
	6	Leasing, Cumulative Timing Limitations (TLs) on Drilling >6 - ≤9 Months	
	7	Leasing, Cumulative Timing Limitations (TLs) on Drilling >3 - ≤6 Months	
	8	Controlled Surface Use	Drilling permitted, specialized mitigation plan required for CSU (this category includes Cumulative Timing Limitations (TLs) on Drilling ≤3 Months, which are minimal)
Available »	9	Standard Lease Terms	Drilling permitted, mitigation plan required

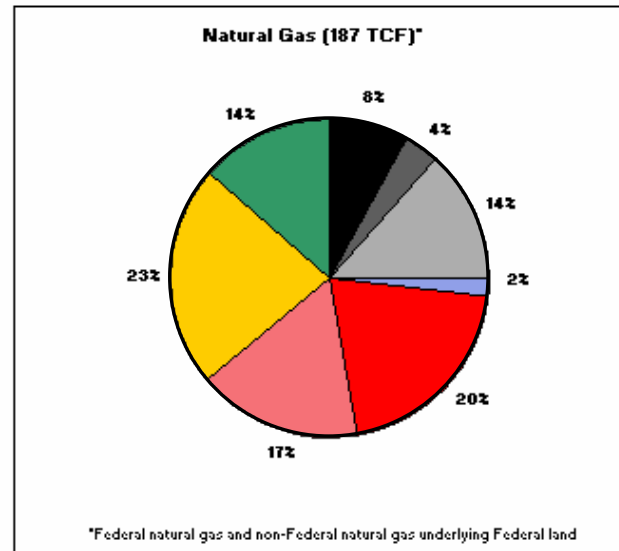
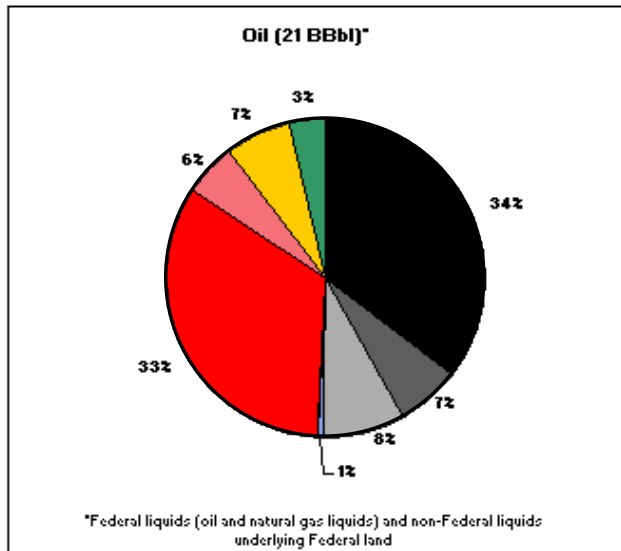
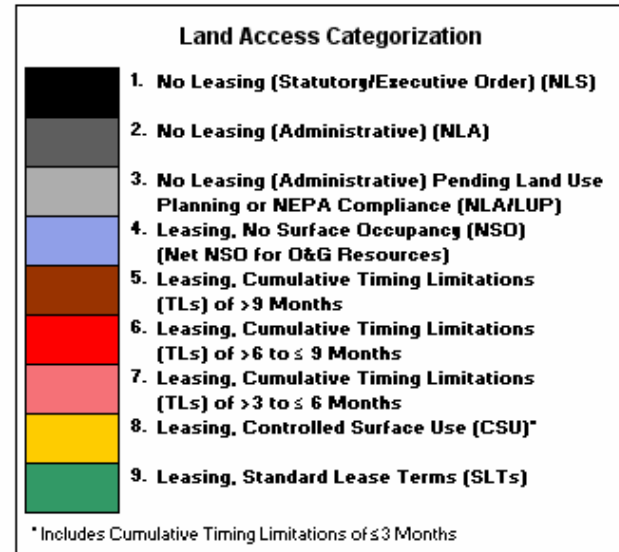
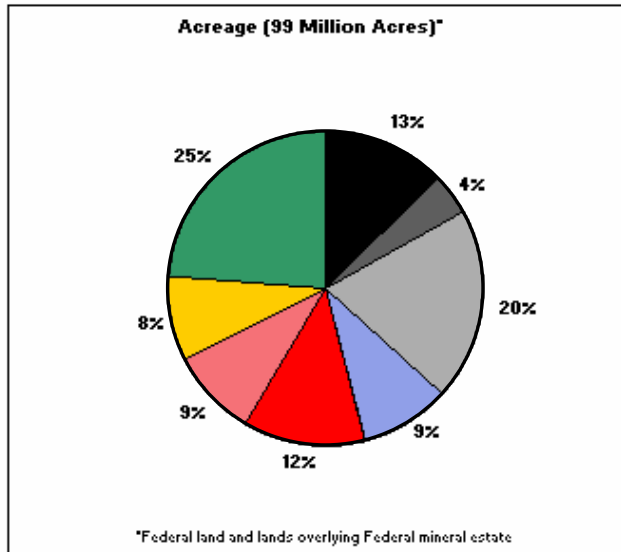
Spatial Union



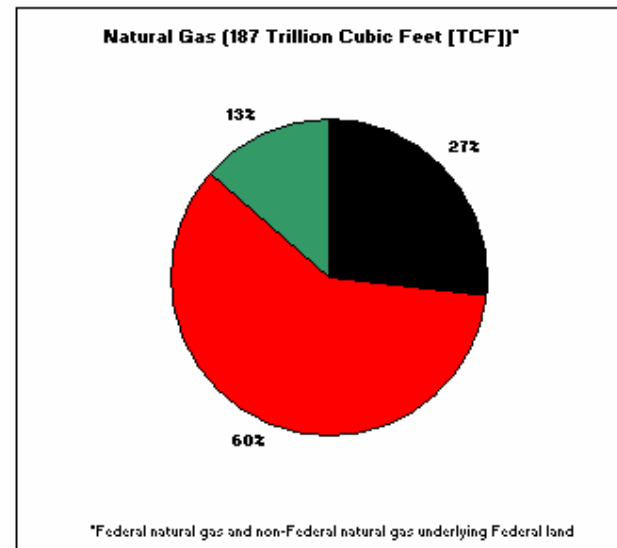
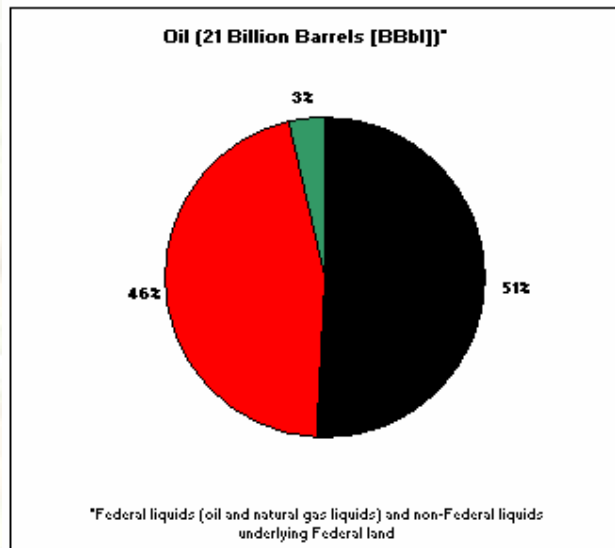
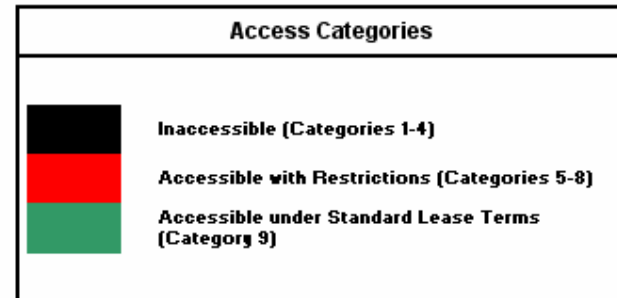
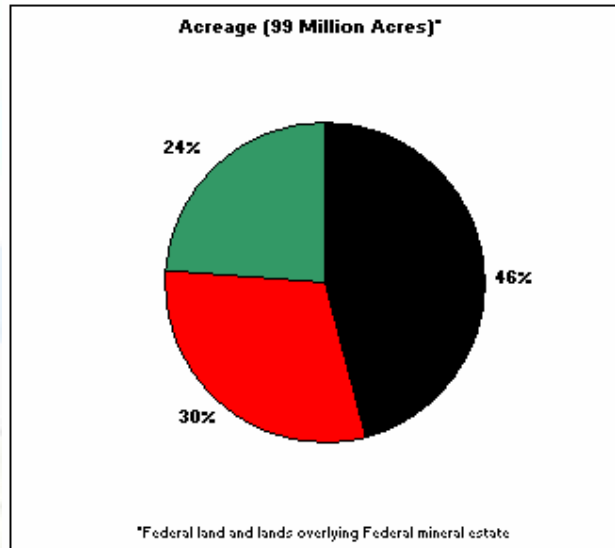
Green River Basin Categorization



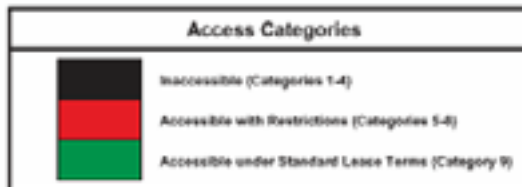
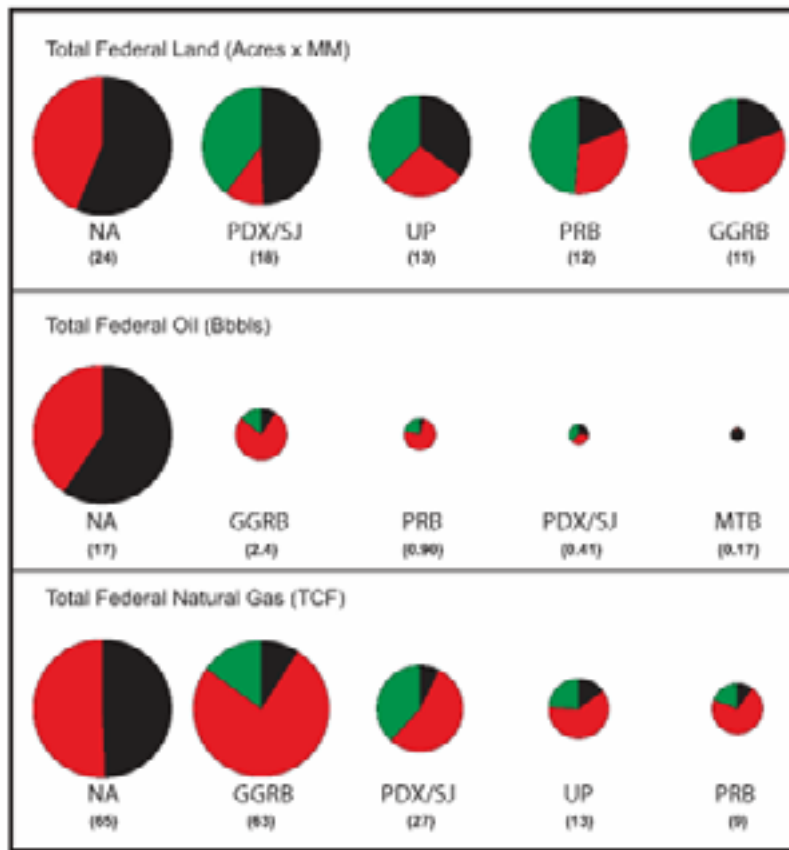
Phase II Aggregate Results



Phase II Simplified Results



Top Five Study Areas



NA – Northern Alaska

PDX/SJ – Paradox/San Juan Basins

UP – Uinta-Piceance Basin

PRB – Powder River Basin

GGRB – Greater Green River Basin

MTB – Montana Thrust Belt

Press Reactions

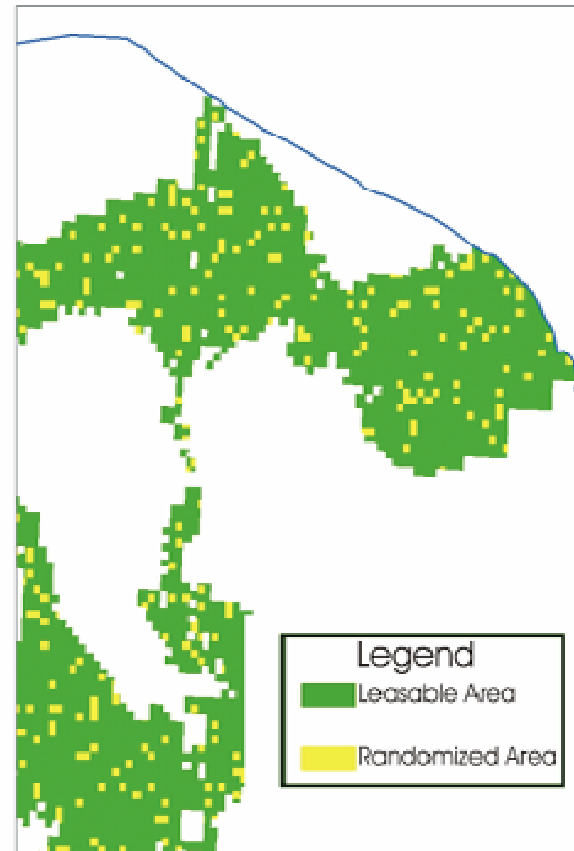
- Report: Much of Oil, Gas Restricted – *Associated Press*
- Sizing Up a Stockpile: Survey finds much of Rockies' energy reserves off limits – *Rocky Mountain News*
- Report says oil, natural gas supplies blocked by rules – *Salt Lake Tribune*
- Feds agree with O&G industry on access – *Public Lands News*
- A Transparent and Misleading Attempt to Support a Pro-Industry Drilling Agenda – *The Wilderness Society*

Factoring In Conditions of Approval

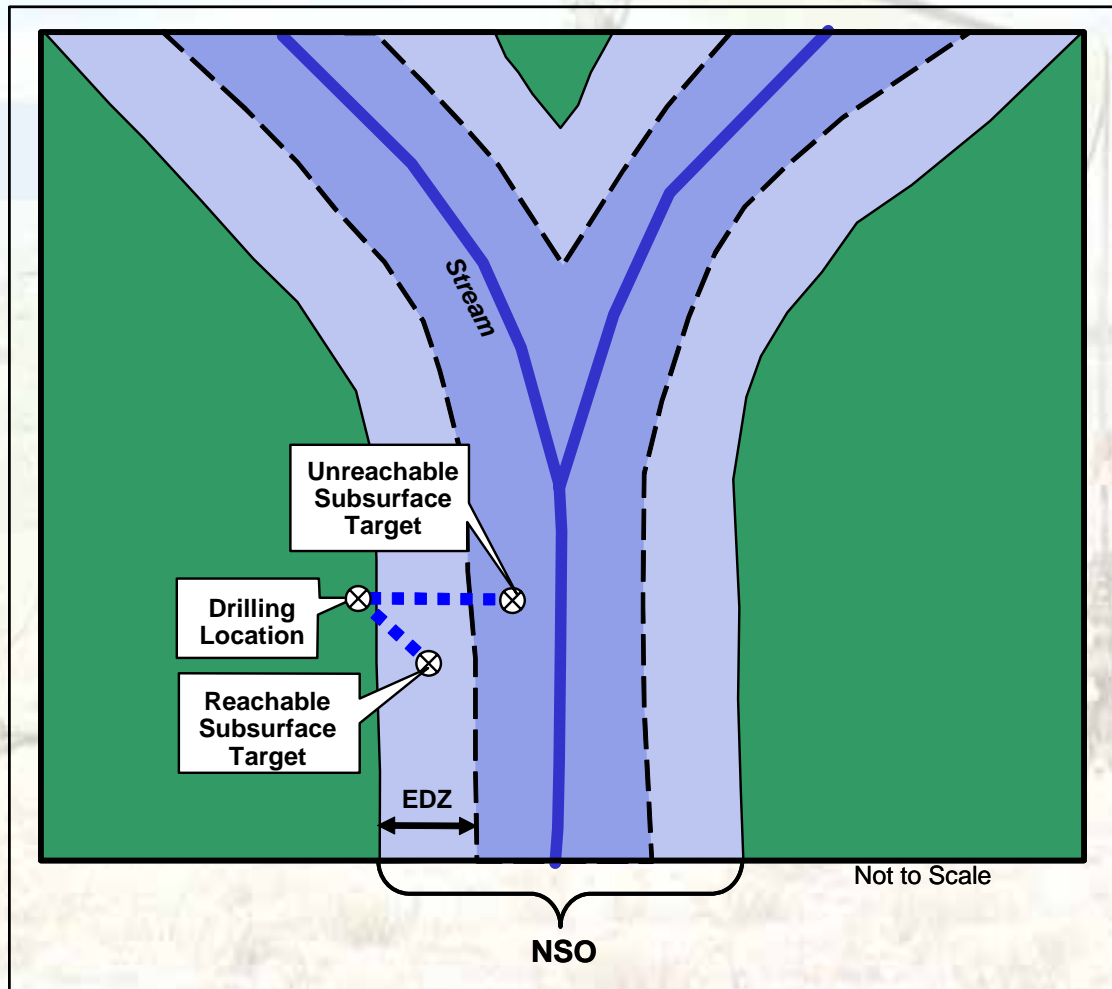
10% Scenario
Randomized area change

$$\%uniqueCOA = \frac{(\#Wells)_{uniqueCOA}}{(\#Wells)_{Acc.Area}} = 10\%$$

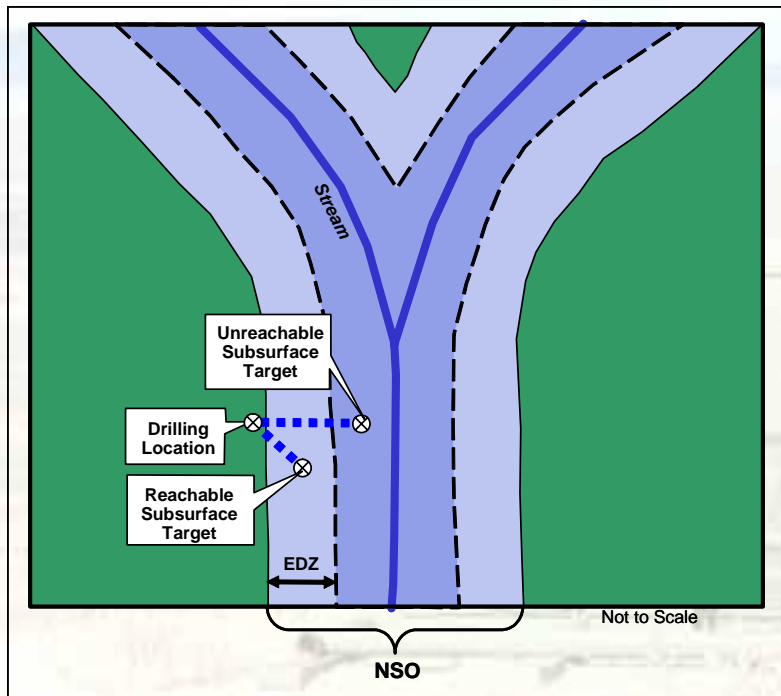
- Randomization performed on a grid of 400 x 400 meter (~40 acre) cells
- Different scenarios run for each BLM Field Office and National Forest



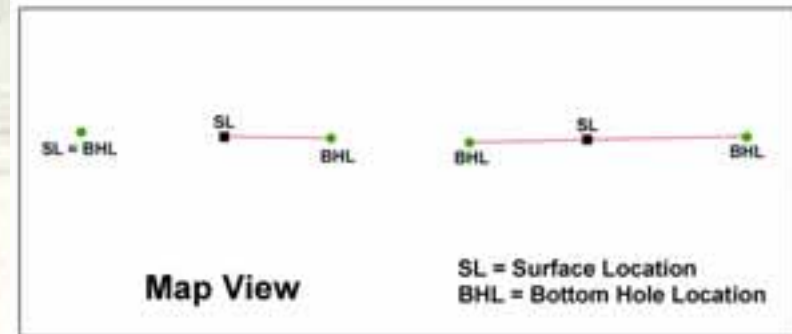
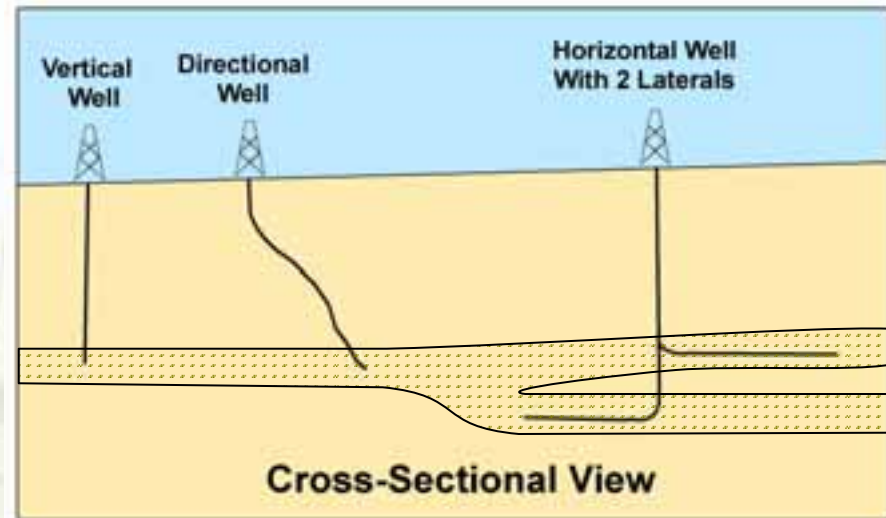
Factoring In the Extended Drilling Zone (EDZ)



Borehole Geometries



JAF01027B.PPT

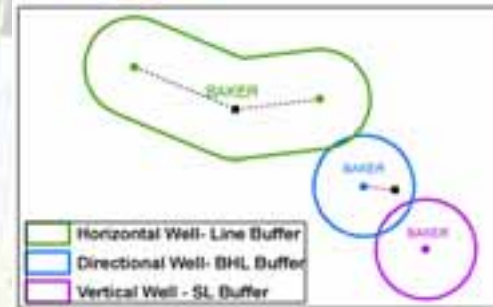


Oil and Gas Field Delineation

Buffer Technique for Three Borehole Geometries

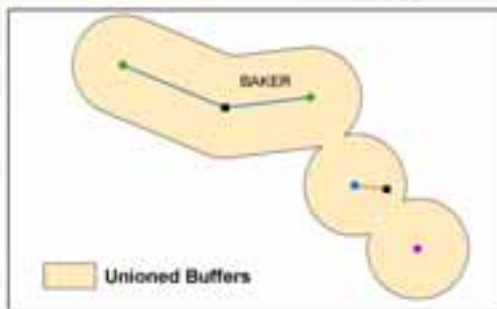


(1) Horizontal, Directional and Vertical Well Types

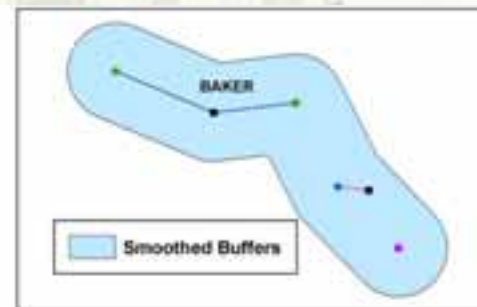


(2) Buffers Vary by Well Type

Object to be Buffered By Well type:
Vertical: Surface Location (SL)
Directional: Bottom-Hole Location (BHL)
Horizontal: Line Between SL and BHL



(3) Union & Dissolve Buffers by Field Name



(4) Smooth Buffers

Buffered Field Outline Issues (Pre-Smoothing)

Scalloped / Botryoidal Appearance

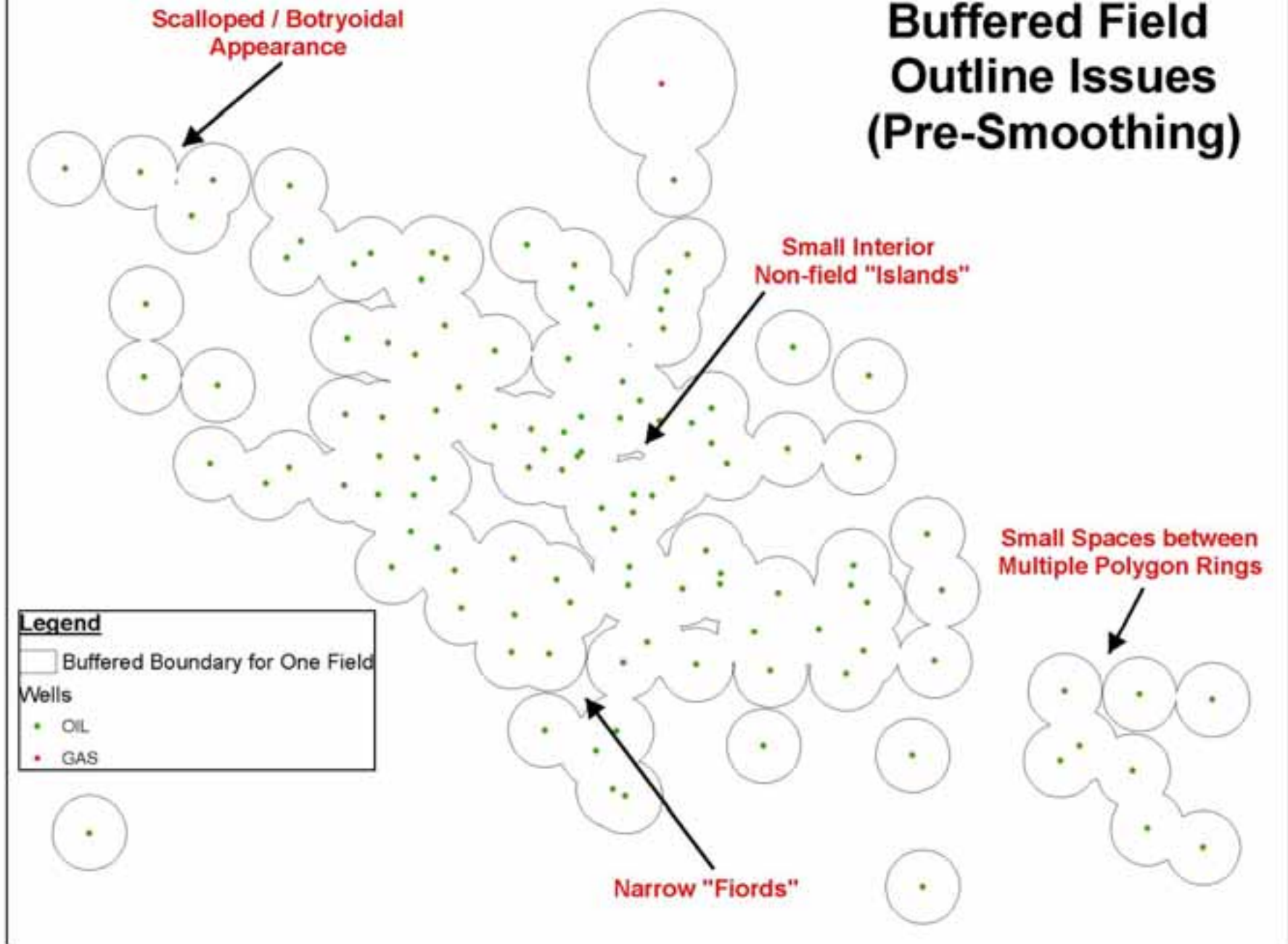
Small Interior Non-field "Islands"

Small Spaces between Multiple Polygon Rings

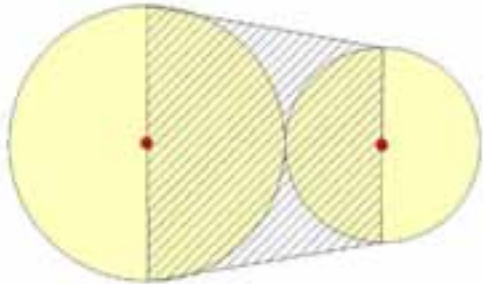
Narrow "Fiords"

Legend

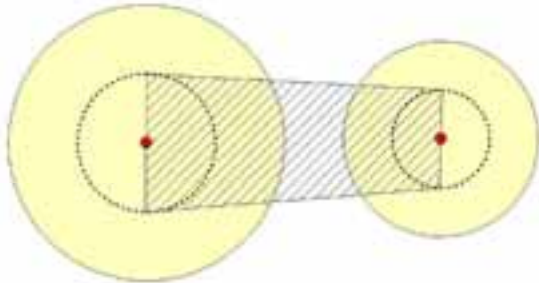
- Buffered Boundary for One Field
- Wells
 - OIL
 - GAS



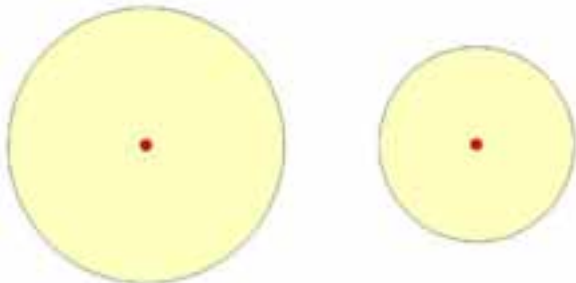
Trapezoids Rules for Smoothing Application



(A) Distance between wells $\leq 2 X$ (average buffer size):
Draw Full Diameter Trapezoid & Union with Buffers

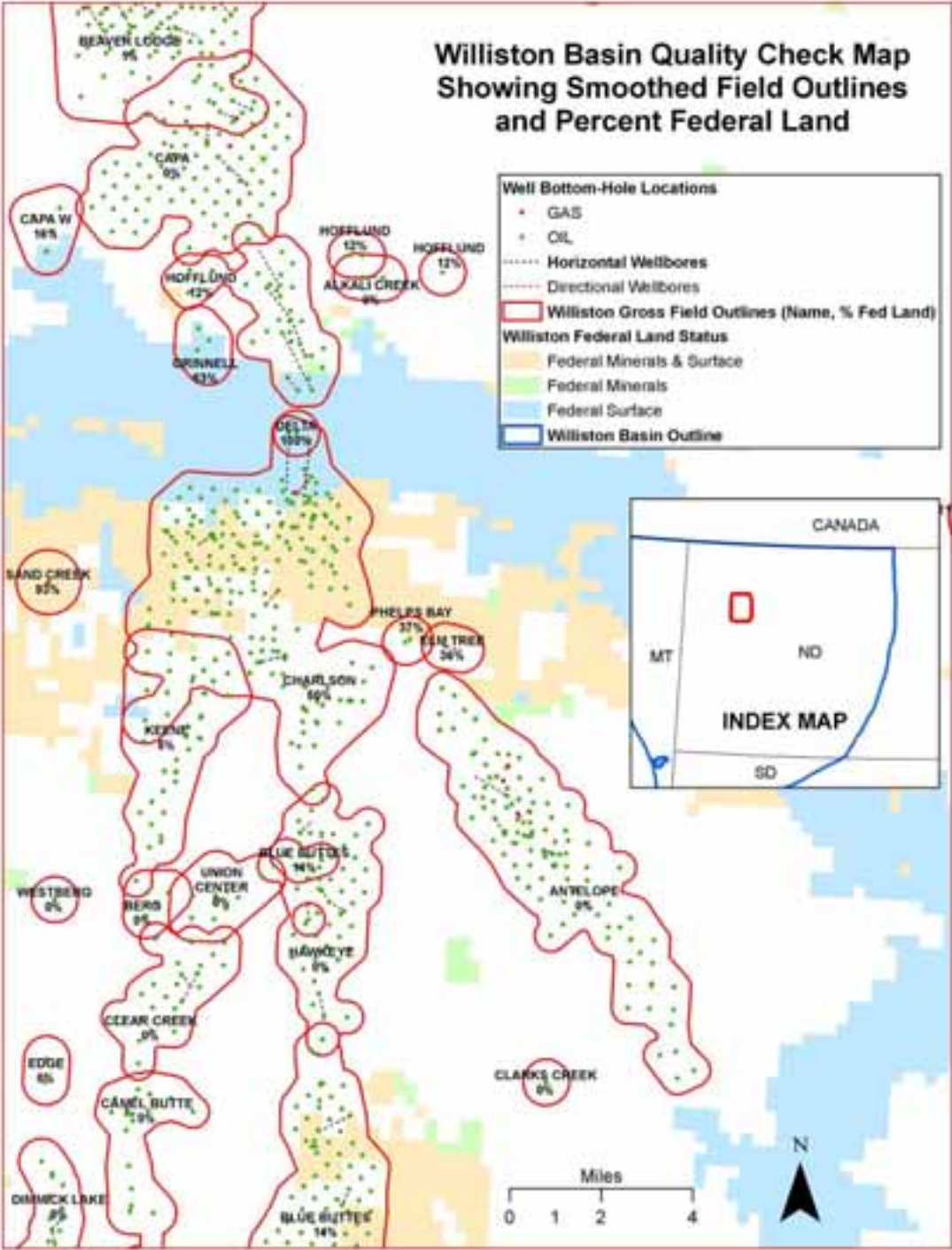


(B) Distance between wells = $2 - 2.5 X$ (average buffer size):
Draw Half Buffer Diameter Trapezoid & Union with Buffers



(C) Distance between wells $> 2.5 X$ (average buffer size):
Do not Draw Trapezoid

Williston Basin Quality Check Map Showing Smoothed Field Outlines and Percent Federal Land

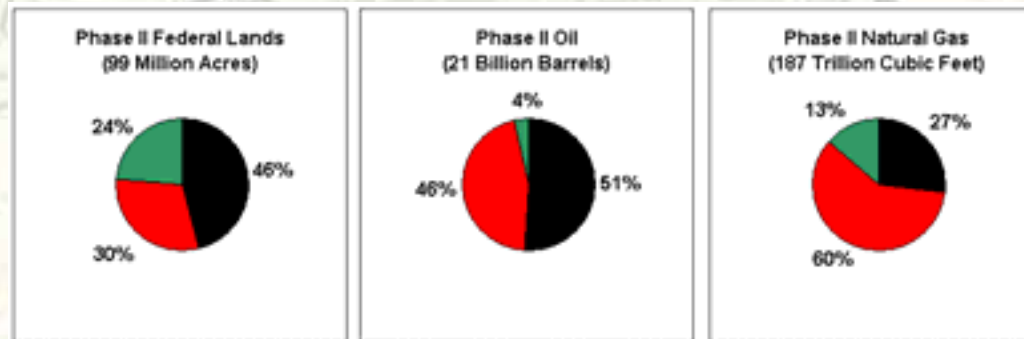


Data Collection Challenges

- DOD Confidentiality Agreements
- Sensitive Wildlife and Cultural Resources Data
- Lack of GIS Data in Eastern Basins
- Lack of Staff/Higher Priority Projects
- Fragmented Leasing Decisions
- Florida Hurricanes

Conclusion

- EPCA Phase II inventoried 99 million acres of Federal land
- Just over $\frac{1}{2}$ of the oil resources are inaccessible
- More than $\frac{1}{4}$ of the natural gas resources are inaccessible
- We couldn't have done this without GIS!



EPCA on the Web



U.S. Department of the Interior - Bureau of Land Management



EPCA Phase II Inventory

Energy Policy Act of 2005

Energy Policy and Conservation Act of 2000



EPCA Phase II Report

[Press Release](#) | [Comparison Table](#) (PDF) | [Qs and As](#) (PDF)

This report, titled *Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and the Extent and Nature of Restrictions or Impediments to Their Development — Phase II Cumulative Inventory*, supersedes Phase I of the inventory. The report includes:

- All five of the areas covered by the initial release of the inventory in 2003 (Paradox/San Juan, Uinta-Piceance, Greater Green River, and Powder River Basins and the Montana Thrust Belt)
- Six additional areas: Northern Alaska (the National Petroleum Reserve - Alaska and the Arctic National Wildlife Refuge 1002 area only), the Wyoming Thrust Belt, the Denver, Appalachian, and Black Warrior Basins, and the Florida Peninsula

www.blm.gov/epca

Questions?

EPCA Reports and DVDs are available
from the Bureau of Land Management

The background of the slide is a photograph of a desert landscape. In the foreground, there is a large piece of yellow and black drilling equipment, possibly a hydraulic fracturing rig, with various pipes and structures. The ground is sandy and sparsely covered with dry, yellowish-brown vegetation. In the distance, there are low, hazy mountains under a clear blue sky.

For more information contact:

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