

Scientific Inventory of Oil and Gas Reserves and Resources on Federal Lands

(Energy Policy and Conservation Act Reauthorization)



Steering Committee:
***U.S. Departments of Interior, Agriculture, and
Energy***



Prepared by:
Advanced Resources International, Inc.

Fall 2004

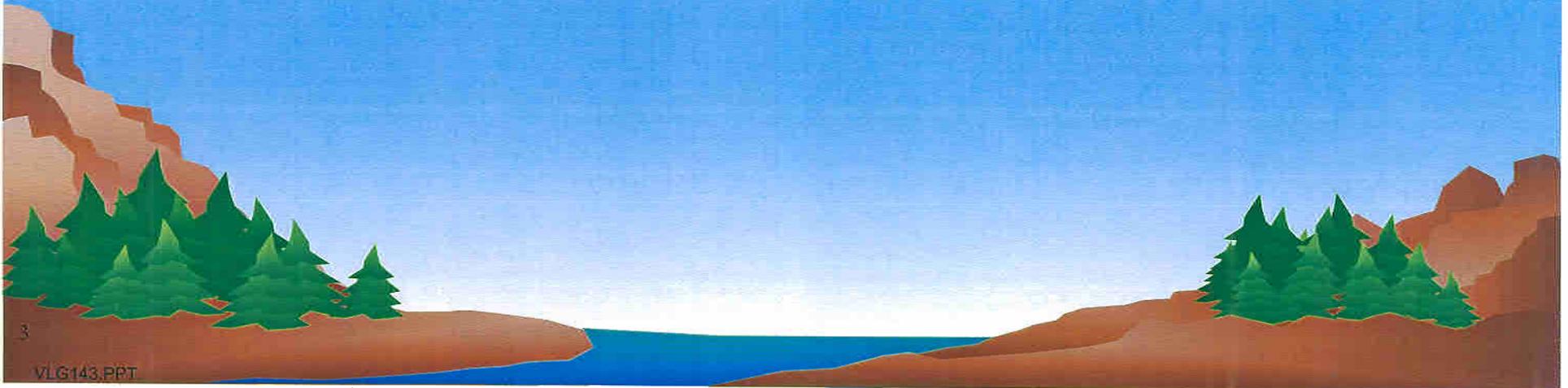
Outline

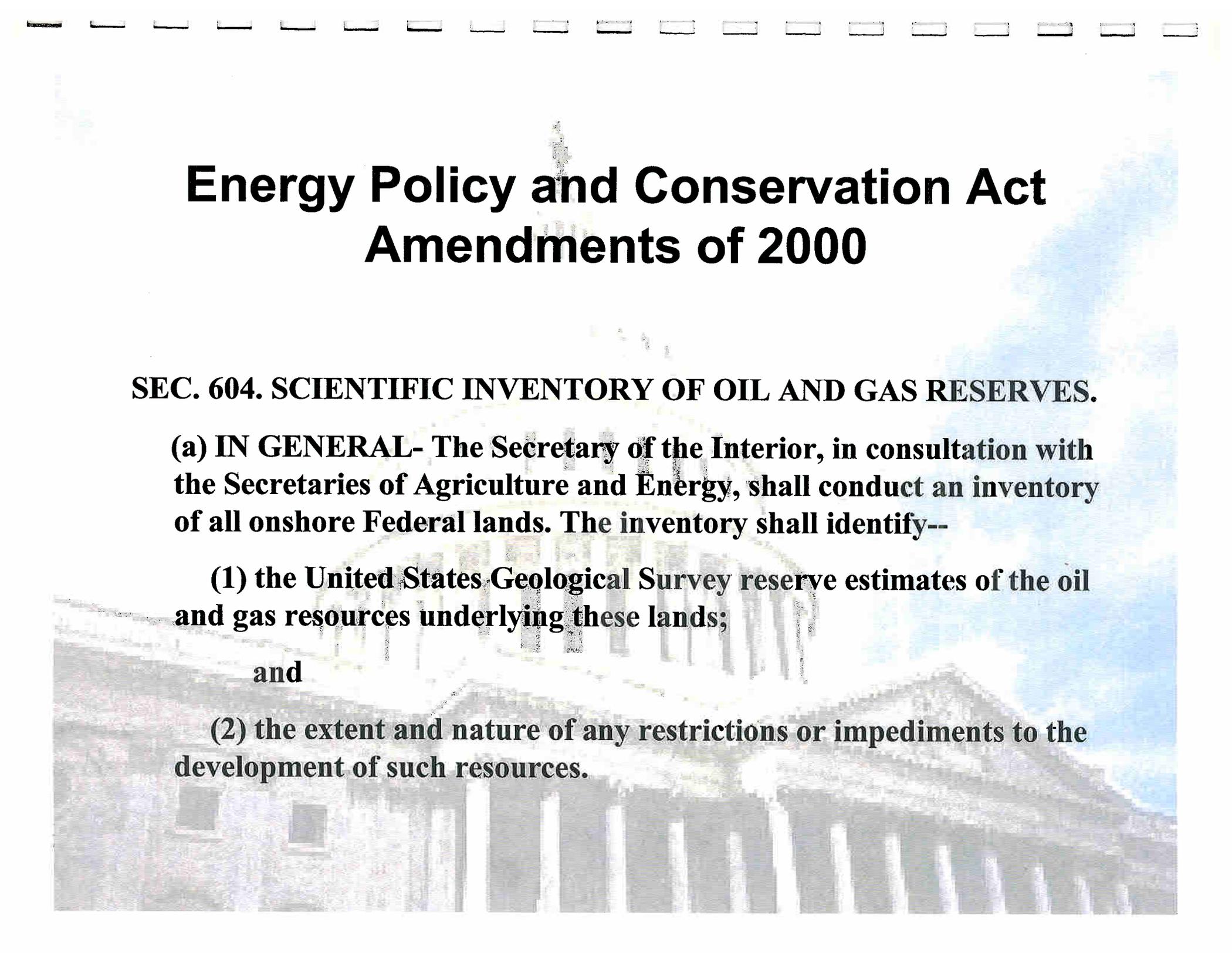


- **Overview of EPCA**
 - Scope
 - Methodology
 - Phase I Inventory
- **Input Sought from FOs for Study**
 - Modeling parameters
 - Non-quantified issues



Scope





Energy Policy and Conservation Act Amendments of 2000

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.

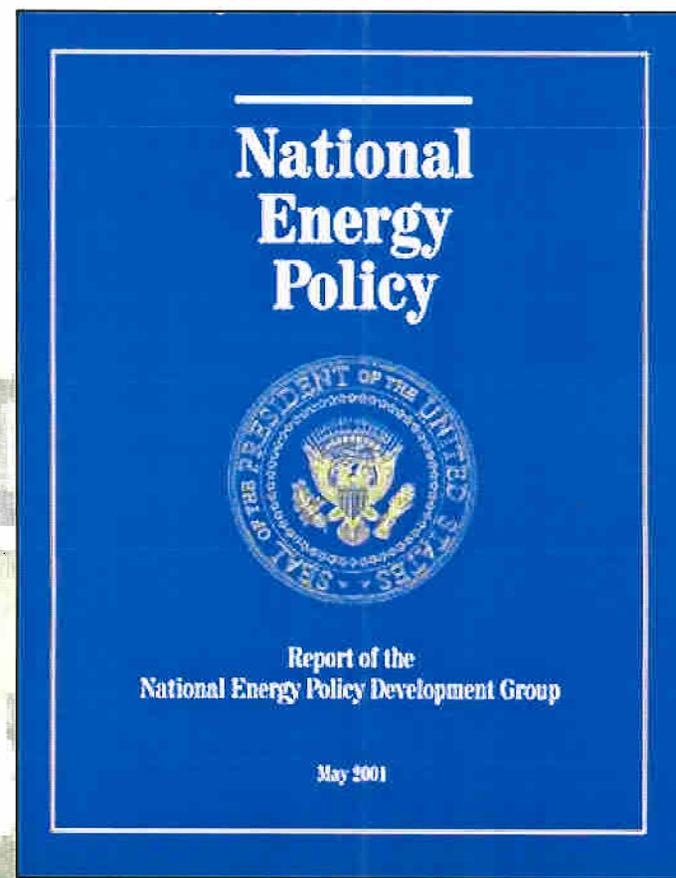
Energy Policy and Conservation Act Amendments of 2000

A MANDATE FROM CONGRESS:

- **This Act marks the first time that Congress asked the Department to undertake a study of restrictions**
- **The Act was signed into law by President Clinton on November 9, 2000**
- **On October 11, 2001, Congress expressed its sense of priority for the study:**
“...in light of recent attacks on the United States that have underscored the potential for disruptions to America’s energy supply, the managers believe this project should be considered a top priority for the Department.”

White House National Energy Policy

- In May, 2001, President Bush's *National Energy Policy* directed that the EPCA inventory be expedited
- Further, constraints to Federal oil and gas leasing should be reassessed and modified "...where opportunities exist (consistent with the law, good environmental practice and balanced use of other resources.)"



EPCA Inventory

- **Purpose:** The analysis is being conducted to provide data to support decision-making by Federal land managers and policymakers regarding oil and natural gas resources and environmental impacts.
- **Phase I of the EPCA Inventory was released in January 2003 and covered high-priority basins:**
 - Paradox/San Juan
 - Uinta/Piceance
 - Greater Green River
 - Powder River
 - Montana Thrust Belt

Scientific Inventory of
Onshore Federal Lands' Oil and Gas
Resources and Reserves
and the
Extent and Nature of Restrictions or
Impediments to their Development

**The Paradox/San Juan, Uinta/Piceance,
Greater Green River, and Powder River Basins
and the Montana Thrust Belt**

**In Compliance with the Energy Policy and Conservation Act
Amendments of 2000, P.L. 106-469 §604**

Prepared
by the
United States
Departments
of the
Interior,
Agriculture,
and Energy



January 2003

EPCA:

**Energy Policy and
Conservation Act**

(Phase I Report)

Scope

- **Assesses the effects of leasing stipulations and land use designation on the availability of oil and natural gas resources.**
- **EPCA Phase II is an Inventory of:**
 - Alaska North Slope (NPRA and ANWR 1002 only)
 - Wyoming Thrust Belt
 - Denver Basin
 - Appalachian Basin
 - Black Warrior Basin
 - Florida Peninsula
- **The studies include analyses for:**
 - Split estate
 - Practical implementation of leasing stipulations

EPCA Phases II, III and IV

Phase	Province Name	NOGA Province Number
II	Northern Alaska (NPRA and ANWR 1002 only)	1
	Wyoming Thrust Belt	36
	Denver Basin	39
	Florida Peninsula	50
	Black Warrior Basin	65
	Appalachian Basin	67
III	Northern Alaska (entire province)	1
	San Joaquin Basin	10
	Eastern Great Basin	19
	Raton Basin – Sierra Grande Uplift	41
	Michigan Basin	63
IV	Big Horn Basin	34
	Wind River Basin	35
	Permian Basin	44
	Bend Arch – Fort Worth Basin	45

EPCA Interagency Team

Coordination and Responsibilities

❖ Department of the Interior



- Bureau of Land Management – Restrictions and Impediments
- Geological Survey – Undiscovered Resources



❖ Department of Agriculture

- Forest Service – Restrictions and Impediments



❖ Department of Energy

- Energy Information Administration – Reserves
- Office of Fossil Energy

Contractors/Consultants



Advanced Resources International



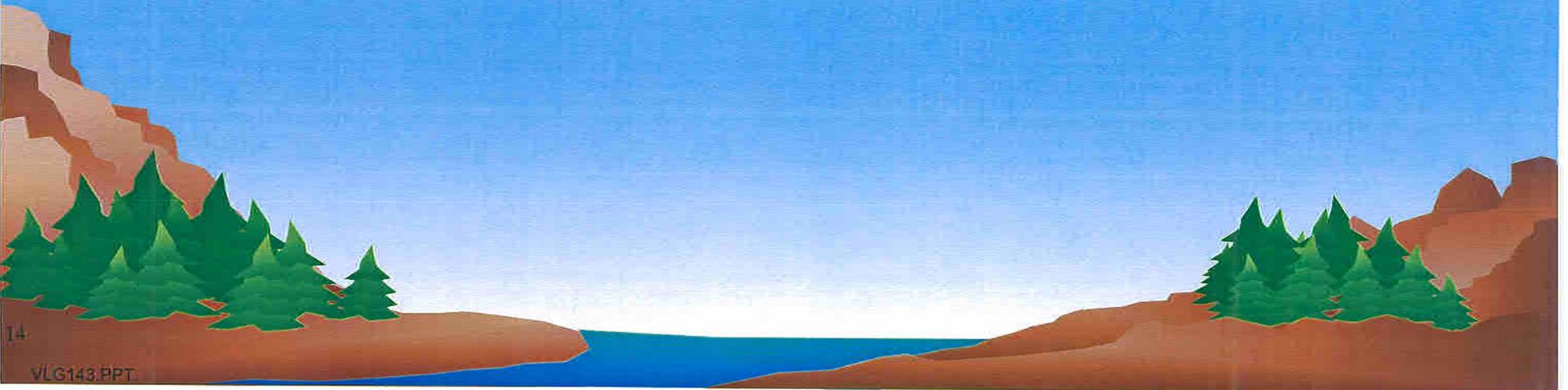
Premier Data Services

Data Needs/Benefits

- **Data From Federal Agencies (primarily BLM & FS)**
 - Leasing stipulation maps -- hard copy or electronic
 - Stipulation text
 - Information on practical implementation of stipulations
- **Benefits**
 - Provide data to support decision-making by Federal land managers and policymakers regarding oil and natural gas resources and environmental impacts.
 - Single source of information for multiple uses on land use and oil and natural gas resources.
 - Digital maps of stipulations currently in hard copy.

Parameters

- **Discovered and undiscovered oil and natural gas resources**
- **Split estate with Federal minerals to be analyzed for resources only**
- **All Federal lands (including, e.g., Bureau of Reclamation) subject to stipulations according to stipulation maps**

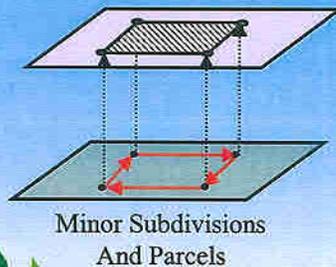
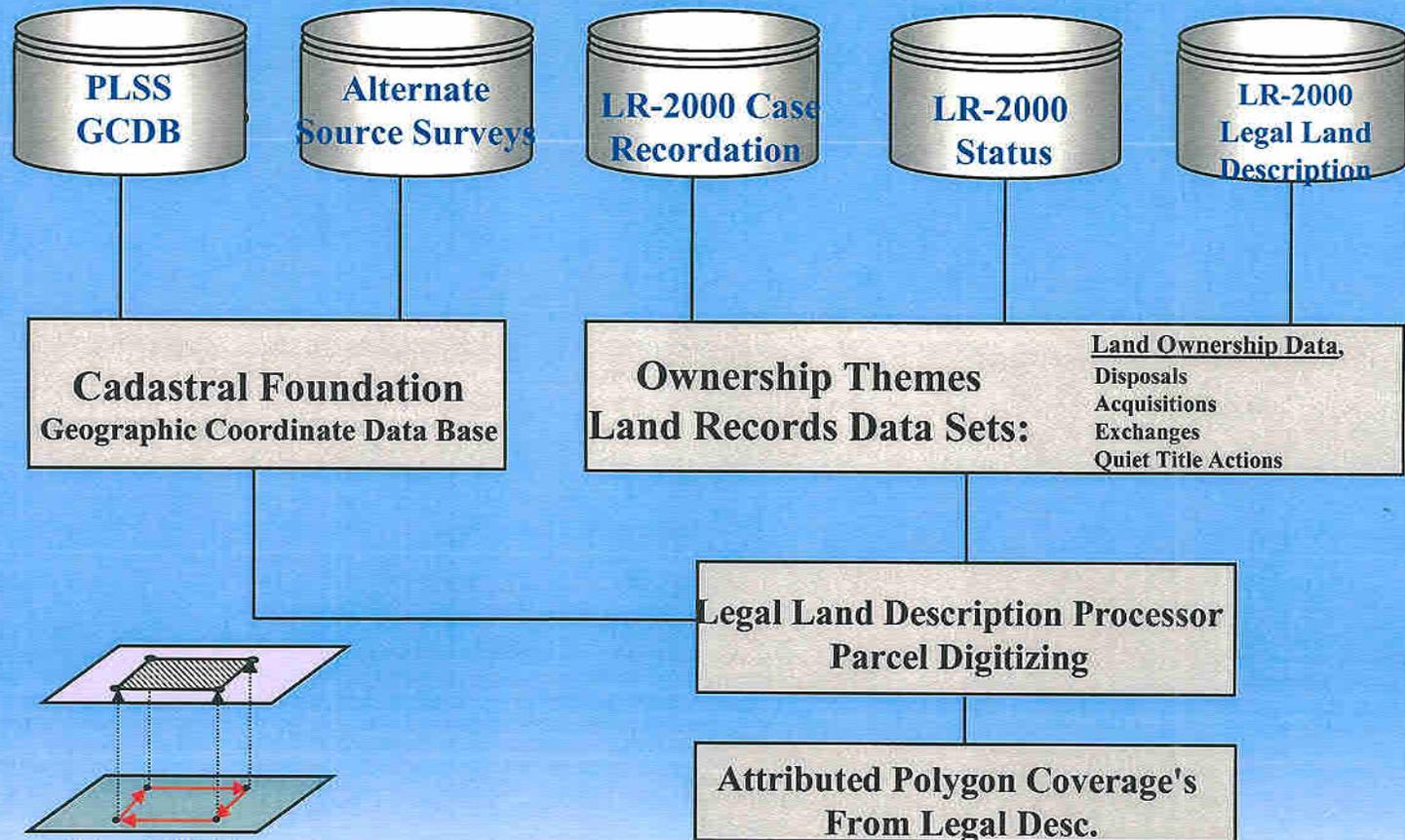




Methodology and Phase I Inventory



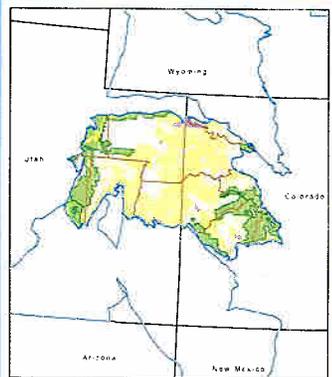
Schematic of BLM's Primary Land Records Databases



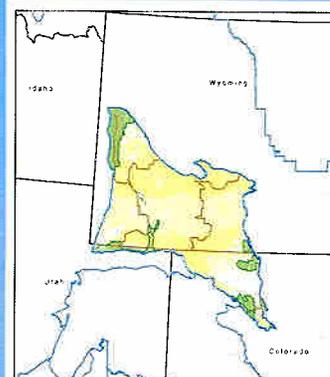
Primary Data Components

- **Land Status (Surface Management Agencies)**
- **Land Access Categorization**
- **Oil and Gas Resources**

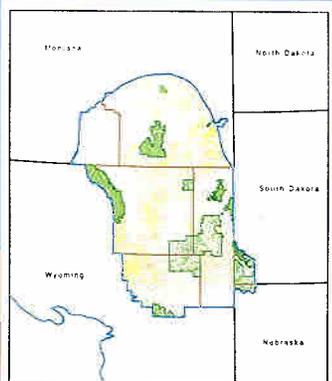
Land Status: Paradox/San Juan Basin



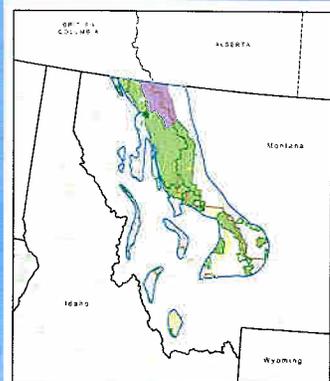
Uinta/Piceance



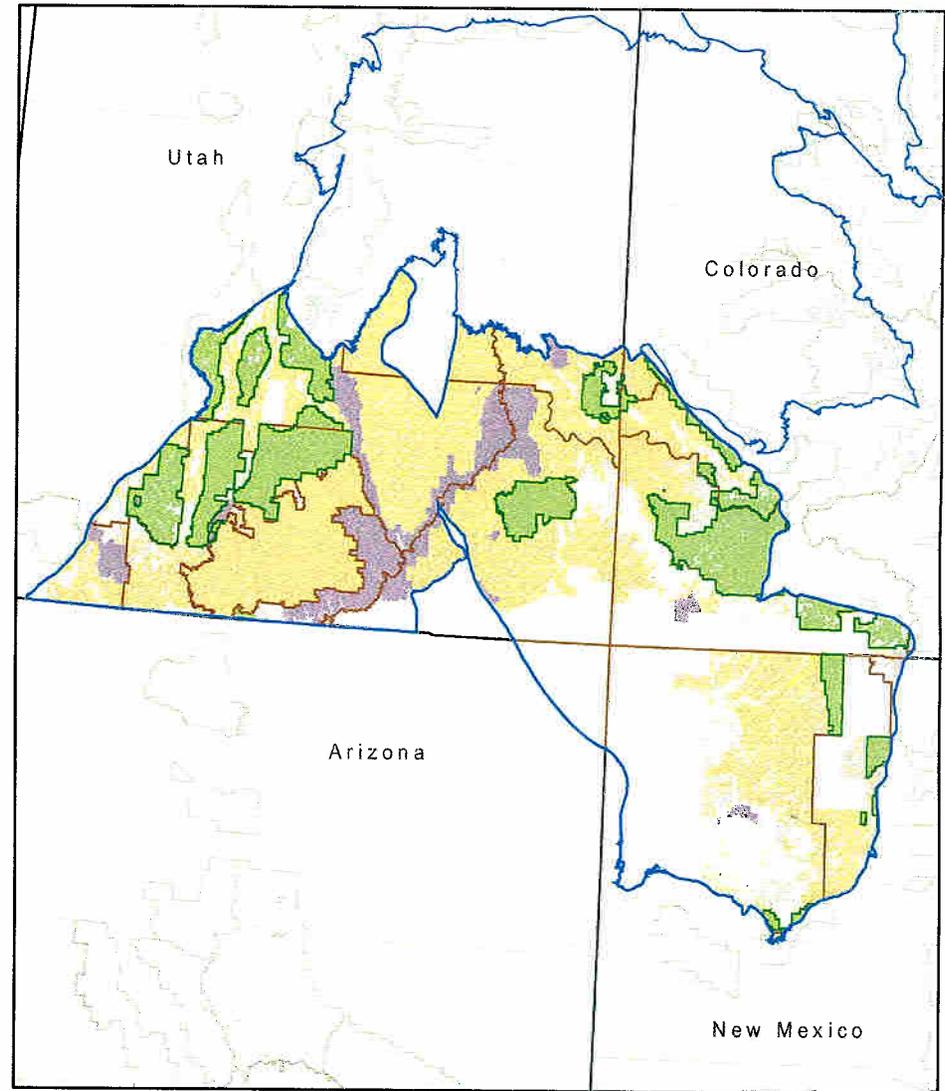
Greater Green River



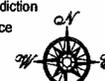
Powder River



Montana Thrust Belt



- BLM Jurisdiction
- Forest Service Jurisdiction
- Oil and Gas Resource Study Areas

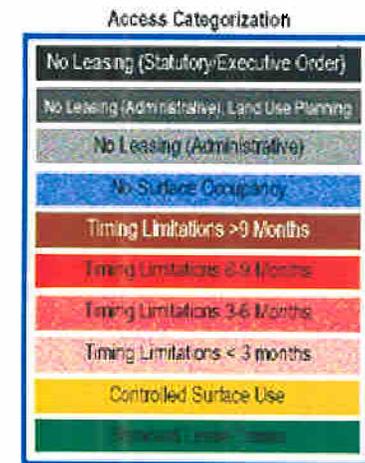


Land Status Within Study Areas	
Bureau of Land Management	Forest Service
National Park Service	Department of Defense
Department of Defense	State Lands
State Lands	Non-Federal

Categorization Hierarchy

Increasingly
Constrained

1. No Leasing (Statutory/Executive Order), (NLS)
2. No Leasing (Administrative), pending NEPA/LUP, (NLA/LUP)
3. No Leasing (Administrative), general category (NLA)
4. Leasing, No Surface Occupancy, (NSO)
- 5-8. Leasing, Cumulative Timing Limitations on Drilling
 - >9 Months (TLs >9)
 - 6-9 Months (TLs 6-9)
 - 3-6 Months (TLs 3-6)
 - <3 Months (TLs <3)
9. Leasing, Controlled Surface Use (CSU)
10. Leasing, Standard Lease Terms (SLTs)



Categorization Hierarchy (cont'd)

- **The hierarchy was formulated:**
 - based on the availability of the lands for leasing, and for areas in which leasing is permitted, the impact relative to the costs to operators for conducting drilling.
 - to ensure that potential for oil and/or gas development could be appropriately assessed (especially for areas of multiple overlapping stipulations) by examining the cumulative impacts of land access.
- **The hierarchy allows relatively straightforward GIS analysis of lands and resources**

Federal Land Categorization

Federal Land Management		Categorization	Level
Bureau of Land Management	BLM	Subject to stipulations	
Bureau of Reclamation	BREC	Subject to stipulations	
Department of Agriculture*	USDA	No Leasing (Administrative), general category (NLA)*	3.
Department of Defense**	DOD	No Leasing (Administrative), general category (NLA)**	3.
Federal Split Estate	SPLIT	Subject to stipulations	
Fish and Wildlife Service	FWS	No Leasing (Administrative), general category (NLA)	3.
Forest Service	FS	Subject to stipulations	
National Park Service	NPS	No Leasing (Statutory/Executive Order), (NLS)	1.
Federal Land Use Designations			
Inventoried Roadless Areas	IRA	Subject to stipulations	
National Conservation Areas	NCA	No Leasing (Statutory/Executive Order), (NLS)	1.
National Monuments	NM	No Leasing (Statutory/Executive Order), (NLS)	1.
National Recreation Areas	NRA	No Leasing (Statutory/Executive Order), (NLS)	1.
National Wildlife Refuges	NWR	No Leasing (Statutory/Executive Order), (NLS)	1.
Special Designated Areas	SDA	No Leasing (Statutory/Executive Order), (NLS)	1.
Wilderness Areas	WILD	No Leasing (Statutory/Executive Order), (NLS)	1.
Wilderness Reinventory Areas	WRA	No Leasing (Administrative), general category (NLA) for offices listed in next table; otherwise subject to stipulations	3.
Wilderness Study Areas	WSA	No Leasing (Statutory/Executive Order), (NLS)	1.

* Ft. Keo Agricultural Experimental Station, MT, only

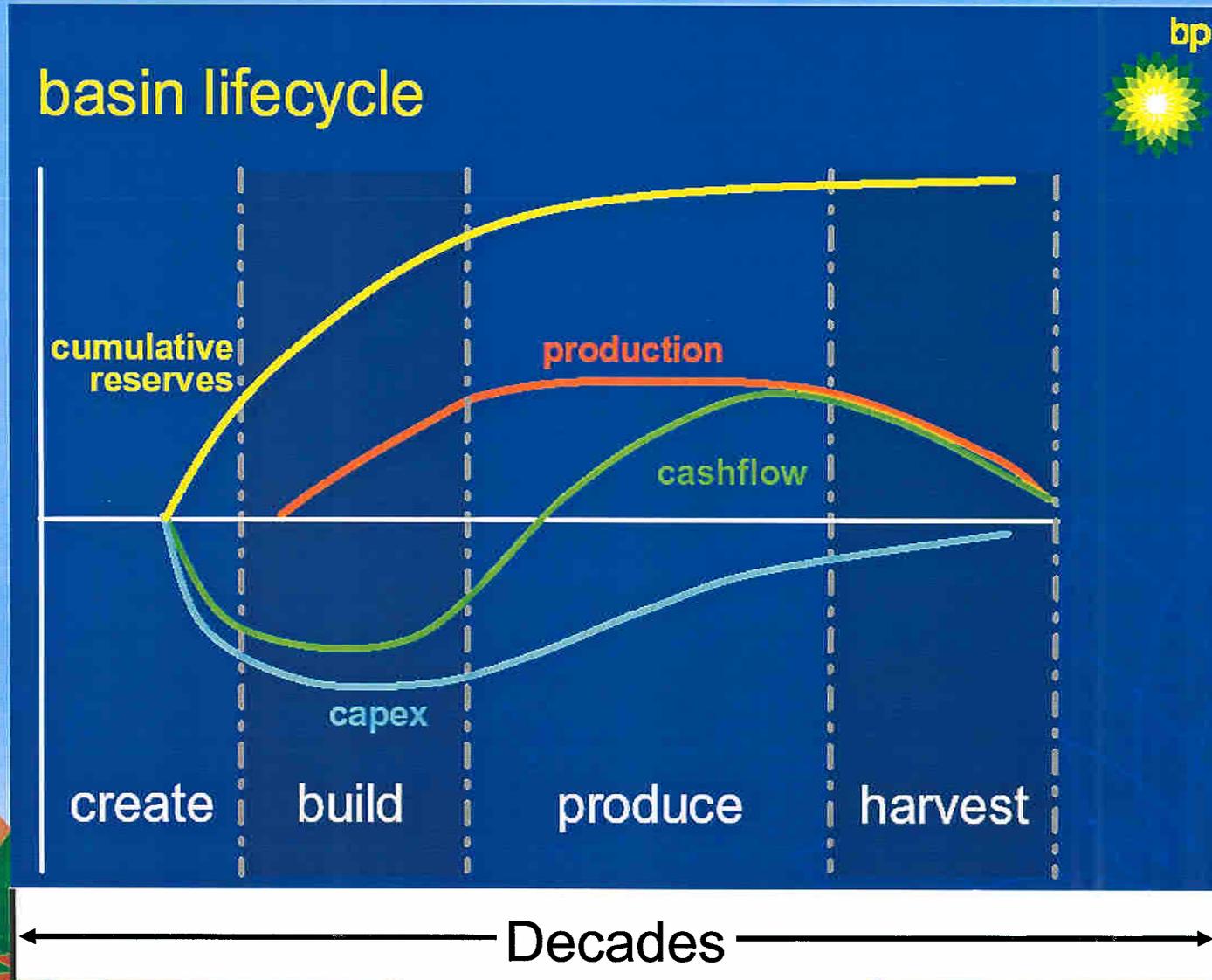
** Except for the Naval Petroleum Reserve, Casper Field Office, which is subject to stipulations

Practical Implementation of the Stipulations



- **Practical implementation of the stipulations will include**
 - **Consideration of the top three stipulations for which exceptions/waivers/modifications are granted, e.g.,**
 - ✓ **Years in which no raptor nests are found and exceptions are granted for APDs**
 - ✓ **Exceptions to steep slopes**
 - **Consideration of directional drilling**

Exceptions Based on E&P Life Cycle



Stipulations Exceptions List, by FS and BLM Field Office

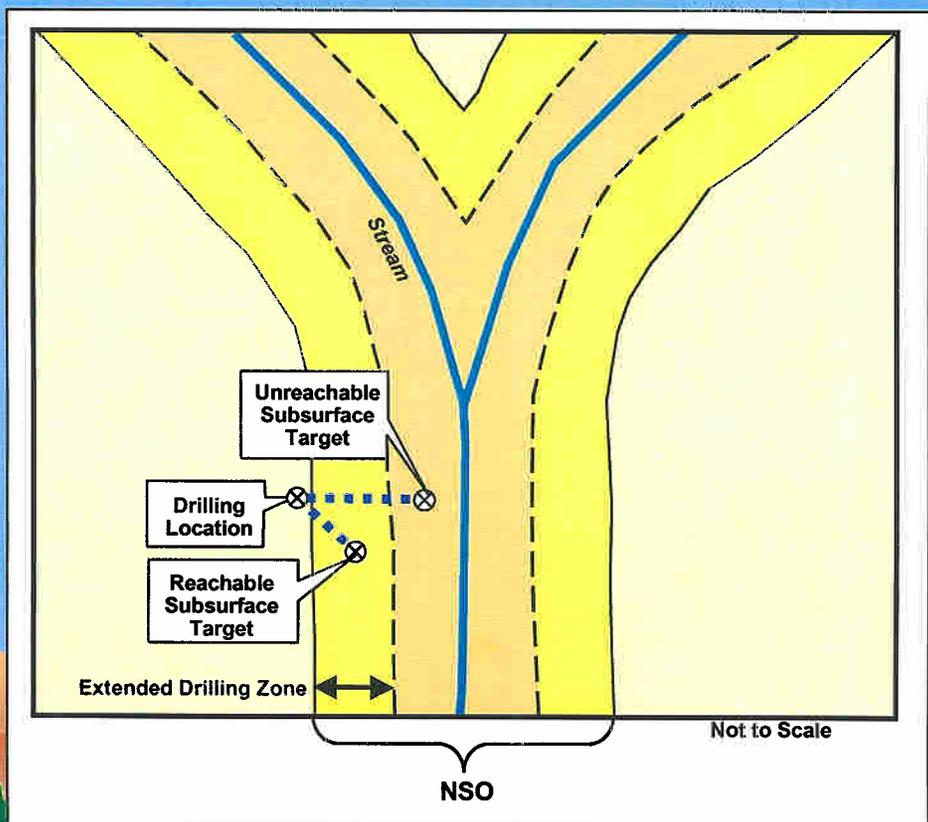
Jurisdiction	Exceptions to stipulations											Comments	
	Big Game Winter Range	Raptors	Sage Grouse	Steep slopes	Bald Eagle Winter Roost	Calving and Fawning	Antelope Fawning	City of Rifle Water-shed	Sensitive Resources	Soils, Watershed	Sedimentation (roads)		
Buffalo WY BLM Field Office		25%	25%										
Carson NF	10%										10%		
Casper WY BLM Field Office	25%	25%											
Durango CO BLM Field Office	50%	50%			50%								
Glenwood Springs CO BLM Field Office								100%					Uinta/Piceance Study Area
Glenwood Springs CO BLM Field Office	20%	30%	20%										GGR Study Area
Grand Junction CO BLM Field Office	70%			15%					30%				
Kemmerer WY BLM Field Office	30%	50%	50%										
Lander WY BLM Field Office	20%	30%	20%										
Little Snake CO BLM Field Office	20%	30%	20%										
Manti La Sai NF													
Miles City MT BLM Field Office	50%	50%	10%	50%		80%							
Missoula MT BLM Field Office	20%	20%		15%									
Moab UT BLM Field Office	70%						70%			70%			
Pinedale WY BLM Field Office	50%	40%	40%										
Rawlins WY BLM Field Office	20%	30%	20%										
Rock Springs WY BLM Field Office	30%	25%	20%										
Routt-Medicine Bow NF	20%	30%	20%										
Uncompahgre CO BLM Field Office	50%	50%			50%								GGR Study Area
Uncompahgre CO BLM Field Office	10%	10%											Paradox/San Juan Study Area
White River CO BLM Field Office	80%	25%											Uinta/Piceance Study Area
White River CO BLM Field Office	20%	30%	20%										Uinta/Piceance Study Area
White River NF						50%							GGR Study Area

Stipulation Exception Factors (GGRB Study Area)

Stipulation	Exception Factor (EF)
Big Game	20%
Sage Grouse	20%
Raptors	30%
Big Game and Sage Grouse	4%
Big Game/Raptors	6%
Sage Grouse/Raptors	6%
Big Game, Sage Grouse and Raptors	1.2%

NSO Extended Drilling Zone

- To account for industry's ability to reach subsurface targets by directional drilling, use of an "extended drilling zone" of $\frac{1}{4}$ mile (or other appropriate distance).



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With extended drilling zone:

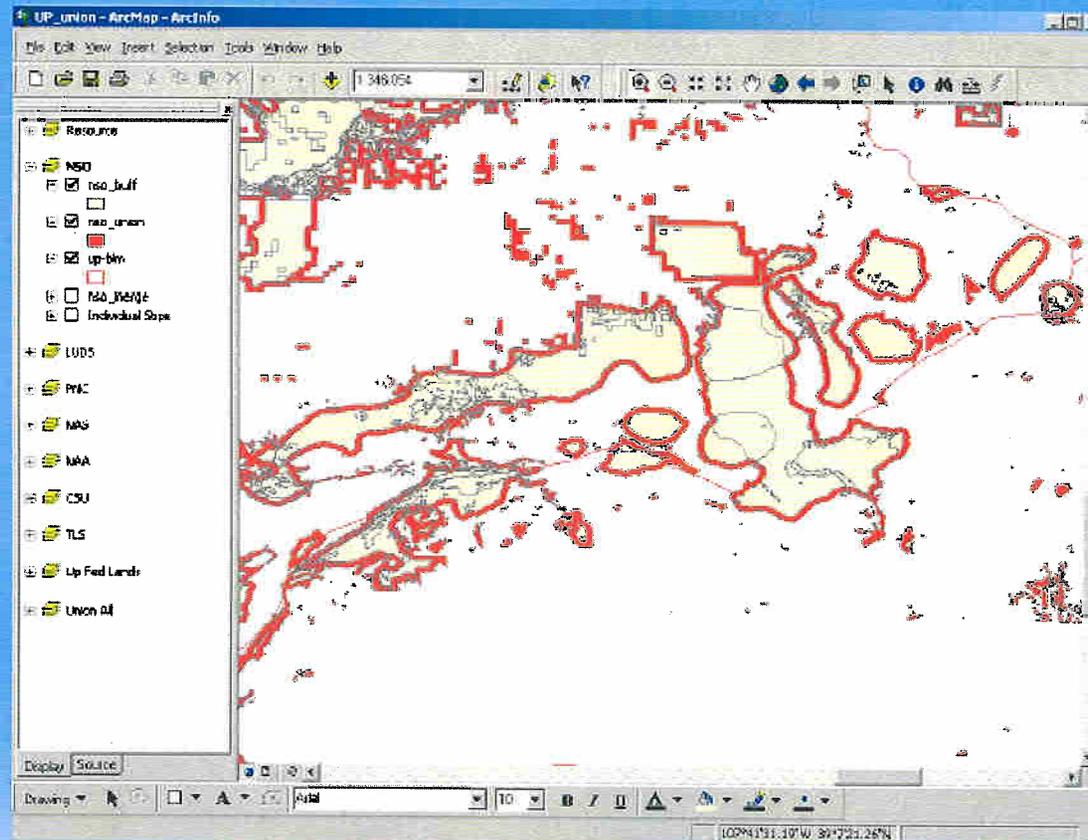
- Location of reachable subsurface target defaults to co-located stipulation (if any)
- Unreachable subsurface target is under NSO.
- Narrow, linear features will be transparent to the analysis

Extended Drilling Zones by Jurisdiction

Jurisdiction	EDZ (miles)	Comments
Albuquerque NM BLM Field Office	0.25	
Ashley NF	0.25	
Beavehead-Deerlodge NF	0.50	
Black Hills NF	0.25	
Buffalo WY BLM Field Office	0.25	
Buffalo Gap NG	0.13	
Butte MT BLM Field Office	0.25	
Carson NF	0.25	
Casper WY BLM Field Office	0.25	
Cedar City UT BLM Field Office	0.00	
Cibola NF	0.25	
Durango CO BLM Field Office	0.00	San Juan Basin portion
Durango CO BLM Field Office	0.50	Paradox Basin portion
Farmington NM BLM Field Office	0.25	
Glenwood Springs CO BLM Field Office	0.25	
Grand Junction CO BLM Field Office	0.25	
Grand Mesa /Uncompahgre /Gunnison NF	0.00	Paradox/San Juan Study Area
Grand Mesa /Uncompahgre /Gunnison NF	0.25	Uinta/Piceance Study Area
Gunnison CO BLM Field Office	0.25	
Helena NF	0.25	
Kanab UT BLM Field Office	0.00	
Kemmerer WY BLM Field Office	0.25	
Lander WY BLM Field Office	0.25	
Lewis and Clark NF	0.25	Eastern portions only
Lewistown MT BLM Field Office	0.25	
Little Snake CO BLM Field Office	0.25	
Manti La Sal NF	0.25	Paradox/San Juan Study Area
Manti La Sal NF	0.50	Uinta/Piceance Study Area
Miles City MT BLM Field Office	0.25	
Missoula MT BLM Field Office	0.50	
Moab UT BLM Field Office	0.25	
Monticello UT BLM Field Office	0.25	
Newcastle WY BLM Field Office	0.00	
Ogala NG	0.13	
Pinedale WY BLM Field Office	0.25	
Price UT BLM Field Office	0.00	Paradox/San Juan Study Area
Price UT BLM Field Office	0.25	Uinta/Piceance Study Area
Rawlins WY BLM Field Office	0.25	
Richfield UT BLM Field Office	0.00	Paradox/San Juan Study Area
Richfield UT BLM Field Office	0.25	Uinta/Piceance Study Area
Rock Springs WY BLM Field Office	0.25	
Routt-Medicine Bow NF	0.25	
Salt Lake UT BLM Field Office	0.25	
Santa Fe NF	0.25	
South Dakota BLM Field Office	0.25	
St. George UT BLM Field Office	0.00	
Thunder Basin NG	0.25	
Uinta NF	0.25	
Uncompahgre CO BLM Field Office	0.50	Paradox/San Juan Study Area
Uncompahgre CO BLM Field Office	0.25	Uinta/Piceance Study Area
Vernal UT BLM Field Office	0.00	
White River CO BLM Field Office	0.25	
White River NF	0.25	

EDZ typically allows access to resources with ¼ mile of NSO boundary

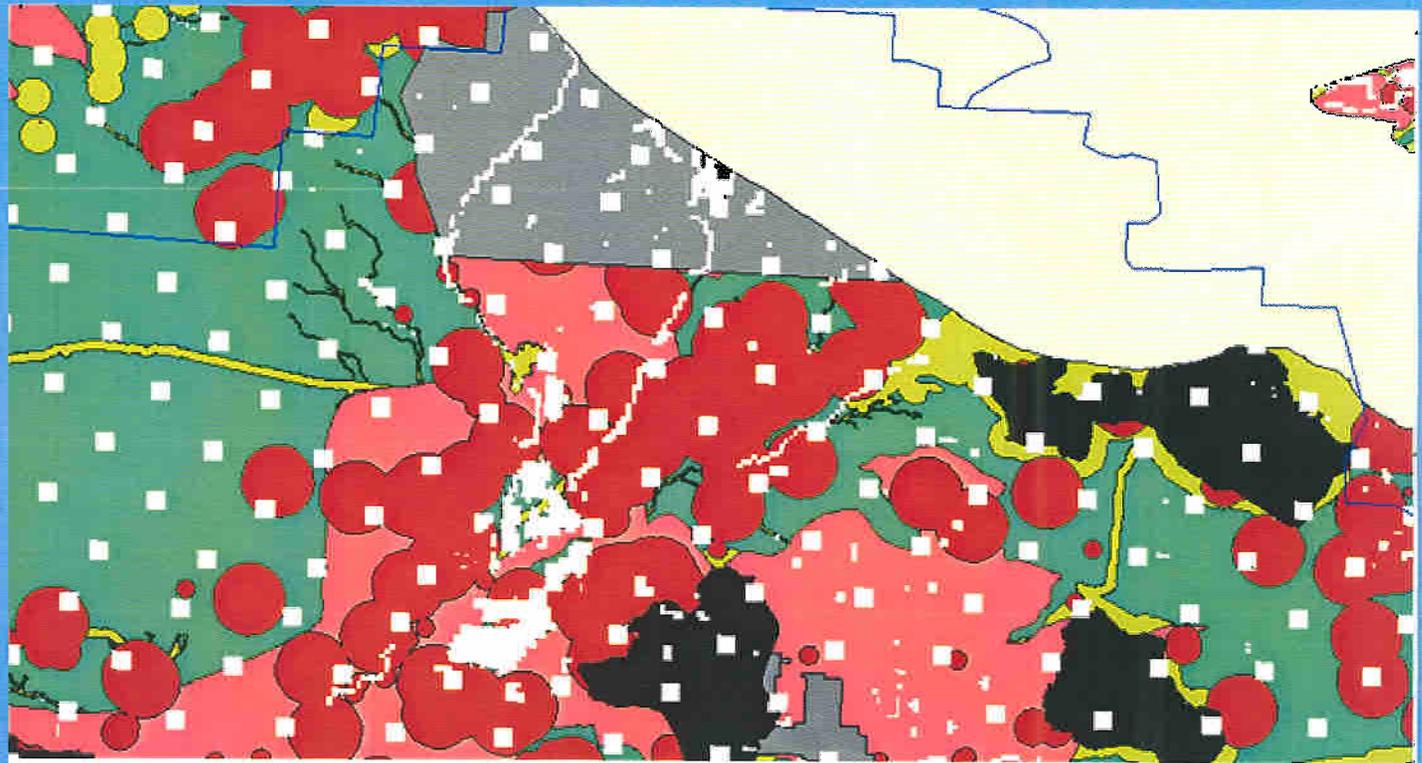
Removal of Extended Drilling Zone from NSO Areas



Application of the Categorization Hierarchy

Access Categorization

No Leasing (Statutory/Executive Order)
No Leasing (Administrative) Land Use Planning
No Leasing (Administrative)
No Surface Occupancy
Timing Limitations >9 Months
Timing Limitations 6-9 Months
Timing Limitations 3-6 Months
Timing Limitations < 3 months
Controlled Surface Use
Shaded Lease Terms



Categorization: TLS 6-9

Stipulation/Land Use Designation

Antelope winter range

Mule deer winter range

Sage grouse nest habitat

J F M A M J J A S O N D



Resources Used in the Analysis

- **US Geological Survey and Energy Information Administration (EIA, a independent agency within DOE) resource determinations were used.**
- **Resources are of three types depending on certainty of occurrence and other factors:**
 - **Undiscovered Technically Recoverable**
 - **Reserves Growth**
 - **Proved reserves**

USGS Province Name	USGS Code	USGS Play or Assessment Unit Name	Play Type	Total Liquids** (MMBbl)	Total Natural Gas*** (Bcf)
Paradox Basin	2101	Buried Fault Blocks, Oilifer Paleozoic	Conventional	62	292
Paradox Basin	2102	Porous Carbonate Buildup	Conventional	192	482
Paradox Basin	2103	Fractured Interbed	Continuous	242	194
Paradox Basin	2104	Permian-Pennsylvanian Marginal Clastics	Conventional	3	56
Paradox Basin	2105	Salt Anticline Flank	Conventional	20	396
Paradox Basin	2106	Permo-Triassic Unconformity	Conventional	21	2
Paradox Basin	2107	Cretaceous Sandstone	Conventional		58
San Juan Basin	50220101	Tertiary Conventional Gas	Conventional	1	80
San Juan Basin	50220161	Pictured Cliffs Continuous Gas	Continuous Gas	17	5,640
San Juan Basin	50220191	Fruitland Fairway Coalbed Gas	Coalbed Gas	2	3,981
San Juan Basin	50220192	Basin Fruitland Coalbed Gas	Coalbed Gas		19,595
San Juan Basin	50220261	Lewis Continuous Gas	Continuous Gas	31	10,177
San Juan Basin	50220302	Gallup Sandstone Conventional Oil and Gas	Conventional	2	<.5
San Juan Basin	50220303	Mancos Sandstones Conventional Oil	Conventional	14	58
San Juan Basin	50220304	Dakota-Greenhorn Conventional Oil and Gas	Conventional	3	22
San Juan Basin	50220361	Mesaverde Central-Basin Continuous Gas	Continuous Gas	5	1,317
San Juan Basin	50220362	Mancos Sandstones Continuous Gas	Continuous Gas	76	5,116
San Juan Basin	50220363	Dakota-Greenhorn Continuous Gas	Continuous Gas	16	3,929
San Juan Basin	50220381	Henefer Coalbed Gas	Coalbed Gas		664
San Juan Basin	50220401	Entrada Sandstone Conventional Oil	Conventional	3	40
Uinta - Piceance Basin	50200101	Conventional Ferron Sandstone Gas	Conventional	<.5	6
Uinta - Piceance Basin	50200161	Deep (6,000 feet plus) Coal and Sandstone Gas	Continuous Gas		59
Uinta - Piceance Basin	50200191	Northern Coal Fairway/Drunkards Wash	Coalbed Gas		752
Uinta - Piceance Basin	50200192	Central Coal Fairway/Buzzards Bench	Coalbed Gas		537
Uinta - Piceance Basin	50200183	Southern Coal Fairway	Coalbed Gas		153
Uinta - Piceance Basin	50200184	Joes Valley and Messina Grabens	Coalbed Gas		NA
Uinta - Piceance Basin	50200185	Southern Coal Outcrop	Coalbed Gas		11
Uinta - Piceance Basin	50200201	Uinta-Piceance Basin Conventional Gas	Conventional	1	66
Uinta - Piceance Basin	50200261	Uinta Basin Continuous Gas Mesaverde TPS	Continuous Gas	11	7,391
Uinta - Piceance Basin	50200262	Uinta Basin Transitional Gas	Continuous Gas	2	1,493
Uinta - Piceance Basin	50200263	Piceance Basin Continuous Gas Mesaverde TPS	Continuous Gas	9	3,064
Uinta - Piceance Basin	50200264	Piceance Basin Transitional Gas	Continuous Gas	1	302
Uinta - Piceance Basin	50200291	Uinta Basin Blackhawk Coalbed Gas	Coalbed Gas		499
Uinta - Piceance Basin	50200292	Mesaverde Group Coalbed Gas	Coalbed Gas		368
Uinta - Piceance Basin	50200361	Piceance Basin Continuous Gas Mancos/Mowry TPS	Continuous Gas	2	1,653
Uinta - Piceance Basin	50200362	Uinta Basin Continuous Gas Mancos/Mowry TPS	Continuous Gas	6	3,111
Uinta - Piceance Basin	50200363	Uinta-Piceance Transitional and Migrated Gas	Continuous Gas	2	1,755
Uinta - Piceance Basin	50200401	Hanging Wall	Conventional	5	28
Uinta - Piceance Basin	50200402	Paleozoic/Mesozoic	Conventional	8	50
Uinta - Piceance Basin	50200501	Uinta Green River Conventional Oil and Gas	Conventional	11	29
Uinta - Piceance Basin	50200502	Piceance Green River Conventional Oil	Conventional	NA	NA
Uinta - Piceance Basin	50200561	Deep Uinta Overpressured Continuous Oil	Continuous Oil	43	64
Southwestern Wyoming	50370101	Sub-Cretaceous Conventional Oil and Gas	Conventional	50	1,383
Southwestern Wyoming	50370201	Mowry Conventional Oil and Gas	Conventional	12	206
Southwestern Wyoming	50370401	Hilliard-Baxter-Mancos Conventional O&G	Conventional	1	15
Southwestern Wyoming	50370501	Mesaverde Conventional Oil and Gas	Conventional	3	56
Southwestern Wyoming	50370601	Mesaverde-Lance-Fort Union Conventional O&G	Conventional	17	320
Southwestern Wyoming	50370701	Lewis Conventional Oil and Gas	Conventional	8	195
Southwestern Wyoming	50370801	Lance-Fort Union Conventional Oil and Gas	Conventional	2	246
Southwestern Wyoming	50370361	Niobrara Continuous Oil	Continuous Oil	107	62
Southwestern Wyoming	50370261	Mowry Continuous Gas	Continuous Gas	174	8,543
Southwestern Wyoming	50370461	Hilliard-Baxter-Mancos Continuous Gas	Continuous Gas	752	11,763
Southwestern Wyoming	50370561	Almond Continuous Gas	Continuous Gas	200	13,350
Southwestern Wyoming	50370962	Rock Springs-Ericson Continuous Gas	Continuous Gas	146	12,178
Southwestern Wyoming	50370661	Mesaverde-Lance-Fort Union Continuous Gas	Continuous Gas	614	13,635
Southwestern Wyoming	50370761	Lewis Continuous Gas	Continuous Gas	541	13,536
Southwestern Wyoming	50370861	Lance-Fort Union Continuous Gas	Continuous Gas	76	7,583
Southwestern Wyoming	50370581	Mesaverde Coalbed Gas	Coalbed Gas		249
Southwestern Wyoming	50370681	Mesaverde Coalbed Gas	Coalbed Gas		27
Southwestern Wyoming	50370682	Fort Union Coalbed Gas	Coalbed Gas		81
Southwestern Wyoming	50370881	Lance Coalbed Gas	Coalbed Gas		165
Southwestern Wyoming	50370882	Fort Union Coalbed Gas	Coalbed Gas		943
Southwestern Wyoming	50370981	Wasatch-Green River Coalbed Gas	Coalbed Gas		65
Powder River Basin	3301	Basin Margin Subthrust	Conventional	21	20
Powder River Basin	3302	Basin Margin Anticline	Conventional	7	4
Powder River Basin	3303	Leo Sandstone	Conventional	81	5
Powder River Basin	3304	Upper Minnelusa Sandstone	Conventional	522	31
Powder River Basin	3305	Lakota Sandstone	Conventional	55	22
Powder River Basin	3306	Fall River Sandstone	Conventional	200	115
Powder River Basin	3307	Buddy Sandstone	Conventional	88	449
Powder River Basin	3308	Deep Frontier Sandstone	Conventional	58	193
Powder River Basin	3310	Turner Sandstone	Conventional	25	32
Powder River Basin	3312	Sussex-Shannon Sandstone	Conventional	72	54
Powder River Basin	3313	Mesaverde-Lewis	Conventional	62	58
Powder River Basin	50330101	E. Basin Margin Upper Fort Union Sandstone	Conventional		27
Powder River Basin	50330181	Wasatch Formation	Coalbed Gas		1,934
Powder River Basin	50330182	Upper Fort Union Formation	Coalbed Gas		12,132
Powder River Basin	50330183	Lower Fort Union-Lance Formations	Coalbed Gas		198
Powder River Basin	50330261	Mowry Continuous Oil Assessment Unit	Continuous Oil	209	198
Powder River Basin	50330361	Niobrara Continuous Oil Assessment Unit	Continuous Oil	240	227
Powder River Basin	50330461	Shallow Continuous Biogenic Gas AU	Continuous Gas		787
Montana Thrust Belt	50270101	Thrust Belt Conventional Gas and Oil	Conventional	134	5,761
Montana Thrust Belt	50270102	Sawtooth Range Structure Conventional O&G	Conventional	18	795
Montana Thrust Belt	50270103	Frontal Structures Conventional Oil and Gas	Conventional	68	1,182
Montana Thrust Belt	50270201	Helena Salient Conventional Oil and Gas	Conventional	15	639
Montana Thrust Belt	50270401	Blacktail Salient Conventional Oil and Gas	Conventional	6	16
Montana Thrust Belt	50270581	Marias River Shale Continuous Oil	Continuous Oil	33	111
Montana Thrust Belt	50270701	Tertiary Basins Oil and Gas	Conventional	73	124
Totals				5,510	183,264

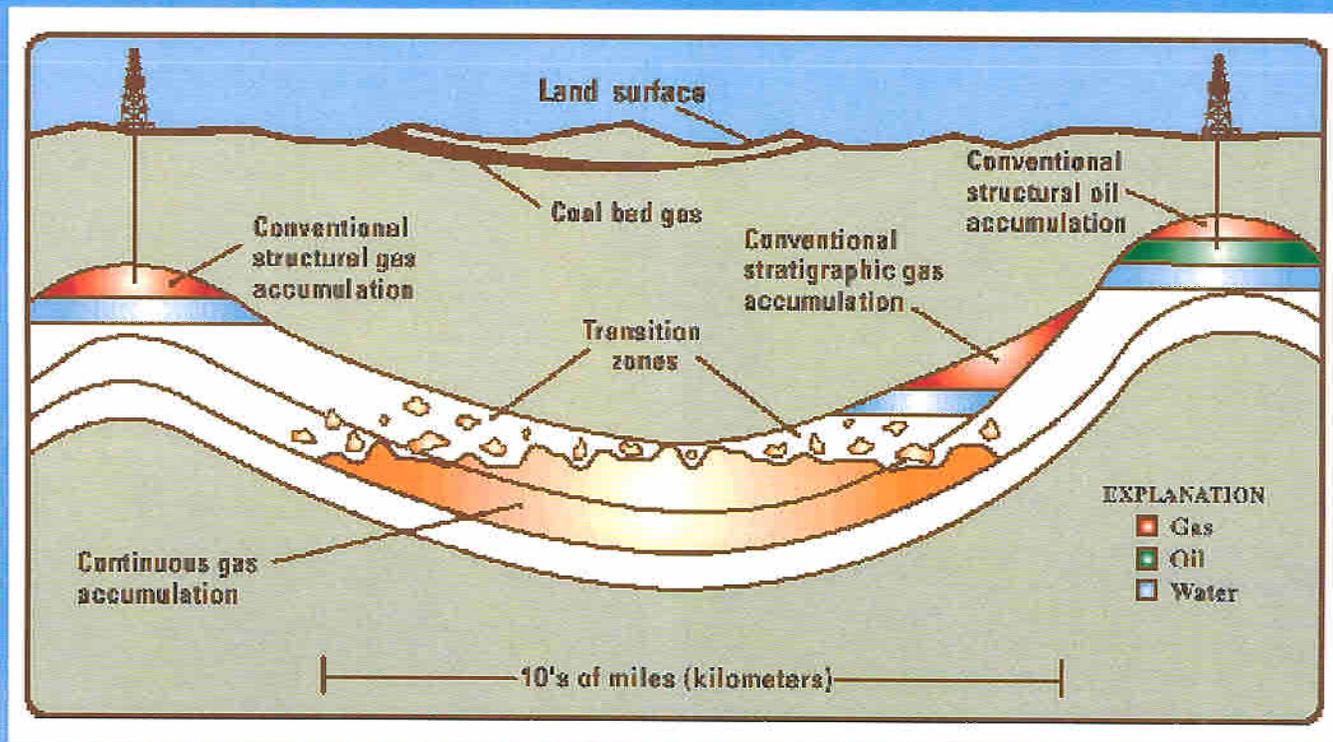
Undiscovered Technically Recoverable Resources by Play

EPCA Phase I Totals

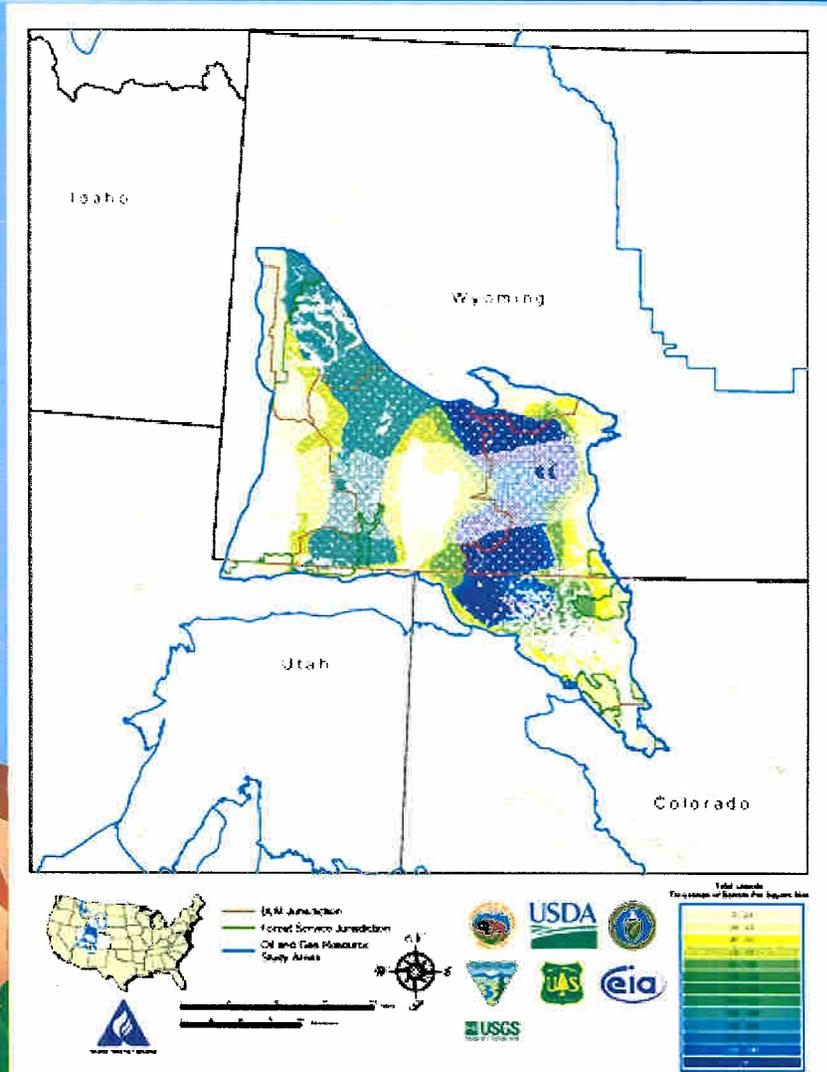
Total Liquids: 5.5 billion bbls

Total Natural Gas: 183 Tcf

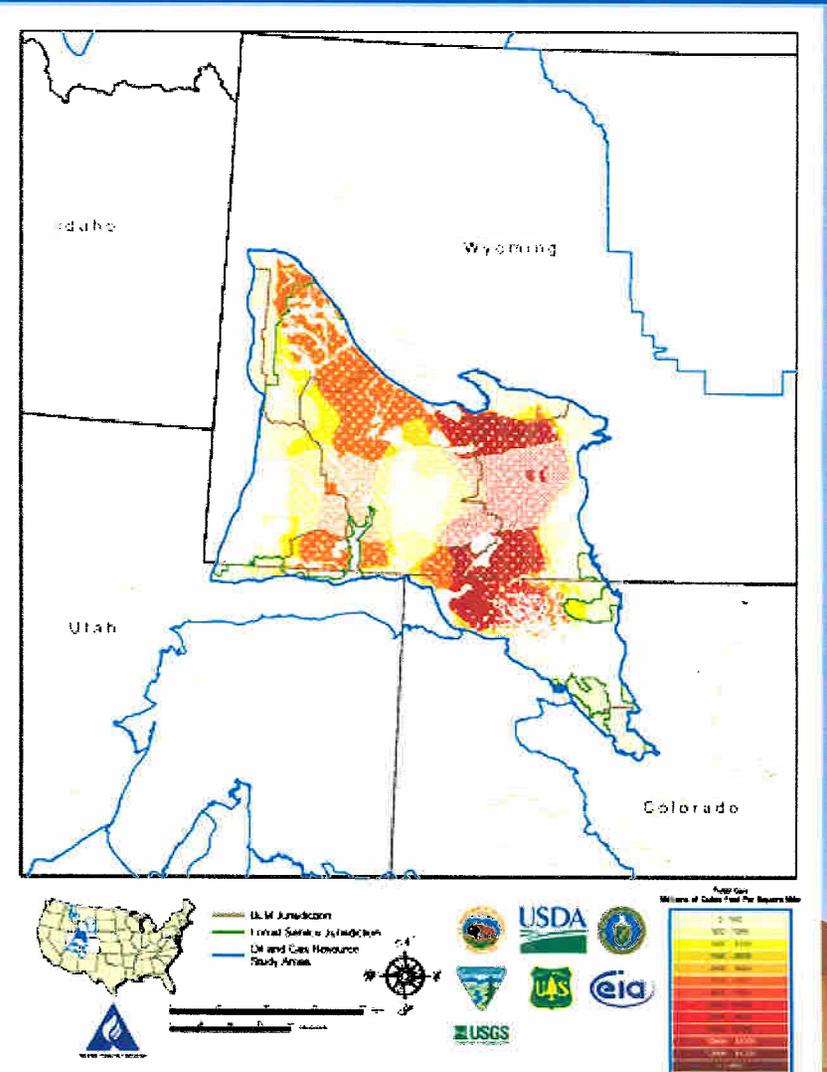
Conventional vs. Continuous Resource Accumulations



USGS Undiscovered Technically Recoverable Resources



Oil



Gas

Reserves Growth

- **Accounts for the fact that, ultimately, more oil/gas is recovered from a field as development occurs than is booked in proved reserves with discovery**
- **Is a significant portion of resources and is subject to stipulations similar to undiscovered resources**



Proved Reserves

Basin	Number of Fields	Total Liquid Reserves (Mbbbl)	Federal Land Liquid Reserves	Percent	Total Gas Reserves (MMcf)	Federal Land Gas Reserves	Percent	Total BOE Reserves (Mbbbl)	Federal Land BOE Reserves	Percent
<i>Paradox-San Juan</i>	250	174,193	53,103	30.5	20,653,622	11,033,357	53.4	3,616,464	1,891,996	52.3
<i>Uinta-Piceance</i>	180	254,329	142,495	56.0	7,181,669	3,779,755	52.6	1,451,274	772,454	53.2
<i>Greater Green River</i>	281	177,362	122,234	68.9	12,703,038	10,081,667	79.4	2,294,535	1,802,512	78.6
<i>Powder River</i>	543	193,456	110,783	57.3	2,398,604	927,738	38.7	593,223	265,406	44.7
<i>Montana Thrust Belt</i>	1	1	0	0.0	0	0	0.0	1	0	0.0
<i>Total</i>	1,255	799,341	428,616	53.6	42,936,933	25,822,517	60.1	7,955,497	4,732,368	59.5

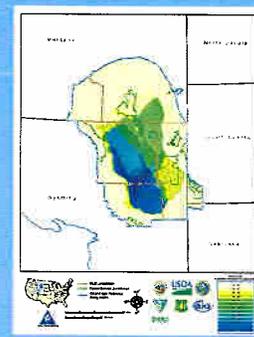
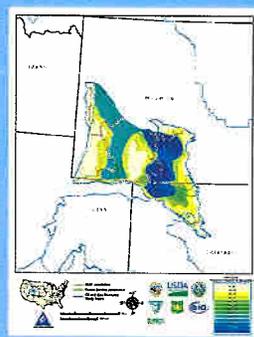
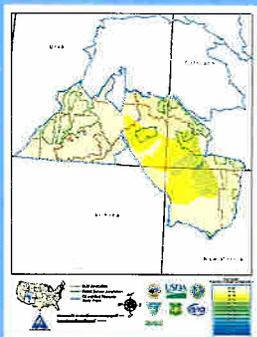
• Proved Reserves

- were categorized as **Standard Lease Terms (Category 10)** in EPCA Phase I
- Will be a separate category (**Category 10**) in cumulative EPCA Phases I & II

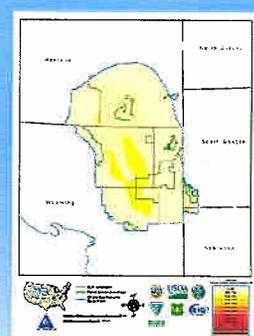
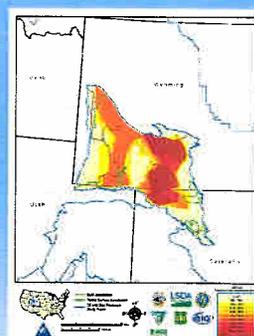
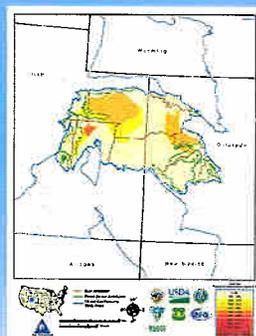
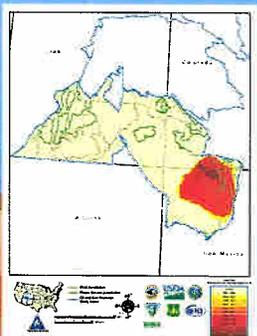
Data Integration/Spatial Analysis

Land Access Categories

+ Oil



+ Gas



=



EPCA Inventory Phase I

Results

EPCA Phase I

Summary of All EPCA Inventory Areas—Oil and Natural Gas Resources Affected by Access Categories

Level	Access Category	Area		Resources			
		(acres x1000)	Percent of Federal	Total Liquids* (MMBbl)**	Percent of Federal	Total Natural Gas*** (Bcf)****	Percent of Federal
1	No Leasing (Statutory/Executive Order)	10,058	17%	298	8%	9,035	7%
2	No Leasing (Administrative, Pending Land Use Plan)	6,007	10%	116	3%	3,690	3%
3	No Leasing (Administrative)	5,098	9%	182	5%	3,185	2%
4	Leasing, No Surface Occupancy	2,714	5%	50	1%	3,120	2%
5	Leasing, Cumulative Timing Limitations on Drilling >9 Months	25	0%	3	0%	114	0%
6	Leasing, Cumulative Timing Limitations on Drilling 6-9 Months	2,521	4%	250	6%	5,549	4%
7	Leasing, Cumulative Timing Limitations on Drilling 3-6 Months	5,442	9%	528	14%	20,401	15%
8	Leasing, Cumulative Timing Limitations on Drilling <3 Months	697	1%	8	0%	733	1%
9	Leasing, Controlled Surface Use	3,753	6%	221	6%	6,080	4%
10	Leasing, Standard Lease Terms	23,091	39%	2,198	57%	86,566	63%
Total Federal Lands Including Split Estate		59,416	100%	3,854	100%	138,472	100%
Total Non-Federal		44,256		2,455		87,668	
Total Study Area		103,672		6,309		226,141	

* Comprising oil, NGLs and liquids associated with natural gas reservoirs

** Comprising associated dissolved and nonassociated natural gas

***MMBbl -- Millions of Barrels

****Bcf -- Billion cubic feet

Small rounding errors may be present

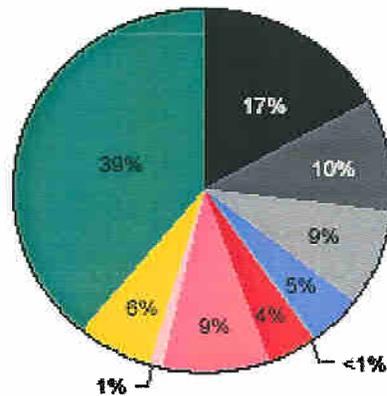
Closed to leasing	21,173	36%	596	15%	15,910	11%
Leasing with restrictions	15,152	26%	1,060	28%	35,997	26%
Leasing with standard lease terms	23,091	39%	2,198	57%	86,566	63%



EPCA Phase I

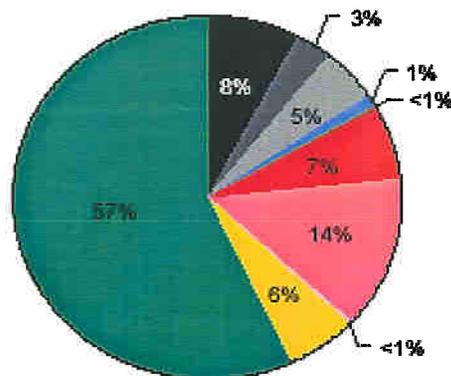
Summary of All EPCA Inventory Areas—Oil and Natural Gas Resources Affected by Access Categories

Percent of Federal and Split Estate Lands

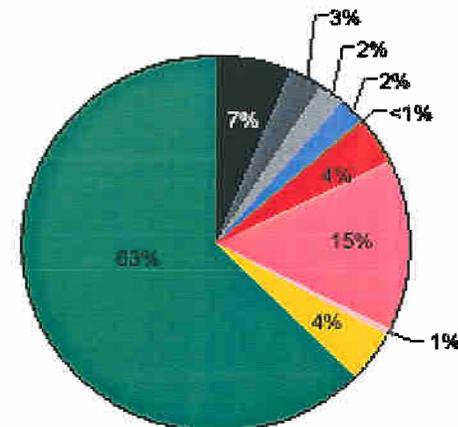


- No Leasing (Statutory/Executive Order)
- No Leasing (Administrative, Pending Land Use Plan)
- No Leasing (Administrative)
- Leasing, No Surface Occupancy
- Leasing, Cumulative Timing Limitations on Drilling >9 Months
- Leasing, Cumulative Timing Limitations on Drilling 6-9 Months
- Leasing, Cumulative Timing Limitations on Drilling 3-6 Months
- Leasing, Cumulative Timing Limitations on Drilling <3 Months
- Leasing, Controlled Surface Use
- Leasing, Standard Lease Terms

Percent of Oil Resources



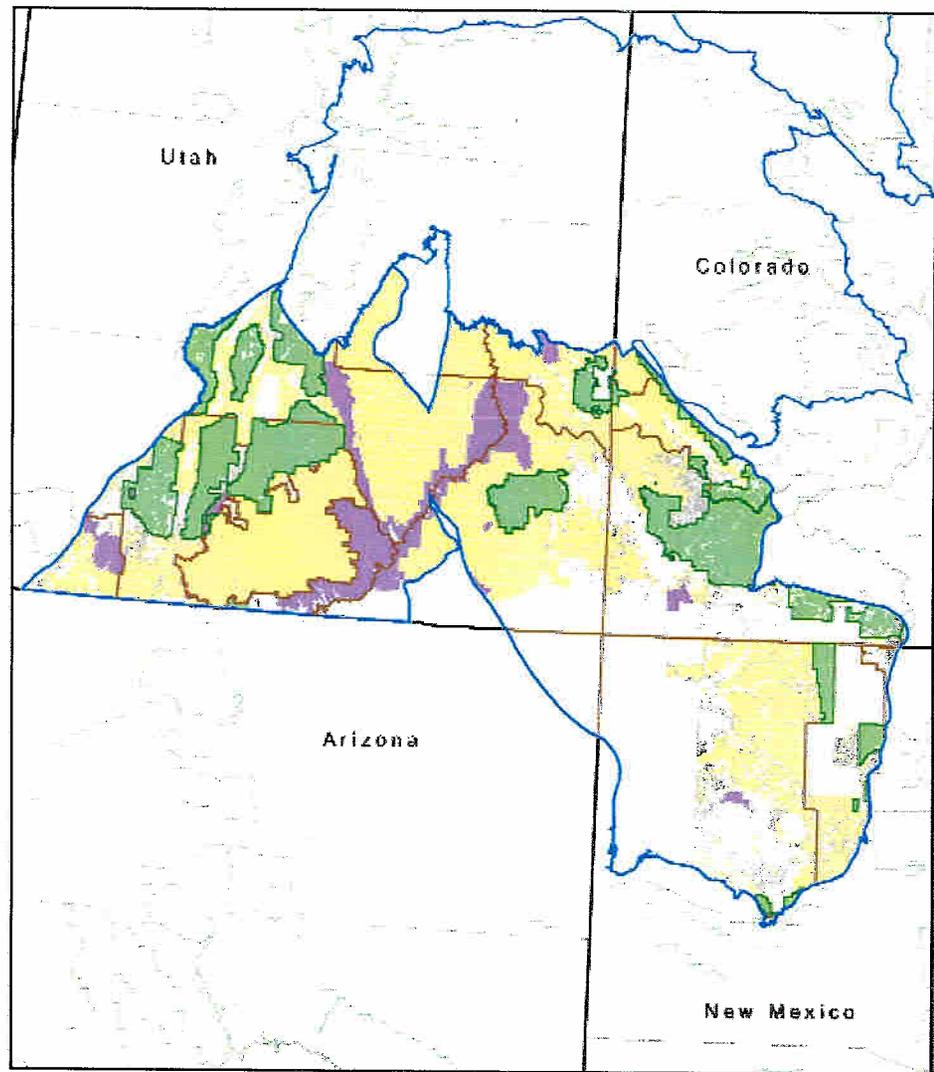
Percent of Natural Gas Resources





Example Results for a Study Area

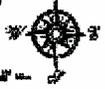




EPCA Phase I Federal Land Status Map Paradox/San Juan Study Area

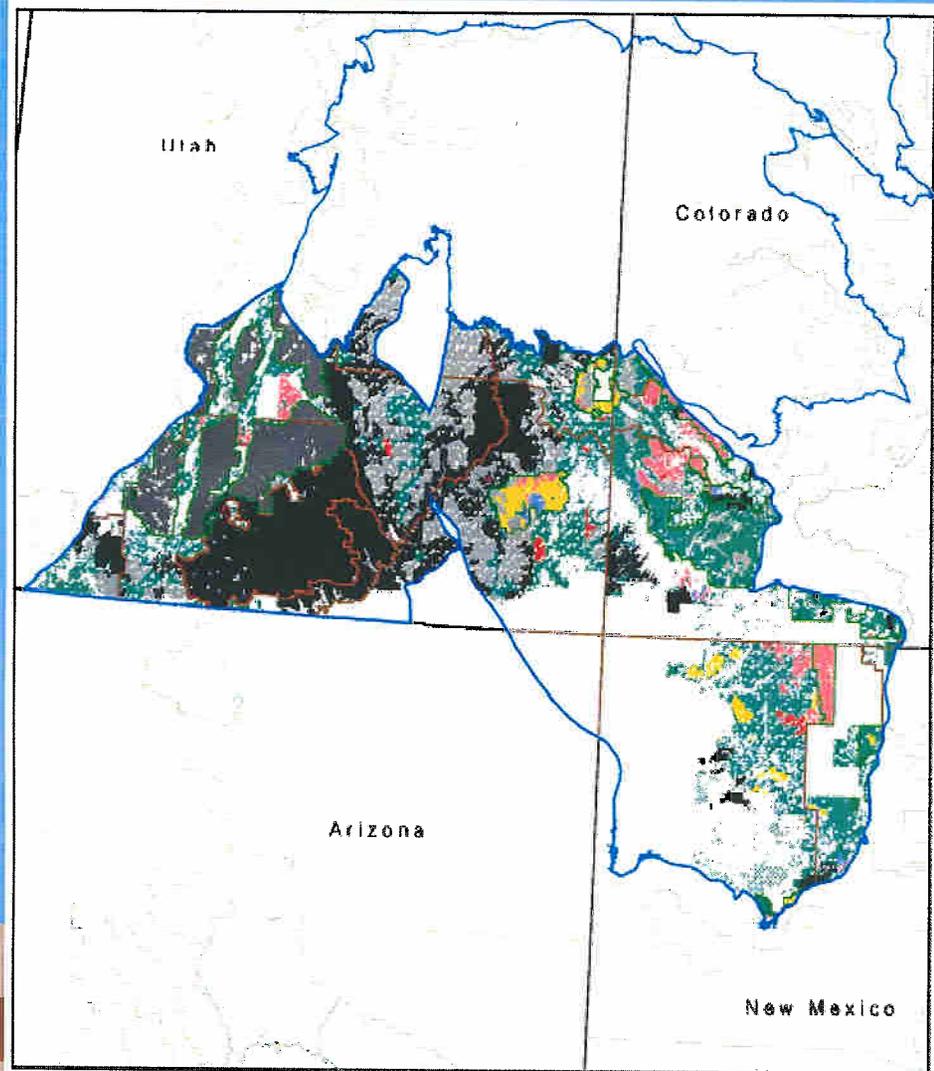


- BLM Jurisdiction
- Forest Service Jurisdiction
- Oil and Gas Resource Study Areas



Land Status Within Study Areas

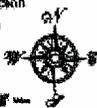
Review of Land Management
Forest Service
National Park Service
Bureau of Reclamation
Public Lands Division
Department of Defense
Open Lands
Not Part of Land



EPCA Phase I Land Access Categorization Paradox/San Juan Study Area

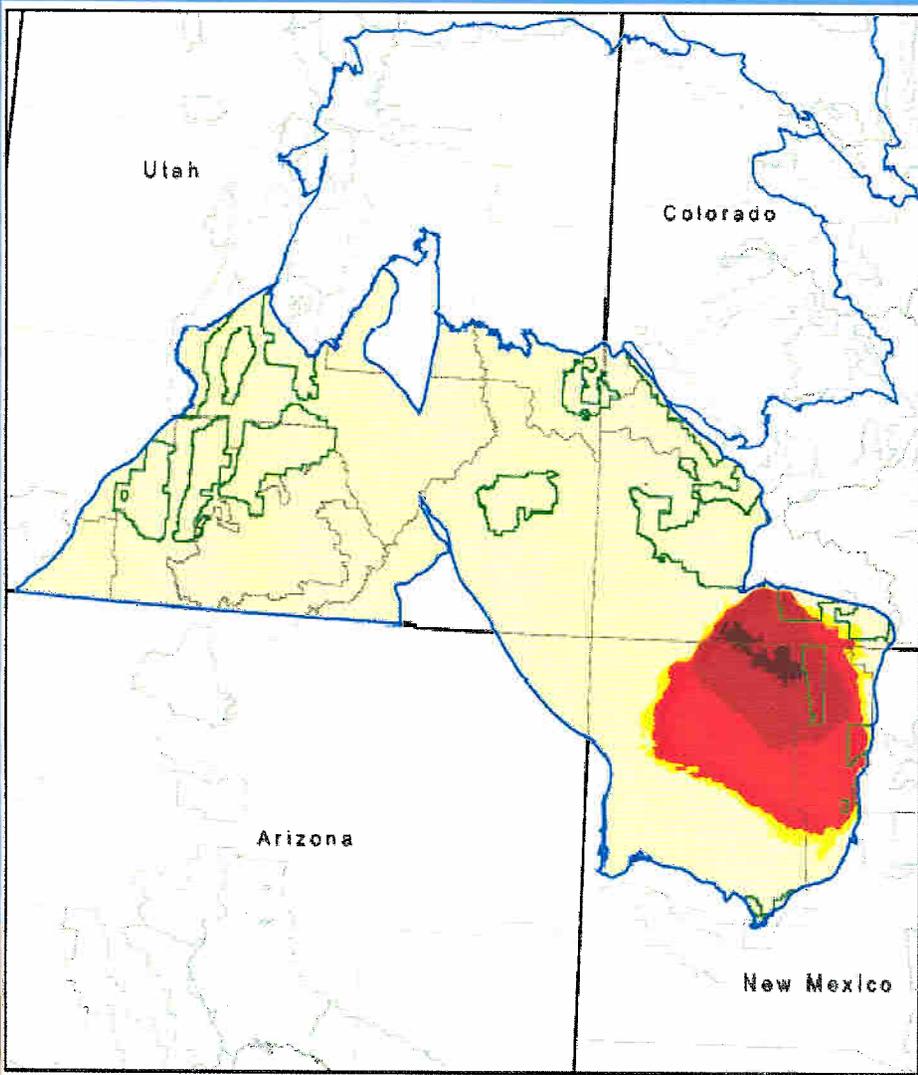


— BLM Jurisdiction
 — Forest Service Jurisdiction
 — Oil and Gas Resource Study Areas



Access Categorization	
Not Available for Management	Black
Not Available for Management	Dark Grey
Not Available for Management	Light Grey
Not Available for Management	White
Not Available for Management	Light Blue
Not Available for Management	Blue
Not Available for Management	Dark Blue
Not Available for Management	Red
Not Available for Management	Orange
Not Available for Management	Yellow
Not Available for Management	Green
Not Available for Management	Dark Green
Not Available for Management	Light Green
Not Available for Management	White

EPCA Phase I Total Gas Map Paradox/San Juan Study Area



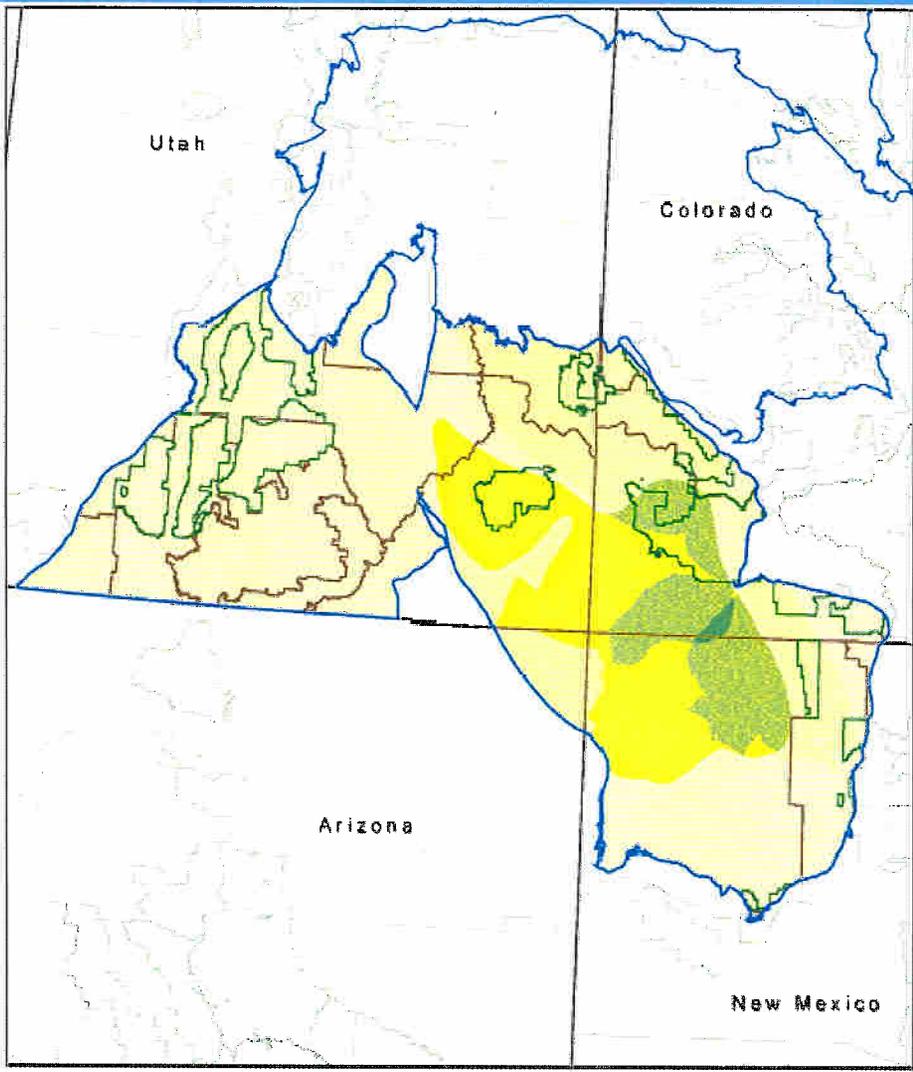
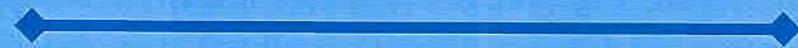
- BLM Jurisdiction
- Forest Service Jurisdiction
- Oil and Gas Resource Study Areas



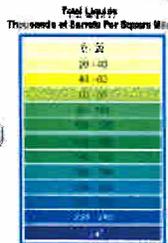
Total Gas
Millions of Cubic Feet Per Square Mile

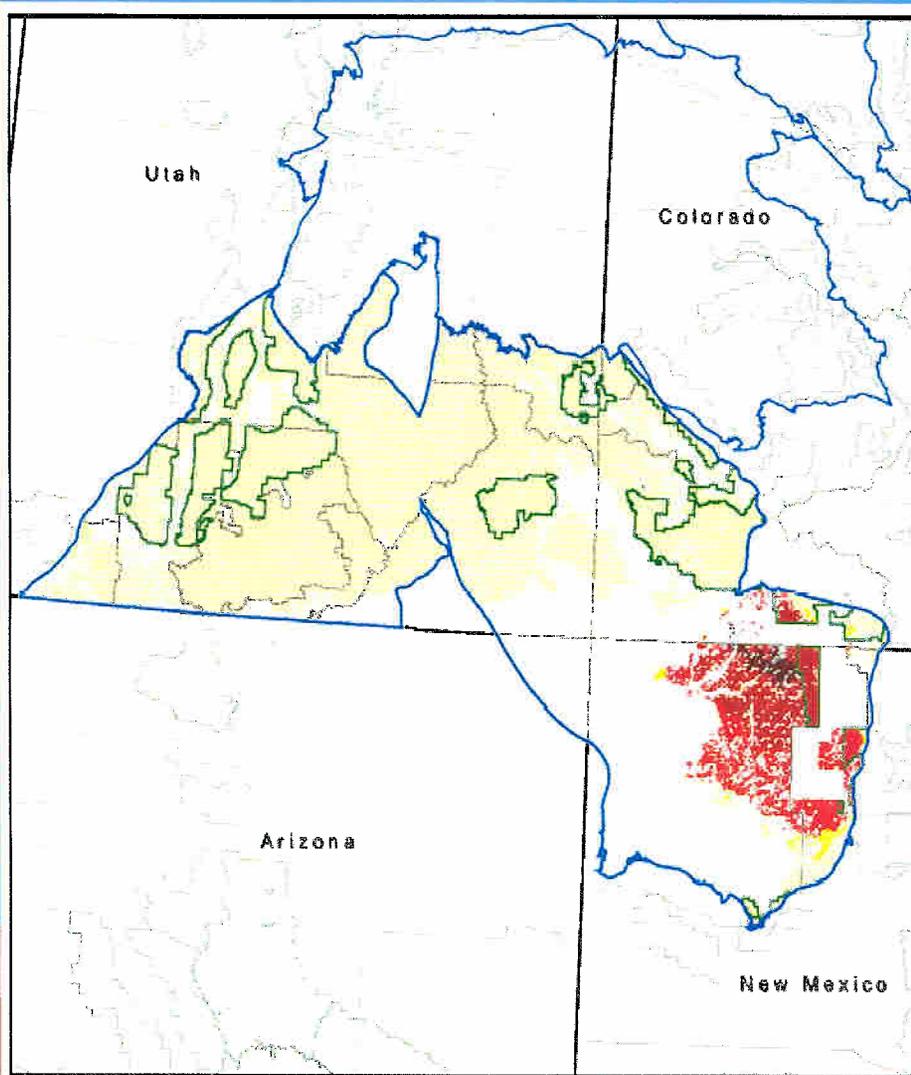


EPCA Phase I Total Liquids Map Paradox/San Juan Study Area



- BLM Jurisdiction
- Forest Service Jurisdiction
- Oil and Gas Resource Study Areas

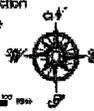




EPCA Phase I Access Map, Total Gas Paradox/San Juan Study Area Categories 1-10

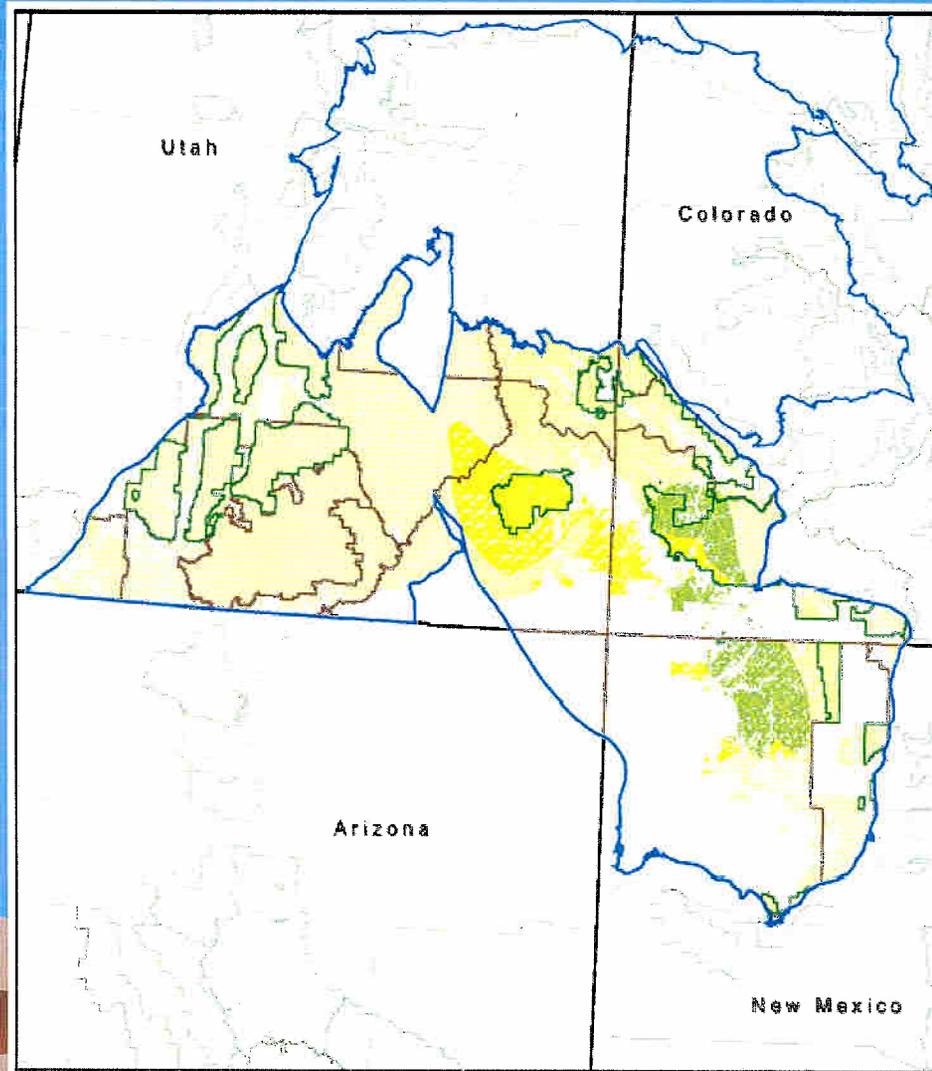


— BLM Jurisdiction
— Forest Service Jurisdiction
— Oil and Gas Resource Study Areas

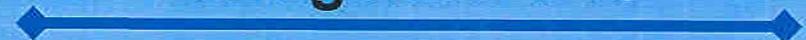


Total Gas
Millions of Cubic Feet Per Square Mile

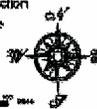




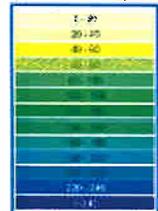
EPCA Phase I Access Map, Total Liquids Paradox/San Juan Study Area Categories 1-10



- BLM Jurisdiction
- Forest Service Jurisdiction
- Oil and Gas Resource Study Area



Total Liquids
Thousands of Barrels Per Square Mile



EPCA Phase I

Results—Land and Resources Categorization, Paradox/San Juan Study Area

Level	Access Category	Area		Resources			
		(acres x1000)	Percent of Federal	Total Liquids* (MMBbl)***	Percent of Federal	Total Natural Gas** (Bcf)****	Percent of Federal
1.	No Leasing (Secretary/Executive Order), (NLS)	5,308	30%	68	15%	540	1%
2.	No Leasing (Administrative), (NLA/LLP)	2,050	12%	4	1%	1	0%
3.	No Leasing (Administrative), (NLA)	2,080	13%	66	16%	647	2%
4.	Leasing, No Surface Occupancy (NSO)	186	1%	6	1%	67	0%
5.	Leasing, Cumulative Timing Limitations on Drilling >8 Months (TL >8)	0	0%	0	0%	0	0%
6.	Leasing, Cumulative Timing Limitations on Drilling 6-8 Months (TL 6-8)	85	1%	4	1%	402	1%
7.	Leasing, Cumulative Timing Limitations on Drilling 3-6 Months (TL 3-6)	784	4%	55	8%	4,015	11%
8.	Leasing, Cumulative Timing Limitations on Drilling <3 Months (TL <3)	23	0%	1	0%	10	0%
9.	Leasing, Controlled Surface Use (CSU)	542	3%	25	5%	1,780	5%
10.	Leasing, Standard Lease Terms (SLTs)	5,960	34%	224	52%	28,869	79%
Total, Federal Lands Including Split Estate		17,628	100%	430	100%	36,340	100%
Total Non-Federal		11,040		404		36,142	
Total Study Area		28,668		834		72,482	

* Comprising oil, NGLs and liquids associated with natural gas reservoirs

** Comprising associated dissolved and nonassociated natural gas

***MMBbl -- Millions of Barrels

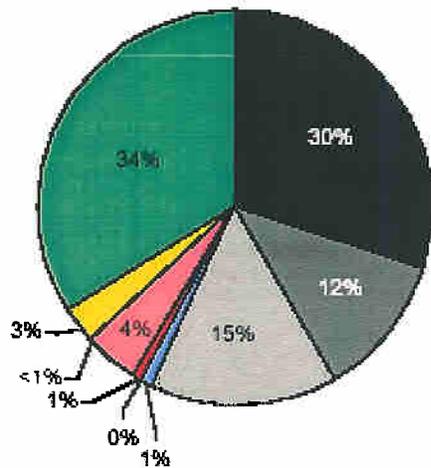
****Bcf -- Billion cubic feet

Closed to leasing	10,048	37%	138	32%	1,167	3%
Leasing with restrictions	1,020	8%	66	16%	6,266	17%
Leasing with standard lease terms	5,960	34%	224	52%	28,869	79%

EPCA Phase I

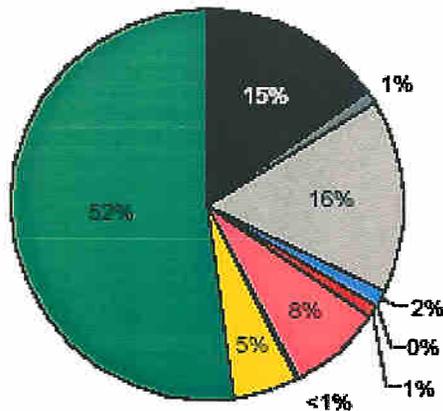
Chart of Results—Land and Resources Categorization, Paradox/San Juan Study Area

Percent of Federal and Split Estate Lands

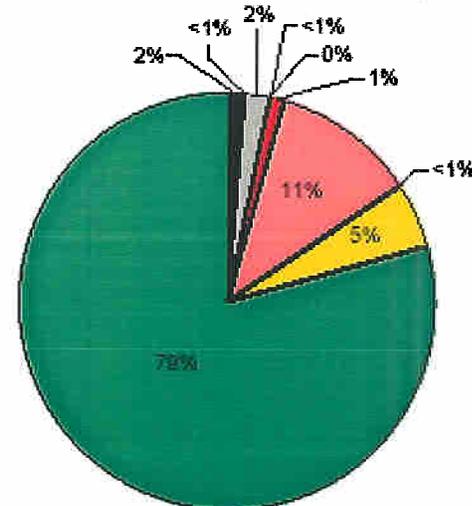


- No Leasing (Statutory/Executive Order)
- No Leasing (Administrative, Pending Land Use Plan)
- No Leasing (Administrative)
- Leasing, No Surface Occupancy
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- Leasing, Cumulative Timing Limitations on Drilling 3-6 Months
- Leasing, Cumulative Timing Limitations on Drilling <3 Months
- Leasing, Controlled Surface Use
- Leasing, Standard Lease Terms

Percent of Oil Resources



Percent of Natural Gas Resources





Input Sought for the Study



Input Sought for the Study

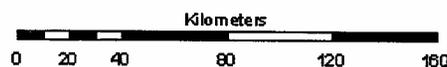
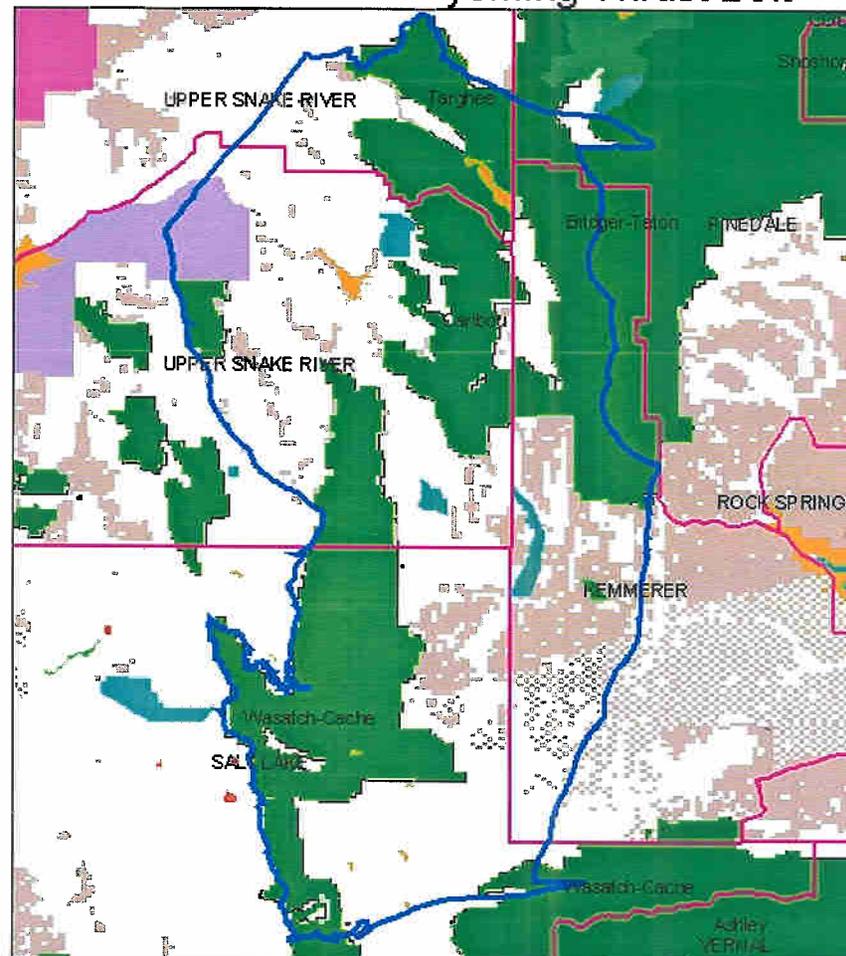


- **Input sought from FOs in three key areas:**
 - **Parameter Design: Practical Implementation of Stipulations**
 - **Parameter Design: NSO Extended Drilling Zone**
 - **Additional Issues**

Wyoming Thrust Belt Study Area



EPCA Phase II - Wyoming Thrust Belt



1:2,500,000



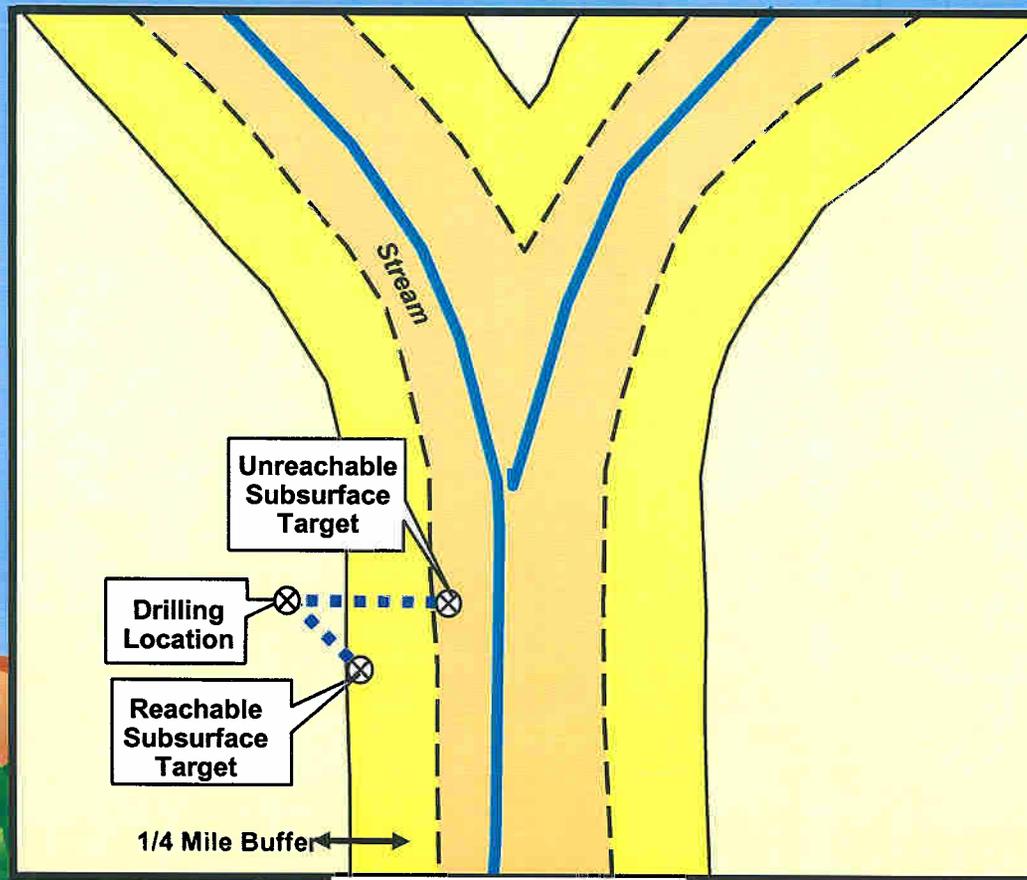
- Wyoming Thrust Belt Study Area
- BLM Districts
- Federally Owned Land (ESRI Data)**
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Forest Service
- Fish and Wildlife Service
- National Park Service
- Other Agencies (NASA, DOE, DOT, DOP, TVA...)

Parameter Design: Practical Implementation of Stipulations

- Input regarding the "top three" significant lease stipulations that, from an implementation point-of-view:
 - are not in force in all instances/seasons
 - and for what portion of the instances/time exceptions are granted
- For example in the Green River Basin study area, Big Game Winter Range stipulations were “discounted” (assumed to be granted exceptions/waivers/modifications) 20% of the time

Parameter Design: NSO Extended Drilling Zone

- To account for industry's ability to reach subsurface targets by directional drilling, use of an "extended drilling zone" of ¼ mile (or other appropriate distance) has been proposed.



With extended drilling zone:

- Location of reachable subsurface target defaults to co-located stipulation (if any).
- Unreachable subsurface target is under NSO.

NSO Extended Drilling Zone General Guidance

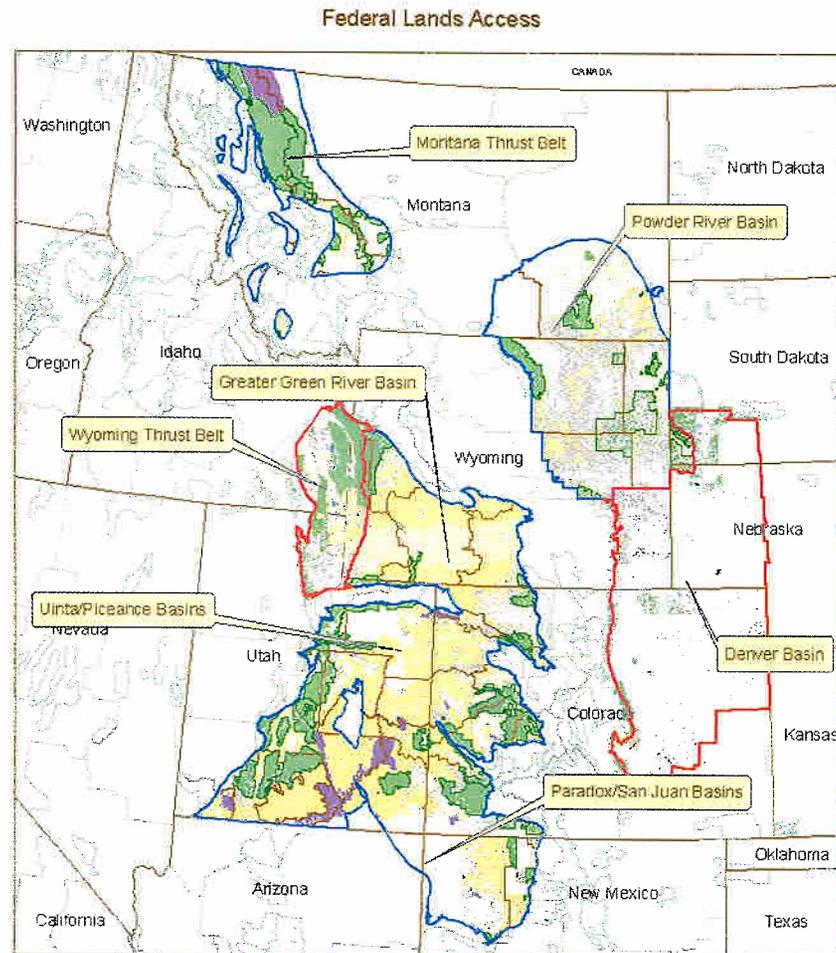
- Based on previous studies, the EDZ has generally been based upon historic activity and the average depth of undiscovered resource objectives:
 - 0 miles for depths < 5000' (esp. CBM)
 - 1/4 mile for depths of 5000' to 10,000'
 - 1/2 mile for depths > 10,000'



Additional Issues

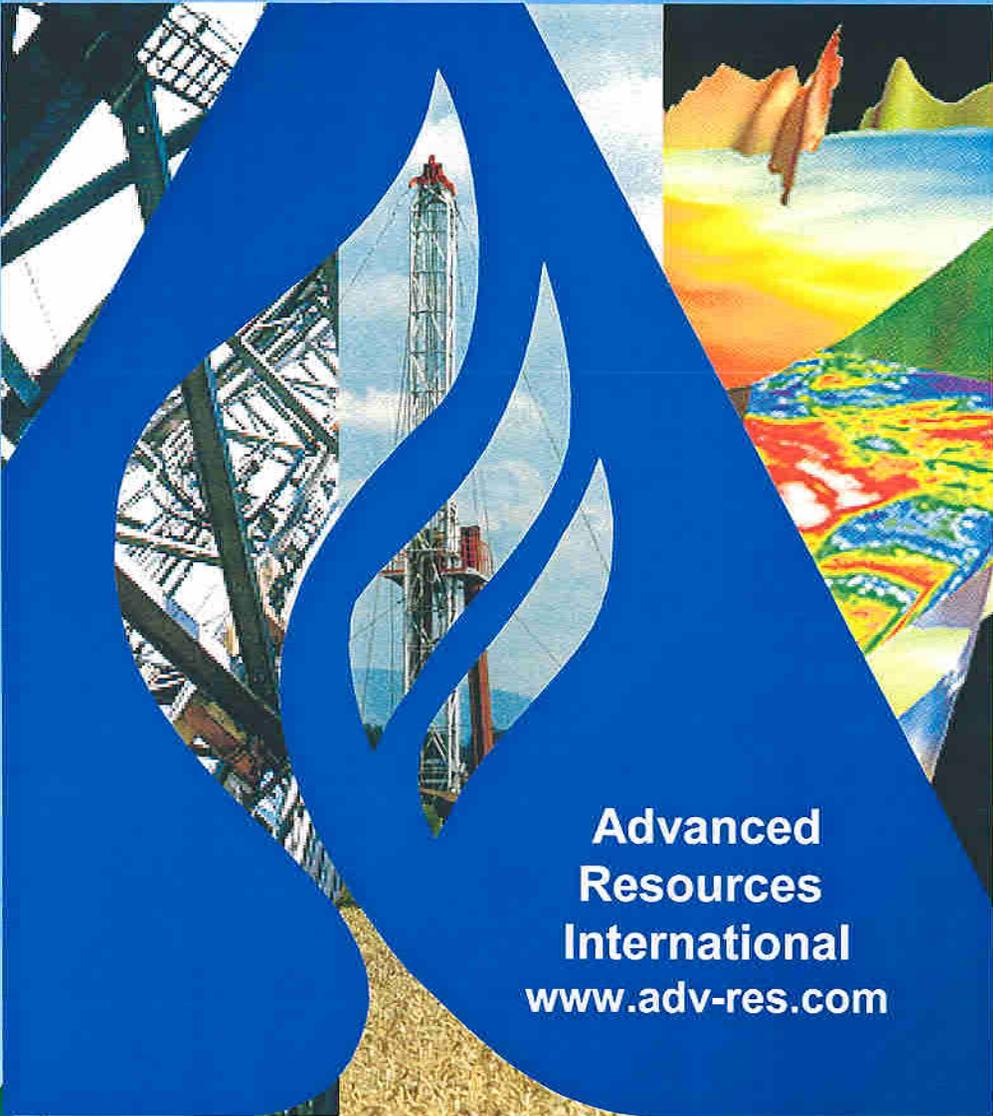
- **Insight into additional land access issues such as:**
 - **Drilling activity, APD duration (average)**
 - **National Environmental Policy Act**
 - **Endangered Species Act**
 - **Roadless Areas, WRAs, CPAs**
 - **COAs**
 - **Tribal consultation**
 - **Staffing adequacy**
 - **O & G vs coal and mineral development**
 - **Visual resources**
 - **Air quality**
 - **Clean water**
 - **Cultural resources/National Historic Preservation Act**
 - **Infrastructure concerns**

Basins Presently Available for DOE Metrics



Legend

Green	Bureau of Land Management
Yellow	State Lands
Red	Private Lands
Blue	Water of Reclamation
Purple	State/County/Local
Black	Department of Defense
White	Non-Federal



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