

# 1.0 Introduction

As the energy needs of the nation continue to grow, the onshore sedimentary basins of the United States become increasingly significant oil and natural gas sources to help meet these needs, especially for natural gas. In 2005, the U.S. consumed about 22 trillion cubic feet (TCF) of natural gas, produced approximately 18 TCF of that consumption domestically, and imported the remaining 4 TCF. Onshore Federal lands produced about 16% of the 2005 domestic consumption. The Energy Information Administration (EIA) in its Annual Energy Outlook 2006 Reference Case predicts that the demand for natural gas will rise to nearly 27 TCF by 2025, of which over 5 TCF will be imported.<sup>1</sup>

Based on recent U.S. Geological Survey (USGS)<sup>2</sup> and Minerals Management Service (MMS)<sup>3</sup> assessments, the nation's undiscovered natural gas resources<sup>4</sup> total approximately 1,040 TCF. The largest potential source for domestic natural gas production is the Outer Continental Shelf (OCS) with approximately 40 percent of the nation's undiscovered natural gas resources. However, EIA data indicate that OCS natural gas production peaked in 1996 at 4.7 TCF and is forecast to be 4.3 TCF per year in 2025, based largely on production from the Gulf of Mexico.

<sup>1</sup> Available on the EIA website:  
<http://www.eia.doe.gov/oiaf/aeo/key.html>

<sup>2</sup> Available on the USGS website:  
<http://energy.cr.usgs.gov/oilgas/noga/index.htm>

<sup>3</sup> Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2006 Update, available on the MMS website:  
<http://www.mms.gov/revaldiv/PDFs/2006NationalAssessmentBrochure.pdf>

<sup>4</sup> See the "Undiscovered Petroleum Resources" definition in Appendix 2.

The nation's second largest natural gas source is the non-Federal onshore lands and state waters, containing about 35 percent of the total.<sup>5</sup> Onshore Federal lands contain the remaining 25 percent. This inventory analyzes onshore Federal natural gas resources in 11 areas, totaling 187 TCF. This 187 TCF would be sufficient to meet the nation's current residential consumption for nearly 39 years.

Similarly, the U.S. consumed about 7.6 billion barrels (Bbbls) of oil in 2005. About 60% of this oil was imported. Onshore Federal lands produced about 5% of the 2005 domestic consumption. The EIA predicts that the nation will consume 9.5 Bbbls in 2025.

The nation's undiscovered oil resources total slightly over 133 Bbbls. Of that total, the MMS estimates that 86 Bbbls are offshore under the OCS, comprising 64 percent of the nation's resources. Federal onshore oil resources are the second largest potential source of production (20 percent) followed by state waters and non-Federal onshore resources (16 percent).

This inventory estimates that, in the 11 areas examined, there are 21.2 Bbbls of oil resources on Federal onshore lands. Of that total, 17.1 Bbbls occur within just two areas of Northern Alaska: the National Petroleum Reserve-Alaska (NPR-A) and the Arctic National Wildlife Refuge (ANWR) 1002 area.

It is clear that Federal lands will be an important future energy supply source. According to the EIA, the Rocky Mountain

<sup>5</sup> Advanced Resources International estimate

region was poised in 2005 to eclipse the Gulf Coast as the single largest supplier of natural gas to the nation. The sedimentary basins in the Interior West are particularly significant future sources of natural gas, and the Alaska North Slope is similarly noteworthy with respect to both oil and gas. Considerable natural gas supply would become available to the lower 48 states with the building of an Alaskan natural gas pipeline.

Congress directed the Secretary of the Interior to inventory the nation's Federal onshore oil and gas resources in relation to Federal actions that inhibit access to these resources. The purpose of this inventory is to add clarity to the debate and assist energy policymakers and Federal land managers in making decisions concerning oil and gas development.

The Phase II inventory examines areas extending from Alaska to Florida (Figure 1-1). Of the more than 295 million acres within these study areas, over 99 million acres of Federal lands (including split estate) were analyzed.

A full set of acronyms used in this report, as well as a glossary, can be found in Appendices 1 and 2, respectively.

## 1.1 Background

Access to Federal lands is probably the most oft-cited issue affecting onshore domestic oil and gas exploration and production. The restrictions and impediments that constrain access to Federal lands are frequently a complex patchwork of requirements that can preclude drilling or increase costs and delay activity. They include areas unavailable for leasing and areas where the minerals can be leased, but the surface of the land may not

be occupied thereby affecting recovery of those resources. There are also limitations on drilling activities due to a variety of environmental considerations, typically manifested as lease stipulations and drilling permit conditions of approval (COAs).

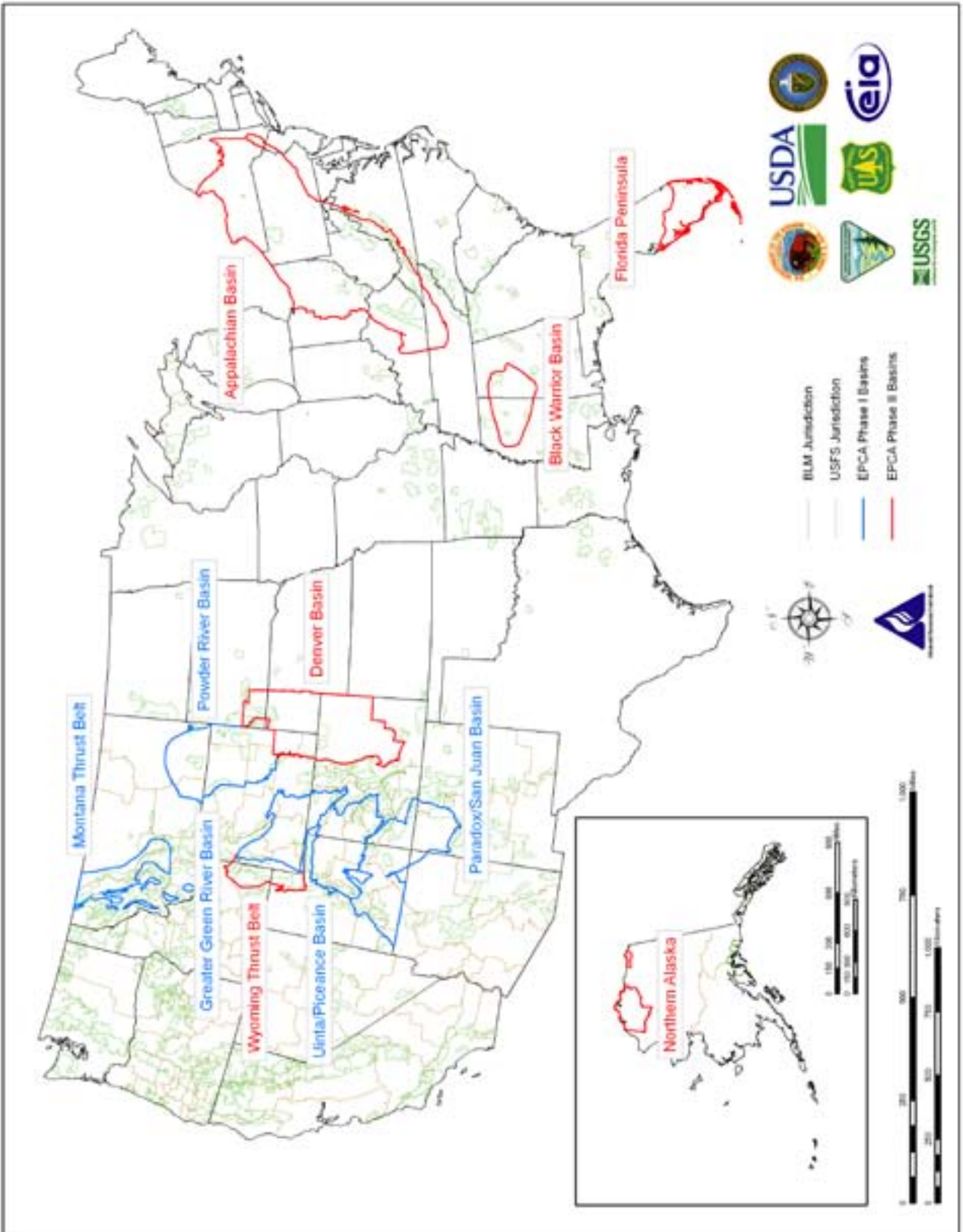
Recent attempts to understand the impacts of Federal land management decisions on access to oil and gas resources began with a 1999 National Petroleum Council (NPC) study.<sup>6</sup> The NPC is an advisory committee to the Secretary of Energy.

One of the objectives of the NPC study was to collect and analyze data on land use and natural gas resources for Federal lands to identify opportunities for increasing natural gas supply from this area. The NPC identified the Interior West as a significant future source of gas supply to help meet the anticipated growing demand. The NPC also estimated that about 40 percent (137 TCF) of the potential supply from this region is currently unavailable for leasing or is subject to surface-use access restrictions because of competing uses or environmental considerations. This analysis was based on a limited sample of Federal lands in the region. The report was developed through a cooperative effort of Federal agencies, including the Department of Energy (DOE), the Bureau of Land Management (BLM), and the U.S. Department of Agriculture's Forest Service (USDA-FS) and the oil and gas industry. Representatives from state and local governments and other stakeholders also participated.

In response to the NPC recommendation, DOE, with the cooperation of the Department of the Interior (DOI) and the

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<sup>6</sup> Meeting the Challenges of the Nation's Growing Natural Gas Demand, December 1999, available on the NPC website: <http://www.npc.org/reports/ng.html>



**Figure 1-1. Study Area Locations**

U.S. Department of Agriculture (USDA), embarked on an effort to assess the relationship between gas resources and land use restrictions on Federal lands. The first area studied was the Greater Green River Basin (GGRB) of Wyoming and Colorado. DOE released its report in May 2001, which showed that 53 percent of the GGRB's natural gas resources were either closed to development or available with restrictions.<sup>7</sup>

Both the NPC and DOE studies were substantially less comprehensive than the present Phase II inventory. While the DOE study was being conducted, EPCA was signed into law in November of that year. Section 604 of this act required a similar study, to be led by DOI in cooperation with the USDA and DOE, which was to include an analysis of undiscovered oil and natural gas resources and proved oil and gas reserves for all onshore Federal lands in the United States. The text of Section 604 and the related conference report are given below.

## 1.2 The EPCA As Amended By The EPAAct 2005

Sec. 604. Scientific Inventory Of Oil And Gas Resources<sup>8</sup>

### **(A) In General—**

The Secretary of the Interior, in consultation with the Secretaries of Agriculture and Energy, shall conduct an inventory of all

<sup>7</sup> "Federal Lands Analysis, Natural Gas Assessment, Southern Wyoming and Northwestern Colorado, Study Methodology and Results," May 2001, available on the DOE website:

[http://fossil.energy.gov/programs/oilgas/publications/fla/Federal\\_Lands\\_Assessment\\_Report.html](http://fossil.energy.gov/programs/oilgas/publications/fla/Federal_Lands_Assessment_Report.html)

<sup>8</sup> Section 604 of EPCA was amended by Section 364 of EPAAct 2005 (42 USC 6217).

onshore Federal lands. The inventory shall identify—

- (1) the United States Geological Survey estimates of the oil and gas resources underlying these lands;
- (2) the extent and nature of any restrictions or impediments to the development of the resources, including—
  - (a) impediments to the timely granting of leases;
  - (b) post-lease restrictions, impediments, or delays on development for conditions of approval, applications for permits to drill, or processing of environmental permits; and
  - (c) permits or restrictions associated with transporting the resources for entry into commerce; and
- (3) the quantity of resources not produced or introduced into commerce because of the restrictions.

**(B) Regular Update—**Once completed, the USGS resource estimates and the surface availability data as provided in subsection (a)(2) shall be regularly updated and made publicly available.

**(C) Inventory—**The inventory shall be provided to the Committee on Resources of the House of Representatives and to the Committee on Energy and Natural Resources of the Senate within two years after the date of enactment of this section.

**(D) Assessments—**Using the inventory, the Secretary of Energy shall make periodic assessments of economically recoverable

resources accounting for a range of parameters such as current costs, commodity prices, technology, and regulations.

***Congress further emphasized the importance of this inventory during the appropriation process:***

CONFERENCE REPORT ON H.R.  
2217, DEPARTMENT OF INTERIOR  
AND RELATED AGENCIES  
APPROPRIATIONS ACT, 2002

JOINT EXPLANATORY STATEMENT OF  
THE COMMITTEE OF CONFERENCE

The managers agree to the following:

. . . 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.<sup>9</sup>

### **1.3 The National Energy Policy, May 2001**

The President's comprehensive National Energy Policy, issued in May 2001, outlines more than 100 recommendations to diversify and increase energy supplies, encourage conservation, and improve energy distribution. The policy recommends a balanced approach that emphasizes renewable energy production, conservation, and traditional fossil fuel production. Oil and natural gas is a major component of the President's policy; in particular, examining ways to increase access to these resources. The Policy notes that some Federal lands otherwise available for leasing, have been

<sup>9</sup> Congressional Record, October 11, 2001, House, p. H6526.

legislatively or administratively withdrawn from leasing. The Vice-President's National Energy Policy Development Group recommended:

. . . that the President direct the Secretary of the Interior to examine land status and lease stipulation impediments to Federal oil and gas leasing, and review and modify those where opportunities exist (consistent with the law, good environmental practice, and balanced use of other resources).

Expedite the ongoing Energy Policy and Conservation Act study of impediments to Federal oil and gas exploration and development, and

Review public lands withdrawals and lease stipulations, with full public consultation, especially with the people in the region, to consider modifications where appropriate.<sup>10</sup>

### **1.4 The EPCA Phase I Inventory, 2003**

Completed in January 2003, the Phase I inventory focused on basins of the Interior West, where most Federal onshore oil and gas resources in the lower 48 states are located.<sup>11</sup> The Phase I inventory covered the Uinta-Piceance, Paradox/San Juan, Powder River, and Greater Green River Basins and the Montana Thrust Belt. The

<sup>10</sup> National Energy Policy, Report of the National Energy Policy Development Group, May 2001, available on the White House website: <http://www.whitehouse.gov/energy/>.

<sup>11</sup> Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to Their Development, January 2003, available on the BLM website: <http://www.blm.gov/energy/epca.htm>

methodologies used in the EPCA Phase I inventory and this inventory are similar and modified data from Phase I are incorporated into this study (see Section 2).

## 1.5 The National Petroleum Council Report, 2003

Also completed in 2003, the NPC provided an update to its 1999 natural gas study.<sup>12</sup> The revised study shows a fundamental shift in the natural gas supply-and-demand balance resulting in higher prices and greater price volatility. Further, the study finds that despite increasing energy efficiency and greater conservation efforts, the traditional North American producing areas can only meet 75 percent of long-term U.S. natural gas needs, leaving the balance to be supplied by imports. To solve some of these problems, the NPC made four recommendations, of which the second was:

### **Recommendation 2: Increase supply diversity**

- Increase Access and Reduce Permitting Impediments to Development of Lower-48 Natural Gas Resources
- Enact Enabling Legislation ... for an Alaska Gas Pipeline

With respect to Federal land access, the NPC examined Conditions of Approval (COAs) in addition to lease stipulations. The study found that the COAs are more of an impediment to development than leasing stipulations. For example, in the Green River Basin, the 2003 NPC study determined that 9 percent of the resource

<sup>12</sup> Balancing Natural Gas Policy: Fueling the Demands of a Growing Economy, National Petroleum Council, September 2003, available on the NPC website: <http://www.npc.org/reports/ng.html>

was unavailable for leasing with an additional 31 percent “effectively” off-limits to development due to prohibitive COAs. The NPC study noted that, in addition to making leasable areas unavailable, the COAs added significant costs and delays to development. Further, it estimated that of the 238 TCF undiscovered, technically recoverable natural gas resources in the Rocky Mountain region, 69 TCF are unavailable for development while the remaining 56 TCF are impacted by access-related regulatory requirements.

## 1.6 Approach

Similar to the Phase I inventory, the Steering Committee, composed of representatives from the participating agencies, was responsible for overseeing the completion of the Phase II inventory. Subsequent to the Phase I inventory, the Steering Committee identified the next six major oil and gas geologic provinces:

- Northern Alaska (NA; NPR-A and ANWR 1002)
- Wyoming Thrust Belt (WTB)
- Denver Basin (DEN)
- Florida Peninsula (FLP)
- Black Warrior Basin (BWB)
- Appalachian Basin (APB).

As with the Phase I inventory, each of these study areas is defined by the aggregation of the USGS oil and gas resource plays for each area. The energy resource, Federal land status, and oil and gas constraints data for these areas have been incorporated into a Geographic Information System (GIS) that allows derivative mapping and statistical analysis. The results presented in this report are cumulative as the Phase II inventory incorporates and supersedes Phase I.

## 1.7 Roles of The Agencies

Section 604 of EPCA designated responsibility for preparing the inventory to the Department of the Interior, in consultation with the Departments of Agriculture and Energy. The Interagency Steering Committee is responsible for providing guidance for conducting the studies, recommending direction to the contractor,<sup>13</sup> making decisions concerning critical parameters, reviewing the methodologies and results, and publishing the report.

The Secretary of the Interior designated the BLM as the lead agency for the inventory. The BLM maintains the oil and gas lease stipulation information and well files containing COAs for lands under its jurisdiction, and land status data for all Federally owned lands within the United States.

The USGS, also a bureau of the DOI, conducts assessments of undiscovered technically recoverable oil and natural gas. The primary source of the oil and gas resource information used in this study is the USGS National Assessment of United States Oil and Gas Resources.

The Secretary of Agriculture designated the USDA-FS, its primary land management agency, to contribute its information regarding oil and gas lease availability and leasing stipulations for lands within the National Forest System.

The DOE, as author of the above-mentioned GGRB report, contributes its expertise and experience in guiding the design and

<sup>13</sup> The contractor is Advanced Resources International of Arlington, VA. They have engaged Premier Data Services of Englewood, CO as a subcontractor.

analysis process for the inventory. DOE's EIA contributes its analysis of proved reserves estimates and reserves growth for Federal lands.

During the course of this study, members of the Steering Committee and contract personnel visited field offices within the various basins. BLM and USDA-FS personnel from more than 80 offices (Table 1-1) participated in these visits. The purpose of these visits was to inform BLM and USDA-FS officials about the studies and to solicit input concerning lease stipulations,

**Table 1-1. BLM and Forest Service Offices Participating in the Inventory**

Jurisdiction	Study Area*
National Forests in Alabama	BWB
Albuquerque, NM, BLM Field Office	PDX/SJ
Allegheny NF	APB
Arapaho and Roosevelt NF and Pawnee NG	DEN
Ashley NF	UP, GGRB
Beaverhead-Deerlodge NF	MTB
Big Cypress NP	FLP
Big Horn NF	PRB
Billings, MT, BLM Field Office	MTB, PRB
Bitterroot NF	MTB
Black Hills NF	PRB, DEN
Bridger-Teton NF	WTB, GGRB
Buffalo, WY, BLM Field Office	PRB
Butte, MT, BLM Field Office	MTB
Caribou-Targhee NF	WTB
Carson NF	PDX/SJ
Casper, WY, BLM Field Office	PRB, DEN
Cedar City, UT, BLM Field Office	PDX/SJ
Cibola NF	PDX/SJ
Custer NF	PRB
Daniel Boone NF	APB

**Table 1-1. BLM and Forest Service Offices Participating in the Inventory (continued)**

Jurisdiction	Study Area*
Dillon, MT, BLM Field Office	MTB
Dixie NF	PDX/SJ
Fairbanks, AK, BLM Field Office	NA
Farmington, NM, BLM Field Office	PDX/SJ
Fillmore, UT, BLM Field Office	UP
Finger Lakes NF	APB
Fish and Wildlife Service lands in Florida	FLP
Fishlake NF	UP, PDX/SJ
Flathead NF	MTB
Gallatin NF	MTB
George Washington and Jefferson NF	APB
Glenwood Springs, CO, BLM Field Office	UP, GGRB
Grand Junction, CO, BLM Field Office	UP, PDX/SJ
Grand Mesa Uncompahgre/Gunnison NF	UP, PDX/SJ
Gunnison, CO, BLM Field Office	UP
Helena NF	MTB
Idaho Falls, ID, BLM Field Office	WTB
Jackson, MS, BLM Field Office	FLP, BWB, APB
Kanab, UT, BLM Field Office	PDX/SJ
Kemmerer, WY, BLM Field Office	WTB, GGRB
Kootenai NF	MTB
Lander, WY, BLM Field Office	GGRB
Lewis and Clark NF	MTB, eastern portions only
Lewistown, MT, BLM Field Office	MTB
Little Snake, CO, BLM Field Office	UP, GGRB
Lolo NF	MTB
Manti La Sal NF	UP, PDX/SJ
Medicine Bow-Routt NF; Thunder Basin NG	UP, PRB, GGRB
Miles City, MT, BLM Field Office	PRB
Milwaukee, WI, BLM Field Office	APB
National Forests in Mississippi	BWB
Missoula, MT, BLM Field Office	MTB

Moab, UT, BLM Field Office	UP, PDX/SJ
Monongahela NF	APB
Monticello, UT, BLM Field Office	PDX/SJ
Nebraska NF and Oglala, Buffalo Gap NG	PRB, DEN
Newcastle, WY, BLM Field Office	PRB, DEN
Pike-San Isabel NF	DEN
Pinedale, WY, BLM Field Office	WTB, GGRB
Pocatello, ID, BLM Field Office	WTB
Price, UT, BLM Field Office	UP, PDX/SJ
Rawlins, WY, BLM Field Office	GGRB, DEN
Richfield, UT, BLM Field Office	UP, PDX/SJ
Rock Springs, WY, BLM Field Office	GGRB
Royal Gorge, CO, BLM Field Office	DEN
Salt Lake, UT, BLM Field Office	UP, WTB
San Juan Public Lands Center, USFS/BLM	PDX/SJ
Santa Fe NF	PDX/SJ
South Dakota BLM Field Office	PRB, DEN
St. George, UT, BLM Field Office	PDX/SJ
Tennessee Valley Authority	BWB, APB
Uinta NF	UP
Uncompahgre, CO, BLM Field Office	UP, PDX/SJ
Vernal, UT, BLM Field Office	UP
Wasatch-Cache NF	WTB
Wayne NF	APB
White River, CO, BLM Field Office	UP
White River NF	UP, GGRB

\* See Appendix 1 for definition of Study Area abbreviations

COAs, and other issues of concern regarding oil and gas development. As described in Section 2, parameter input from these officials was critical to the study. Data were collected during and following the field visits.

## 1.8 Intended Use

This inventory is designed to be useful to a wide range of interests. In a broad sense, it gives a picture of where oil and natural gas



is estimated to occur and a quantification of what statutory and administrative constraints limit exploration and development. Agencies can use this inventory data to identify areas of high resource potential and to examine Federal land management decisions affecting access to energy resources. This inventory provides both the public and Federal land managers with information about the potential magnitude of oil and natural gas resources unavailable for development due to access limitations. This information can be used in conjunction with information about other resource values and the environment.

The highly detailed Federal land access data along with the oil and gas resource data is available for additional analyses by Congress, industry, environmental organizations, and other interested parties. Land withdrawals, oil and gas lease stipulations, and COAs protect or mitigate adverse impacts to other valuable land resources. Land management agencies can analyze this information together with existing policies and procedures to identify opportunities for improving and enhancing decisions in their land use planning, leasing, and permitting processes. Agencies can use this information to prioritize the need for additional data and analyses, and to identify opportunities for improving access to oil and gas resources. Overall, this inventory provides fundamental information to help resolve development issues.

A fundamental product of this inventory is the GIS database containing numerous layers of geographic data referenced by longitude and latitude. While the surface data used in the inventory is accurate, an important caution applies to the use and interpretation of the undiscovered energy resources data: the precise locations of

recoverable accumulations of undiscovered oil and natural gas resources on Federal lands are unknown. For the purpose of this inventory, it was assumed that there is a uniform distribution of the resources within a given play or assessment unit.

Over the last several decades, the USGS methodology has been the government's standard for oil and gas resource estimation. The USGS assessment process estimates the volume of undiscovered oil, natural gas, and natural gas liquids that have the potential to be added to reserves during a thirty-year forecast period. Assessment results are based on known or estimated geologic input parameters provided by knowledgeable geologists—parameters such as trapping mechanism, source rock, reservoir quality and size of known accumulations. Because of the uncertainty about the input parameters, the assessment result is expressed as a probability distribution of potential resources in the assessment unit or geologic play. For these reasons this inventory does not imply that the locations of accumulations of undiscovered oil and gas resources are known to occur under specific land parcels.

## 1.9 Products/Future Direction

The tables, data, maps (GIS products), and this summary report, describing the methodology, applied standards, results, and land access issues, are available on DVD and on the BLM (<http://www.blm.gov/>) website.

Section 604 of EPCA requires that all Federal lands of the onshore United States be inventoried. With the completion of this Phase II report, an estimated 76 percent of the onshore Federal oil and gas resources have been inventoried. For the

Phase III/IV release, the inventory has been redesigned by the Steering Committee to cumulatively analyze 18 geologic provinces comprehensively, and to extrapolate the access constraints for the small portion of remaining resources (estimated to be about 10 percent) in the rest of the U.S. For subsequent releases, the information and analysis for previously studied areas will be updated as the availability of new data and developments in technology warrant.

In addition, the recently passed Energy Policy Act of 2005 (EPAcT 2005) Section

364, modifies the scope of this inventory to require the evaluation of additional Federal constraints associated with granting permits, post-lease restrictions, and barriers to transportation. The EPAcT 2005 also requires the DOE, using this inventory, to make periodic assessments of economically recoverable resources. The inclusion of the impact of COAs on Federal oil and gas accessibility in this Phase II release represents a partial fulfillment of these additional requirements.