



# Arctic National Wildlife Refuge (ANWR): A Primer for the 112<sup>th</sup> Congress

**M. Lynne Corn**

Specialist in Natural Resources Policy

**Michael Ratner**

Analyst in Energy Policy

**Kristina Alexander**

Legislative Attorney

June 15, 2011

Congressional Research Service

7-5700

[www.crs.gov](http://www.crs.gov)

RL33872

## Summary

In the ongoing energy debate in Congress, one issue has been whether to approve energy development in the Arctic National Wildlife Refuge (ANWR or Refuge) in northeastern Alaska—and if so, under what conditions—or whether to continue to prohibit development to protect the area’s biological, recreational, and subsistence values. ANWR is rich in fauna, flora, and oil and natural gas potential. Its development has been debated for more than 50 years, but sharp increases in energy prices from late 2000 to early 2001, in 2004-2008, and in 2011 from a variety of causes (e.g., terrorist attacks, oil spills, and energy infrastructure damage from hurricanes), have repeatedly intensified the debate. Few onshore U.S. areas stir as much oil industry interest as ANWR. At the same time, few areas are considered more worthy of protection in the eyes of conservation and some Native groups. Current law explicitly prohibits oil and natural gas leasing in the Refuge. This report provides a primer on this debate, including background information, and a short description of issues which have arisen repeatedly, as well as some that have been debated only recently.

Procedurally, a key feature in this background is the difficulty in changing the status quo, either toward development or toward additional protection. When energy prices have been high, those Members who advocate increasing supplies as a method of lowering energy prices have renewed their focus on ANWR development. Changes in party control in the House in the 112<sup>th</sup> Congress have encouraged development advocates. Over the years, opponents of opening the Refuge have succeeded consistently in stopping such attempts. However, any change from the status quo appears just as difficult for proponents of wilderness designation who seek to provide additional statutory protection as it does for development advocates.

Substantively, a number of issues have been raised. Development advocates assert:

- any ANWR oil would reduce U.S. energy markets’ exposure to Middle East crises; lower oil prices; extend the economic life of the Trans Alaska Pipeline;
- development would create jobs in Alaska and elsewhere in the United States; and
- ANWR oil could be developed with minimal environmental harm, and some argue that development could be limited to a total of 2,000 acres.

Wilderness advocates counter:

- intrusion on this ecosystem cannot be justified on any terms;
- economically recoverable oil found (if any) would provide little energy security and could be replaced by cost-effective alternatives;
- ANWR production would have negligible effect on oil prices;
- job claims are exaggerated; and
- development would be widely scattered, with irreparable impacts.

This primer provides background for analyzing the various claims through an examination of its history, and an analysis of its geological, biological, human, and economic resources.

## Contents

Most Recent Developments.....	1
Background .....	1
Legislative History of the Refuge .....	3
Alaska Native Claims Settlement Act .....	4
Alaska National Interest Lands Conservation Act .....	4
Chandler Lake Agreement of 1983 .....	6
Actions in the 109 <sup>th</sup> to 112 <sup>th</sup> Congresses .....	6
The Energy Resources.....	7
Current Market Conditions.....	7
High Oil Prices Affect Project Economics .....	7
Oil Resource Potential.....	10
Prices Unlikely to Support Natural Gas Development.....	12
Advanced Technologies in Development and Production.....	13
Native Interests and Subsistence Uses .....	16
The Biological Resources.....	16
Major Legislative Issues Past and Present.....	19
To Develop or Not to Develop?.....	19
Environmental Protection.....	21
The Size of Footprints.....	21
Native Lands.....	22
Evolving Maps.....	23
Revenue Disposition .....	23
Project Labor Agreements (PLAs).....	23
Oil Export Restrictions.....	24
NEPA Compliance .....	25
Compatibility with Refuge Purposes .....	25
Judicial Review.....	25
Special Areas .....	25
For Additional Reading .....	26

## Figures

Figure 1. North Slope of Alaska .....	2
Figure 2. Arctic National Wildlife Refuge.....	5
Figure 3. Northern Alaska Petroleum Sites .....	8
Figure 4. Weekly Global Crude Oil Prices .....	10
Figure 5. 1002 Area of ANWR .....	11
Figure 6. Evolution of Down-hole Operations .....	14
Figure 7. Terrestrial Polar Bear Den Locations .....	19

## **Contacts**

Author Contact Information .....	27
Acknowledgments .....	27

## Most Recent Developments

Rapidly rising gasoline prices and turmoil in oil-rich areas of the Middle East have stimulated renewed congressional interest in domestic oil development. While the focus has tended to be on policies for offshore development, particularly in Alaska and the Gulf of Mexico, oil potential and wilderness values in the Arctic National Wildlife Refuge (ANWR or Refuge) are again being debated. The Obama Administration has expressed opposition to development in the Refuge. The possibility of large quantities of hydrocarbons in ANWR is a key driver of the debate on its future. The developed parts of Alaska's North Slope suggest some promise for ANWR's oil and natural gas resources.

## Background

ANWR consists of 19 million acres in northeast Alaska. It is administered by the Fish and Wildlife Service (FWS) in the Department of the Interior (DOI). Its 1.5-million-acre coastal plain is viewed by development proponents as a promising onshore oil prospect.<sup>1</sup> According to the U.S. Geological Survey (USGS), the mean estimate of *technically* recoverable oil<sup>2</sup> from multiple prospects on the federally owned land in the Refuge is 7.7 billion barrels (billion bbl), and there is a small chance that more than 11.8 billion bbl could be recovered on the federal lands over the life of the prospective fields. (In comparison, the United States currently uses about 7.0 billion bbl/year; see "Oil Resource Potential," below.)

However, the amount that can be recovered depends on the economics of the oil markets. In early June 2011, oil was priced in the futures market at about \$100 per barrel (bbl). In the most recent analysis available, in 2005 when oil was priced at \$55/bbl (or \$65.18 in 2010 dollars), the mean estimate of *economically* recoverable oil<sup>3</sup> on the federal lands was 7.14 billion bbl and there is a small chance that the federal lands could have over 10.7 billion bbl of *economically* recoverable oil.<sup>4</sup> (See Box: **Old Geological Data, Old Prices, and New Interest** on use of older data; the effect of changing oil prices on the ultimate recovery of oil is subtle and is discussed below.) That amount would be nearly as much as the single giant field at Prudhoe Bay, found in 1967 on the state-owned portion of the coastal plain west of ANWR (shown in **Figure 1**), now estimated to have held almost 14 billion bbl of economically recoverable oil. However, the available information indicates that any ANWR oil would be scattered among multiple smaller fields, rather than concentrated in a single large field, which would make development more expensive and potentially expanding the area of any environmental effects.

---

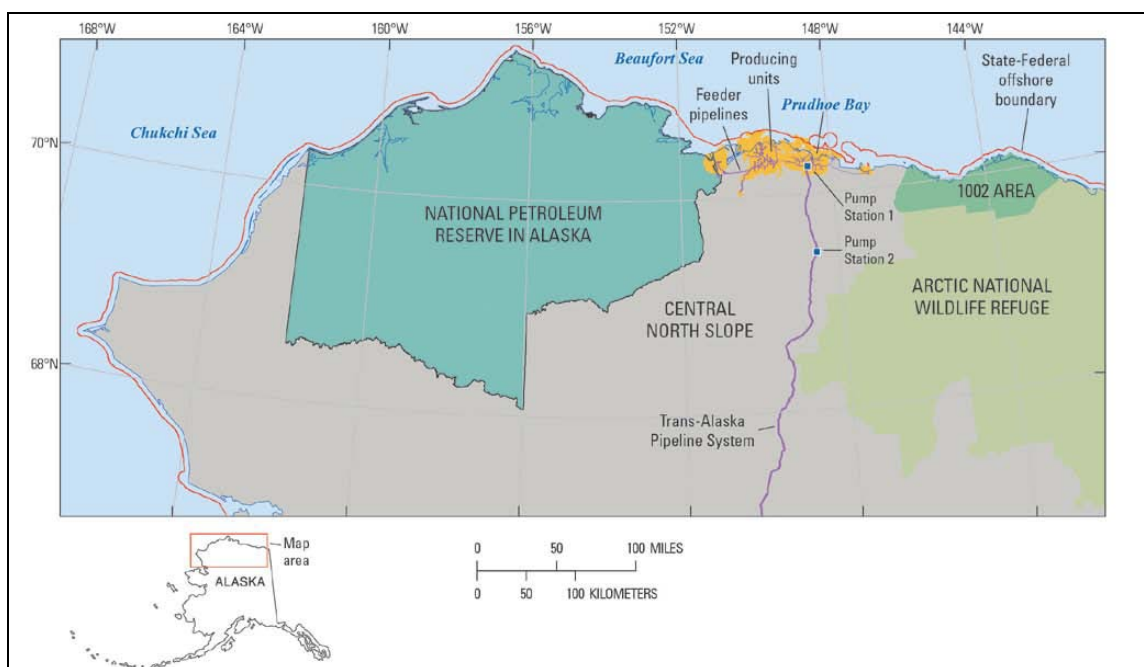
<sup>1</sup> The part of the coastal plain of ANWR that is under debate is called the *1002 area*. See "Alaska National Interest Lands Conservation Act" below, for the origin of this term.

<sup>2</sup> Technically recoverable means the quantity of oil or natural gas assessed as being in a formation that can be recovered using current technology without regard to cost and prices.

<sup>3</sup> Economically recoverable means the portion of technically recoverable resources that could be produced at a given price and accounting for costs, including a return on capital. It is not accurate to assume that the amount of economically recoverable resources will go up in the same portion as prices may rise, i.e. if prices double the amount of economically recoverable resources does not necessarily double.

<sup>4</sup> USGS, *Economics of 1998 U.S. Geological Survey's 1002 Area Regional Assessment: An Economic Update*, Open-File Report 2005-1359 (Washington, DC: 2005). See "Current Market Conditions" below, for a discussion of price effects on oil prospects.

Figure 1. North Slope of Alaska



**Source:** Figure 1 in Emil D. Attanasi and Philip A. Freeman, *Economic Analysis of the 2010 U.S. Geological Survey Assessment of Undiscovered Oil and Gas in the National Petroleum Reserve of Alaska*, U.S. Geological Survey, May 2011. <http://pubs.usgs.gov/of/2011/1103/ofr2011-1103.pdf>.

Existing law bars development of ANWR. If Congress were to open federal lands in ANWR to development, that could open adjacent Native lands, based on current law. In addition, nearby onshore development would also make state lands (already legally open to development) along the coast more economically attractive and, as a result, these state lands might also become more attractive to industry. Together, the federal, state, and Native ownerships have multiple individual fields with oil potential. While only fields on the federal lands would produce federal revenue from bonus bids, rents, and royalties, the 2005 USGS figures show that when state and Native lands are also considered, the mean estimate of economically recoverable oil rises to 9.7 billion bbl, and there is a small chance that economically recoverable oil in the three ownership areas might total over 14.6 billion bbl, if oil is priced at \$65.18 in 2010 dollars. (See Box: **Old Geological Data, Old Prices, and New Interest** for a discussion of the use of old data and old prices, and see “Oil Resource Potential,” below, for further discussion of prices.)

The Refuge, especially the nearly undisturbed coastal plain, is home to a wide variety of plants and animals. The presence of caribou, threatened polar bears, grizzly bears, wolves, migratory birds, and other species in this wild area has led some to call the area “America’s Serengeti.” Some advocates have proposed that the Refuge and two neighboring parks in Canada become an international park, with continuing prohibitions on oil exploration and development. Several species found in the area (including polar bears, caribou, migratory birds, and whales) are also offered certain limited protection through international treaties or agreements.

The analysis below covers the legislative history of ANWR; the economic and geological factors that have triggered interest in development; the Native interests in the area; and the philosophical, biological, and environmental quality factors that have been issues in past Congresses.<sup>5</sup>

The conflict between high oil potential and nearly pristine nature in the Refuge creates a dilemma: should Congress open the area for energy development or should the area's ecosystem continue to be protected from development, perhaps permanently? What factors should determine whether, or when, to open the area? If the area is opened, to what extent can damages be avoided, minimized, or mitigated? To what extent should Congress legislate special management to guide the manner of any development, and to what extent should federal agencies be allowed to manage the area under existing law?

## Legislative History of the Refuge

The balance between oil and natural gas development and the preservation of biological resources of northern Alaska has been controversial for decades, even before Alaska became a state. In 1943 the federal government withdrew all lands on the North Slope (the land north of the crest of the Brooks Mountain Range, and between Canada and the Chukchi Sea) by Public Land Order (PLO) 82 to prevent certain types of development. In November 1957, an application was filed protecting some of those lands (plus some additional lands south of the crest of the Brooks Range) for the benefit of wildlife and migratory birds.<sup>6</sup> Alaska was admitted to the Union in 1959. In 1960, PLO 2214 reserved the 1957 segregated area as the Arctic National Wildlife Range. The PLO withdrew the lands from "all forms of appropriation ... including mining but not the mineral leasing laws," thus leaving oil and natural gas development as a possibility.

<sup>5</sup> Basic information on the Refuge can be found in CRS Report RL31278, *Arctic National Wildlife Refuge: Background and Issues*, by M. Lynne Corn et al. (hereafter cited as CRS Report RL31278). For legal background, see CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR)*, by Pamela Baldwin (hereafter cited as CRS Report RL31115). State lands on the coastal plain are shown at <http://www.dog.dnr.state.ak.us/oil/products/maps/maps.htm>. An extensive presentation of arguments in favor of development can be found at <http://www.anwr.org>, sponsored by a consortium of groups. Opponents' arguments can be found at <http://www.alaskawild.org/> and <http://www.protectthearctic.com/>.

<sup>6</sup> Under the regulations in effect at that time, this application "segregated" the lands in question, removing them from disposal. This fact is important because just eight months later, the Alaska Statehood Act was passed, and on January 3, 1959, Alaska was formally admitted to the Union. Submerged lands in the Refuge that might have been treated as State property under the Equal Footing Doctrine, were deemed federal property instead. The Supreme Court held that the segregation of lands before statehood prevented Alaska from owning certain submerged lands (such as river beds) in the refuge upon statehood. *United States v. Alaska*, 521 U.S. 1 (1997).

### Old Geological Data, Old Prices, and New Interest

Because ANWR has been closed since 1980 to "leasing or other development leading to production of oil and natural gas from the range" unless authorized by an act of Congress, research that would require field studies or seismic exploration inside the 1002 area (shown in **Figure 2**) has not occurred for over 30 years. The most recent geological data gathered on site in the 1002 area date from the 1980s as background for the 1002 report. Any studies of geological resources in the 1002 area that have been published after the 1002 report are based on new analyses of data from earlier field investigations, extrapolations from exploration of nearby areas, and/or improved modeling of older data. New industry techniques are also considered in reevaluating an area's potential. As a result, the best available information is often old.

The most recent federal government studies on economically recoverable amounts of oil were published in 2002, when oil was \$65.18/bbl in 2010 dollars – considerably below the June 2011 market price of \$100/bbl. While oil prices may have some effect on how much oil may ultimately be recovered economically, the relationship is complex. See "Advanced Technologies in Development and Production" below.

Despite these withdrawals, not all of ANWR is owned by the federal government. The history of ANWR (and its energy development restrictions) is intertwined with congressional efforts to settle land claims of Native Alaskans. As part of those efforts, some ANWR property was transferred to Native corporations. To understand the restrictions on development, some of the history of those transfers will be explained.

## **Alaska Native Claims Settlement Act**

In 1971 Congress enacted the Alaska Native Claims Settlement Act (ANCSA, P.L. 92-203) to resolve Native claims against the United States. One purpose of ANCSA was to distribute land to Native corporations, which were created in the act. Native *Village* Corporations usually were entitled to select the surface estate of lands; they received the surface estate of approximately 22 million acres of land then held by the federal government.<sup>7</sup> Native *Regional* Corporations were entitled to the selected subsurface estate, meaning they got the mineral rights. Usually the Regional Corporations could receive the lands beneath the Village Corporations in their area, but subsurface lands beneath pre-1971 refuges were not available, and other lands were substituted for them. ANCSA section 22(g) provided that surface lands conveyed within a refuge created before 1971 were subject to that refuge's regulations. As a result, this provision limited Native claims regarding oil development.

## **Alaska National Interest Lands Conservation Act**

In 1980 Congress enacted the Alaska National Interest Lands Conservation Act (ANILCA, P.L. 96-487), expanding the Wildlife Range to the south and west by 9.2 million acres, and renaming it the Arctic National Wildlife Refuge. (See **Figure 2**.) ANILCA section 702(3) designated 8 million acres of the original Wildlife Range as a wilderness area. The remainder of the original refuge, defined in section 1002 of ANILCA as the *Coastal Plain* and constituting 1.5 million acres, was not included.<sup>8</sup> Instead, Congress postponed decisions on the development or further protection of the Coastal Plain. Section 1002 of ANILCA directed that all of the resources of the Coastal Plain be studied. (As a result, the Coastal Plain is also referred to as the "1002 area.") That study was completed in 1987. It is known as the *1002 report* or the *Final Legislative Environmental Impact Statement* or *FLEIS*.<sup>9</sup>

---

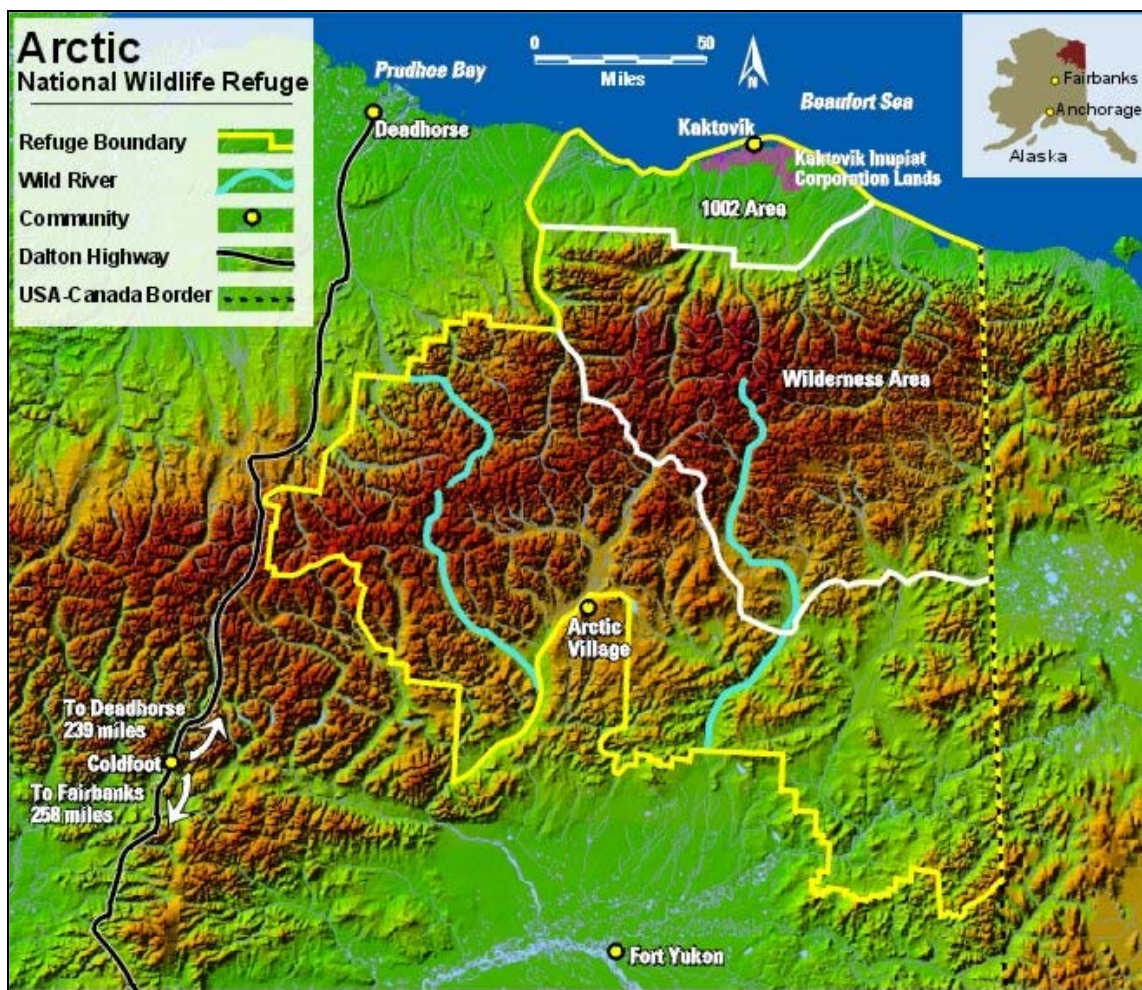
<sup>7</sup> The Bureau of Land Management provides this discussion of the difference between surface and subsurface estates: "In split estate situations, the surface rights and subsurface rights (such as the rights to develop minerals) for a piece of land are owned by different parties. In these situations, mineral rights are considered the dominant estate, meaning they take precedence over other rights associated with the property, including those associated with owning the surface. However, the mineral owner must show due regard for the interests of the surface estate owner and occupy only those portions of the surface that are reasonably necessary to develop the mineral estate." Available at [http://www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/best\\_management\\_practices/split\\_estate.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/split_estate.html).

<sup>8</sup> In the ANWR debate, the term *coastal plain* can have two meanings. First, it can be used in a geographic sense, to refer to the broad area extending from the northern foothills of the Brooks Range and north to the ocean, and from the Canadian border in the east to the Chukchi Sea in the west. Second, it is also used by many (including authors of many bills that have been introduced in the past) to refer to the specific area in ANWR defined in statute, legislative maps, or regulation. When used in the latter sense, the term is generally capitalized: in effect, the **Coastal Plain** is a small, eastern portion of the coastal plain. To avoid possible confusion, this report will use *1002 area* when referring to the area at issue for development in legislation.

<sup>9</sup> U.S. Dept. of the Interior. Fish and Wildlife Service, Geological Survey, and Bureau of Land Management. *Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment*. Report and Recommendation to the Congress of the United States and Final Legislative Environmental Impact Statement. Washington, DC, 1987; hereafter known as (continued...)



Figure 2. Arctic National Wildlife Refuge



Source: <http://arctic.fws.gov/shademap.htm>.

Note: Red-brown colors indicate Brooks Range.

For the future of the 1002 area, the most significant aspect of ANILCA is section 1003. This section prohibited oil and natural gas production in the Refuge as a whole, and “leasing or other development leading to production of oil and natural gas from the range” unless authorized by an act of Congress.<sup>10</sup>

(...continued)

the 1002 report.

<sup>10</sup> The requirement is statutory, and therefore cannot be overridden by an Executive Order. (For more history of legislation on ANWR and related developments, see CRS Report RL31278, *Arctic National Wildlife Refuge: Background and Issues*, by M. Lynne Corn et al.; for legal issues, see CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR)*, by Pamela Baldwin. For specific actions, including key votes, see CRS Report RL32838, *Arctic National Wildlife Refuge (ANWR): Votes and Legislative Actions, 95<sup>th</sup> Congress through 111<sup>th</sup> Congress*, by M. Lynne Corn and Beth A. Roberts.)

## **Chandler Lake Agreement of 1983**

In 1983, a further complication was added to energy development in ANWR. As allowed by ANCSA, the Kaktovik Inupiat Corporation (KIC), a Native Village Corporation, had previously selected the surface estate of certain lands near the northern boundary of the refuge. These selections amounted to three townships. Because the refuge was created before ANCSA, the Arctic Slope Regional Corporation (ASRC), was prohibited from taking title to the subsurface estate of those lands. ANILCA, in its definition of the 1002 area, excluded these three townships, even though, in a geographic sense, they are within the coastal plain. ANILCA further authorized KIC to select more lands within the 1002 area, as defined. These additional lands totaled approximately 19,588 acres. Together with the three townships, the KIC surface estate in ANWR totals more than 92,000 acres, though much of the total is defined out of the 1002 area. (In addition, there are at least eight individually owned Native allotments within the 1002 area that, together with the KIC/ASRC lands, total nearly 100,000 acres.)

Then, in 1983, an agreement between the United States and ASRC, known as the Chandler Lake Agreement (or sometimes the 1983 Agreement), gave ASRC title to the subsurface estate beneath those KIC surface lands, even though the KIC lands all fall in a refuge area created before ANCSA.<sup>11</sup> The 1983 Agreement prohibits development of the ASRC lands in ANWR unless Congress opens ANWR. Such an opening could affect not only development of any energy resources owned by ASRC, but also all 100,000 acres of Native lands, since they would become available for surface occupancy for storage, staging, and other development activities. These lands might even be preferred locations for such activities, depending on any restrictions Congress might place on use or occupancy of the remainder of the 1002 area.

## **Actions in the 109<sup>th</sup> to 112<sup>th</sup> Congresses**

A history of congressional action on ANWR could go back as far as the 86<sup>th</sup> Congress, and perhaps farther. For brevity, this report will begin about six years ago with the 109<sup>th</sup> Congress. The ANWR debate took two basic routes in the 109<sup>th</sup> Congress: (a) reconciliation bills (S. 1932 and H.R. 4241) under the budget process, which cannot be filibustered; and (b) other bills (H.R. 6, an energy bill; H.R. 2863, Defense appropriations; and H.R. 5429, a bill to open the Refuge to development), which can be filibustered.<sup>12</sup> These bills all would have provided for an expedited opening of the Refuge to development to address national energy needs.<sup>13</sup> In the end, Congress did not send any of these bills to the President.

---

<sup>11</sup> Agreement Between Arctic Slope Regional Corporation and the United States of America (Aug. 9, 1983). This agreement is sometimes known as the Chandler Lake Agreement, referring to some of the property transferred as a result of the agreement. A copy is available from the authors of this report. Also see U.S. General Accounting Office (now U.S. Government Accountability Office), *Federal Land Management: Chandler Lake Land Exchange Not in the Government's Best Interest*, GAO/RCED-90-5, October 1989.

<sup>12</sup> For more on the budget process and budget enforcement, see CRS Report RS20368, *Overview of the Congressional Budget Process*, by Bill Heniff Jr. For ANWR and reconciliation, see CRS Report RS22304, *ANWR and FY2006 Budget Reconciliation Legislation*, by Bill Heniff Jr. and M. Lynne Corn.

<sup>13</sup> For details of these bills, and of House and Senate actions on them at that time, see CRS Report RL33523, *Arctic National Wildlife Refuge (ANWR): Controversies for the 109<sup>th</sup> Congress*, by M. Lynne Corn, Bernard A. Gelb, and Pamela Baldwin.

In the 110<sup>th</sup> Congress, there was an effort in the second session to assume ANWR revenues in the budget resolution (S.Con.Res. 70), through a motion to adjust budget levels to assume increased revenues from opening ANWR to leasing and exploration. However, on May 14, 2008, the House rejected the motion (185-229, Roll Call #321). In the Senate, during debate on S. 2284 (a bill originally concerning flood insurance) on May 13, 2008, the Senate rejected the McConnell amendment (S.Amdt. 4720) to open ANWR to energy development (42-56, Roll Call #123). Rising gasoline prices during 2008 intensified interest in opening ANWR to development, and a number of bills to open the 1002 area to development were introduced during the second session.

While 17 bills concerning the Refuge were introduced in the 111<sup>th</sup> Congress, no bills were reported by committees in either House or Senate.

Five bills have been introduced concerning ANWR in the 112<sup>th</sup> Congress. Three bills (H.R. 49, S. 351, and S. 352) would open the area in whole or in part to development, and two (H.R. 139 and S. 33) would designate the area as wilderness. There has been no action to date on these bills.

## The Energy Resources

The developed parts of Alaska's North Slope suggest promise for energy prospects in the adjoining ANWR. Petroleum-bearing strata extend eastward from structures in the National Petroleum Reserve-Alaska through the Prudhoe Bay field, and may continue into and through ANWR's 1002 area. (See **Figure 3** and **Figure 5**.) Both changing prices and changing costs affect oil and natural gas prospects and the current market. However, production issues in some North Slope fields have raised doubts about ANWR's potential for oil and natural gas resources.<sup>14</sup> Any ANWR resources would be expensive to produce and would require construction of new infrastructure, such as pipelines and processing units due to location and environmental conditions.

## Current Market Conditions

### High Oil Prices Affect Project Economics

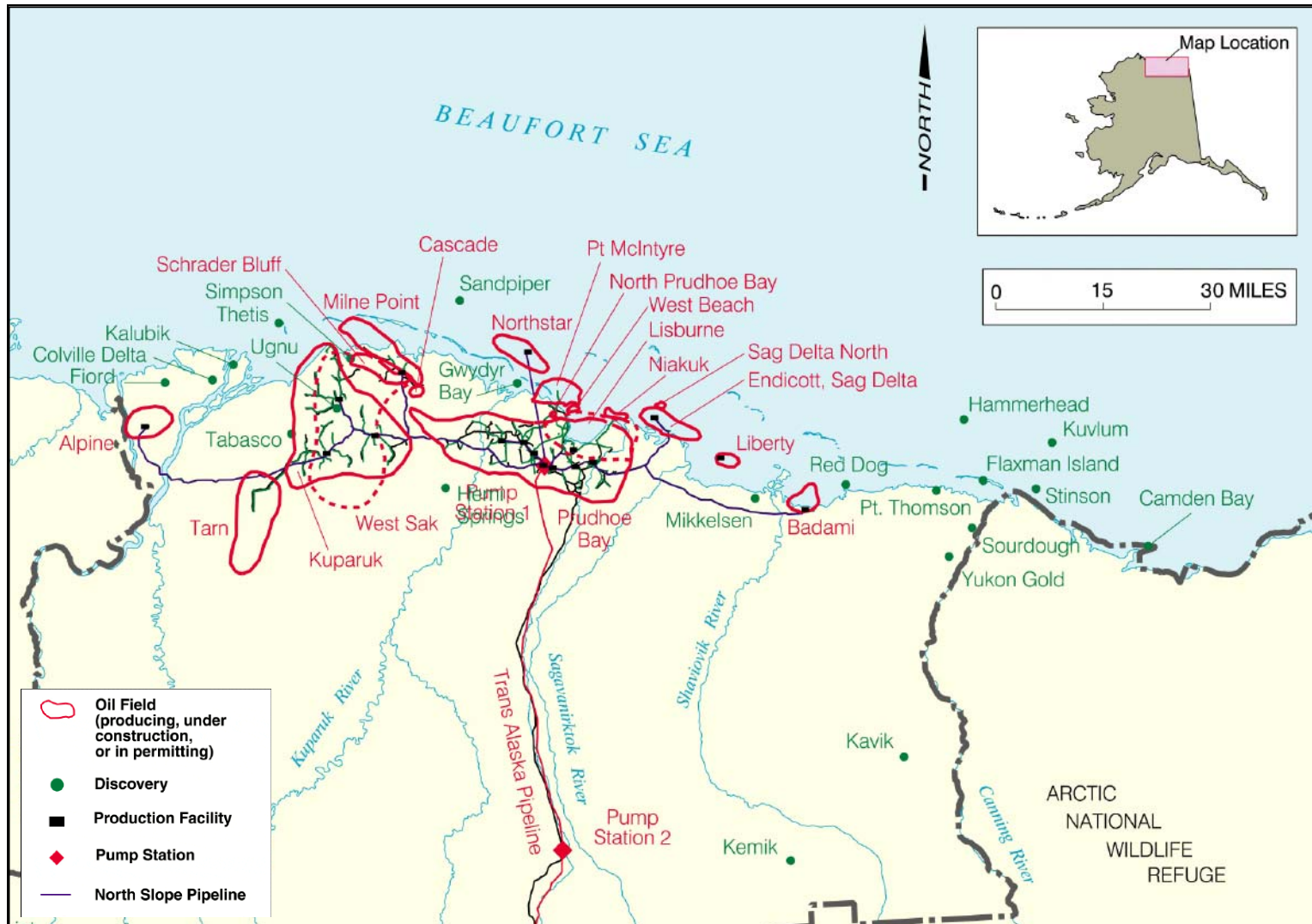
The United States consumed approximately 19.2 million barrels per day (Mb/d) of oil in 2010, the most of any country. Of that, 9.4 Mb/d net came from imported sources of oil, while the rest (51%) was produced domestically with production from Alaska accounting for about 0.6 Mb/d or 3% of U.S. consumption. Alaskan oil production, the bulk of which is from the North Slope, declined almost 0.050 Mb/d from 2009 to 2010, and has been in steady decline since peaking in 1988.<sup>15</sup>

---

<sup>14</sup> U.S. Department of Energy, National Energy Technology Laboratory, *Alaska North Slope Oil and Gas: A Promising Future or an Area in Decline?*, April 8, 2009, [http://netl.doe.gov/technologies/oil-gas/publications/AEO/ANS\\_Potential.pdf](http://netl.doe.gov/technologies/oil-gas/publications/AEO/ANS_Potential.pdf).

<sup>15</sup> U.S. Energy Information Administration (EIA), *Petroleum & Other Liquids, Crude Oil Production database*, [http://www.eia.gov/dnav/pet/pet\\_crd\\_crpdn\\_adc\\_mbbldpd\\_a.htm](http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbldpd_a.htm).

Figure 3. Northern Alaska Petroleum Sites



Source: Trans-Alaska Pipeline System Renewal EIS, <http://www.tapseis.anl.gov/guide/photo/akoiflds.html>.

Whether oil is produced domestically or imported, it is traded in a global market, and any one part of the market can affect other parts. The result is that oil prices are set by world markets. **Figure 4** shows the interconnectedness of crude oil prices regardless of where it is produced. Through 2010, the demand for oil has increased as the global economy has improved and put upward pressure on oil prices. More recently, the political unrest in the Middle East and North Africa has pushed prices up further, though short of an earlier peak in 2008.<sup>17</sup> High oil prices contribute to the call for increased domestic production, including the call for development of ANWR.

In 2010, U.S. domestic production of oil and other liquids was 9.8 Mb/d or 51% of U.S. consumption. Imports accounted for another 9.4 Mb/d, with Canada and Mexico the top two suppliers. U.S. oil imports fell on a barrel per day basis each year between 2005 and 2010 to reach the current levels just under 50% of U.S. liquid fuel consumption, its lowest percentage since 1997.<sup>18</sup> The economic downturn and higher oil prices have contributed to slowing consumption, while price-driven investment and policy helped increase domestic production, particularly from ethanol and deepwater Gulf of Mexico.<sup>19</sup>

Industry interest in ANWR will likely increase as oil prices increase, particularly if projections are that prices will be high for an extended period of time. Sustained high oil prices make development of more expensive oil resources more economically feasible. Additionally, the smaller fields thought to be present in the 1002 area might be more attractive if prices are high, particularly if they are close to larger, more promising fields that would likely be developed first.

### Assessments Evolve as Technology and Information Change

A recent report by the USGS on the National Petroleum Reserve-Alaska (NPRa) highlights the uncertainty of energy resources and the risks involved on the North Slope.<sup>16</sup> In its report, USGS revised its 2002 figures for undiscovered conventional technically recoverable oil and natural gas in the NPRa. The 2002 assessment mean values showed 10.6 billion barrels of oil and 61.4 trillion cubic feet of natural gas. The 2010 assessment shows 0.9 billion barrels of oil and 52.8 trillion cubic feet of natural gas, a reduction of more than 90% in oil estimates and 14% in natural gas estimates. On a barrel of oil equivalent basis, the 2010 assessment estimated that the composition of the prospective energy resources is 8% oil and 92% natural gas. In contrast, the 2002 assessment had estimated that the prospective resources had a much higher ratio of oil: 48% oil to 52% natural gas. The change in ratio was the result of new data from drilling in other areas since the 2002 assessment.

<sup>16</sup> Emil D. Attanasi and Philip A. Freeman, Economic Analysis of the 2010 U.S. Geological Survey Assessment of Undiscovered Oil and Gas in the National Petroleum Reserve of Alaska, U.S. Geological Survey, May 2011. <http://pubs.usgs.gov/of/2011/1103/ofr2011-1103.pdf>.

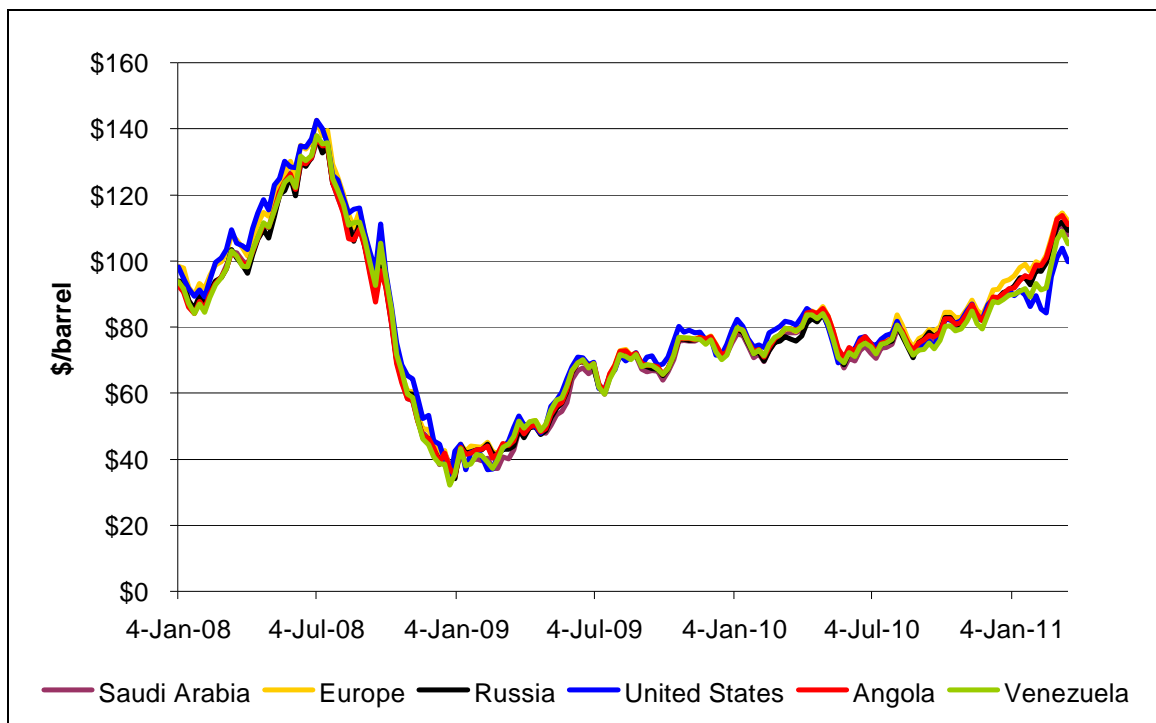
<sup>17</sup> CRS Report R41683, *Middle East and North Africa Unrest: Implications for Oil and Natural Gas Markets*, by Michael Ratner and Neelesh Nerurkar.

<sup>18</sup> EIA, *Petroleum & Other Liquids, U.S. Imports by Country of Origin database*, [http://www.eia.gov/dnav/pet/pet\\_move\\_impcus\\_a2\\_nus\\_ep00\\_im0\\_mbbldpd\\_a.htm](http://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbldpd_a.htm).

<sup>19</sup> For additional information on the role of U.S. oil imports see CRS Report R41765, *U.S. Oil Imports: Context and Considerations*, by Neelesh Nerurkar. For additional information of the beneficial and detrimental consequences of trade deficits, see CRS Report RL31032, *The U.S. Trade Deficit: Causes, Consequences, and Policy Options*, by Craig K. Elwell.

**Figure 4. Weekly Global Crude Oil Prices**

January 2008 through March 2011



**Source:** U.S. Energy Information Administration (EIA) - [http://www.eia.doe.gov/dnav/pet/pet\\_pri\\_wco\\_k\\_w.htm](http://www.eia.doe.gov/dnav/pet/pet_pri_wco_k_w.htm).

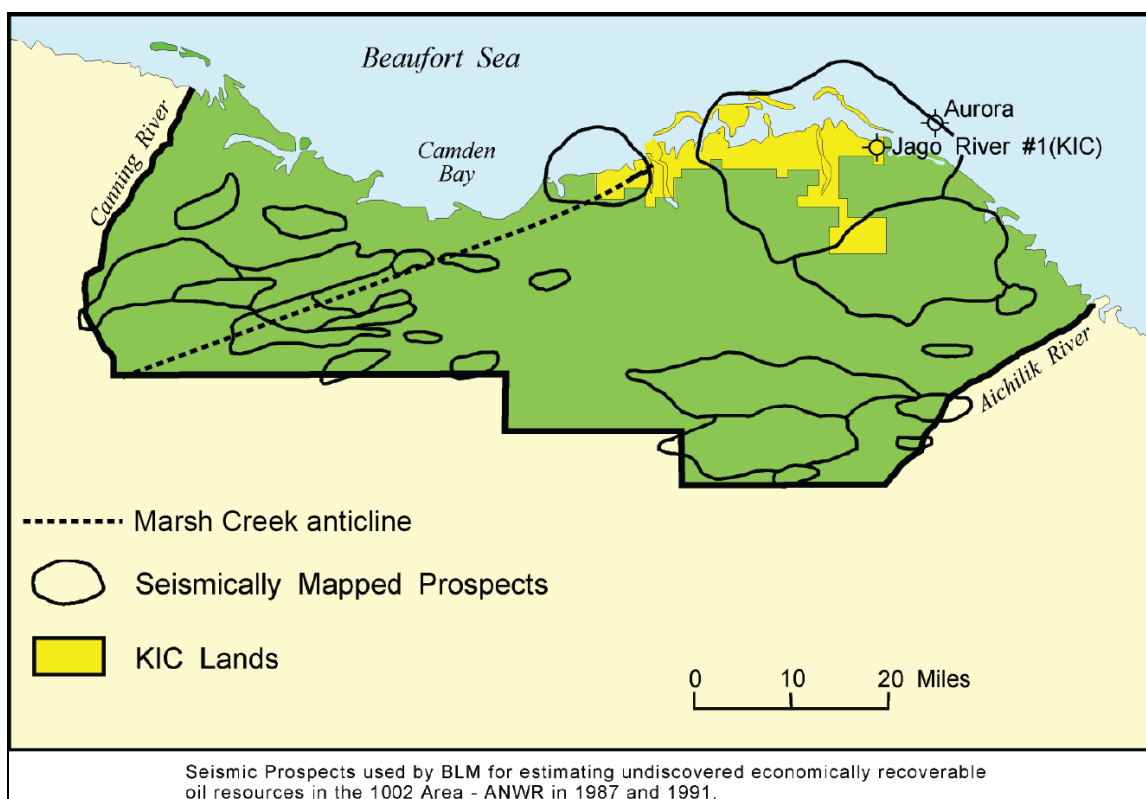
**Notes:** This chart demonstrates that crude oil prices from any given region are linked in the world market.

## Oil Resource Potential

Estimates of ANWR's oil potential are based on limited data and numerous assumptions about geology and economics. Early attention focused on the northern and eastern parts of the 1002 area. Since the 1990s, interest has shifted to parts of the 1002 area west and north of the Marsh Creek anticline, roughly a third of the 1002 area. (See **Figure 5**.) The shift was driven mainly by a re-evaluation of geological data from nearby formations. A geologic study of oil and natural gas prospects in ANWR, completed in 1998 by the USGS,<sup>20</sup> found a high probability (95%) that at least 11.8 billion bbl of technically recoverable oil are *present* on federal lands in the 1002 area. (For comparison, annual U.S. oil consumption from all domestic sources was about 7.0 billion bbl in 2010.)

<sup>20</sup> U.S. Dept. of the Interior, Geological Survey (USGS), *The Oil and Gas Potential of the Arctic National Wildlife Refuge 1002 Area, Alaska*, USGS Open File Report 98-34 (Washington, DC: 1999), Summary and Table EA4. Because ANWR is not open to "leasing or other development leading to production of oil and gas from the range" unless authorized by an act of Congress, new geological field research in the 1002 area has not occurring since 1987. Any studies published after 1987 are based on field data from earlier investigations, inferences from newer drill sites offshore or on adjacent lands, and/or improved modeling of older data. As a result, the best available information is often old.

Figure 5. 1002 Area of ANWR



**Source:** Alaska Department of Natural Resources, Arctic National Wildlife Refuge – 1002 Area, [http://www.dog.dnr.alaska.gov/products/maps/images/anwr1\\_h.gif](http://www.dog.dnr.alaska.gov/products/maps/images/anwr1_h.gif). Marsh Creek anticline added by CRS Publication Graphics, based on Figure 2 in USGS map in <http://pubs.usgs.gov/of/2005/1217/pdf/2005-1217.pdf>.

But the amount that would be economically recoverable depends in part on the price of oil. As of early June, oil prices were about \$100/bbl. In its last economic assessment, in 2005, USGS estimated that, at \$55/bbl in 2003 dollars (\$65.18 in 2010 dollars), there is a 95% chance that 4.0 billion bbl or more could be economically recovered and a small (5%) chance of 10.9 billion bbl or more on the federal lands in the 1002 area; the mean was 7.3 billion barrels.<sup>21</sup> These estimates reflected newer field development practices, and cost and price changes since USGS's 1998 assessment.

Moreover, about one-third more oil may be under adjacent state waters and Native lands.<sup>22</sup> The state waters adjacent to the 1002 area are far from any support system or land-based development, and any oil that may be under them would not currently be economic to produce. If onshore development were to occur, leases in state waters could benefit from onshore transportation systems (airstrips, haul roads, pipelines, etc.) and supply bases (gravel mines, water treatment plants, staging areas, etc.), and these areas might become more attractive to industry. In addition,

<sup>21</sup> USGS, Economics of 1998 U.S. Geological Survey's 1002 Area Regional Assessment: An Economic Update, Open-File Report 2005-1217 (Washington, DC: 2005). See Table 4. The three figures show here include very minor amounts of natural gas liquids, which would be produced along with any oil.

<sup>22</sup> According to the same USGS report, if state and Native lands are included, there is a mean estimate that 9.7 billion barrels could be economically recovered at this price, a 95% chance of 5.4 billion bbl or more and a 5% chance of 14.6 billion bbl or more.

lifting the statutory prohibition on oil and natural gas development in the Refuge would not only lift the ban on Native lands but might make smaller fields on Native lands more attractive, if they were able to share facilities with nearby development, or if they became preferred locations for support facilities due to fewer restrictions on surface development.<sup>23</sup>

The Energy Information Administration (EIA, in the U.S. Department of Energy) estimated that, if development of the 1002 area were to begin in 2008, production would begin in about 2018, and grow to a peak in about 2028.<sup>24</sup> The peak would range from about 510,000 bbl/day to 1,450,000 bbl/day, depending on the size of the resource. Under that scenario, in 2030, ANWR production would range from 0.4% to 1.2% of world oil consumption, and would reduce the world price of low-sulfur crude by \$0.41/bbl to \$1.44/bbl in 2026. (EIA further noted that these reductions could be neutralized by a corresponding decrease in production among other oil producers.) ANWR production at these levels would help to hold fuel imports, which have been declining, steady at about 51% between 2018 and 2025, by causing a corresponding reduction in crude oil imports. It would also help to spread the costs of operating the Trans Alaska Pipeline System (TAPS) over a larger number of barrels. EIA reported that the operation of TAPS is considered uneconomic if flows fall below 200,000 bbl/day, causing a further loss in U.S. production if TAPS were to shut down.

## **Prices Unlikely to Support Natural Gas Development**

USGS has projected that in addition to oil, large quantities of natural gas may be found in the 1002 area, as in other areas on the North Slope. Unlike oil, the United States imports very little natural gas (about 15% of consumption in 2010, mostly from Canada). Prices for natural gas are more regionally based than oil, and with ample supplies, the United States has experienced relatively low prices over the last two years.

Current natural gas prices would not likely support building the infrastructure, including a pipeline, that would be required to transport ANWR natural gas to the lower 48 states or exporting it internationally.<sup>25</sup> This a major obstacle to developing ANWR's natural gas resources as well as those in the rest of northern Alaska. Natural gas prices in the United States are projected to remain low for the remainder of the decade and beyond.<sup>26</sup> BP and Conoco-Phillips have dropped a plan to build a pipeline from the North Slope to natural gas markets in the lower 48 states. ExxonMobil and TransCanada are still exploring the possibility of constructing such a pipeline.<sup>27</sup>

---

<sup>23</sup> For more detail on possible oil under Native lands and state waters, see CRS Report RS21170, *ANWR Oil: Native Lands and State Waters*, by Bernard A. Gelb.

<sup>24</sup> This discussion is condensed from pp. 8-11 in US. Dept. of Energy, Energy Information Administration, "Analysis of Crude Oil Production in the Arctic National Wildlife Refuge," May 2008, [http://www.eia.doe.gov/oiaf/servicerpt/anwr/pdf/sroiaf\(2008\)03.pdf](http://www.eia.doe.gov/oiaf/servicerpt/anwr/pdf/sroiaf(2008)03.pdf). Hereafter referred to as *EIA 2008*. For economic impacts of development, see also CRS Report RS21030, *ANWR Development: Economic Impacts*, by Bernard A. Gelb.

<sup>25</sup> For more information, see CRS Report R40963, *The Alaska Natural Gas Pipeline: Background, Status, and Issues for Congress*, by Paul W. Parfomak.

<sup>26</sup> EIA, *Annual Energy Outlook 2011 with Projections to 2035*, Washington, D.C., April 2011, p. 78, [http://www.eia.gov/forecasts/aeo/pdf/0383\(2011\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2011).pdf).

<sup>27</sup> Associated Press, "Company abandoning bid to build natural gas line in Alaska, says it couldn't get support," *Washington Post*, May 17, 2011, online.



Another transportation option is to ship liquefied natural gas (LNG) via tankers. Alaska is home to the only facility for liquefying natural gas for transport in the United States. However, earlier this year, ConocoPhillips, the operator of the Kenai LNG facility, announced it was shutting the plant down. The natural gas production from the fields that supplied Kenai LNG is declining and to date the cost of an 800-mile natural gas pipeline from Alaska's North Slope to the terminal has been prohibitive.

Alaska already produces about 3.3 million cubic feet per year (Mcf/y) or 13% of total U.S. natural gas production, while consuming only 0.3 Mcf/y. However, most of Alaska's natural gas production is used to boost oil production by reinjecting the natural gas into oil fields to increase down-hole pressure. Increased pressure helps boost oil extraction rates and total recovery.

## **Advanced Technologies in Development and Production**

The industry has looked for ways to adapt its practices to the harsh and changing environment of the arctic region. The cost of operating in arctic conditions has increased beyond the higher industry costs in other parts of the United States, in part due to the remoteness of the area. Environmental concerns have prompted companies to reduce their footprint in the region, which has resulted in smaller production sites and extensive use of ice roads and ice exploration platforms. However, warming trends in the Arctic have limited ice technologies and may prompt new methods of development.

The average cost of drilling and completing an onshore well in Alaska is approximately 31 times greater than an onshore well in the lower 48 states, according to American Petroleum Institute<sup>28</sup> data.<sup>29</sup> In 2009, the average cost of drilling and completing a well in the lower 48 states was almost \$4 million to an average depth of 6,617 feet for an average cost per foot of \$595. In Alaska, the cost per well was just over \$122 million to an average depth of 11,484 feet, for an average cost per foot of \$10,628.<sup>30</sup> (In 2005, Alaskan drilling costs per foot were 6.4 times higher than those in the lower 48 states.<sup>31</sup>) This cost differential highlights the difficulties and challenges of producing oil and natural gas in arctic conditions and the need for substantial finds of oil and natural gas to cover the higher costs. The presumed dispersed nature of ANWR's oil and natural gas resources may make it a difficult financial choice to develop.

According to EIA, "the main impact of such approaches [enhanced recovery techniques and development of smaller fields] on the amount of oil actually recovered from ANWR is likely to occur after 2030, the current time horizon for EIA analyses."<sup>32</sup> EIA further states:

The basic intuition that higher crude oil prices would likely result in higher ultimate recovery from whatever resource exists in place is sound. However, given the timing and cost considerations outlined above, EIA does not expect the recent increase in oil prices to affect

---

<sup>28</sup> The American Petroleum Institute is an industry funded advocacy group, <http://www.api.org/>.

<sup>29</sup> E-mail exchanges between Michael Ratner of CRS and API staff, citing data aggregated in API's 2009 Joint Association Survey (JAS) on Drilling Costs, May 3, 2011. The data base is available, for a fee, at <http://www.api.org/statistics/accessapi/product-description.cfm>. According to the API website, the JAS is "the only long-term source of information on detailed U.S. drilling expenditures."

<sup>30</sup> Ibid. Figures were based on over 30,000 wells in the lower 48 states, and about 40 Alaskan wells.

<sup>31</sup> See EIA 2008, p. 7.

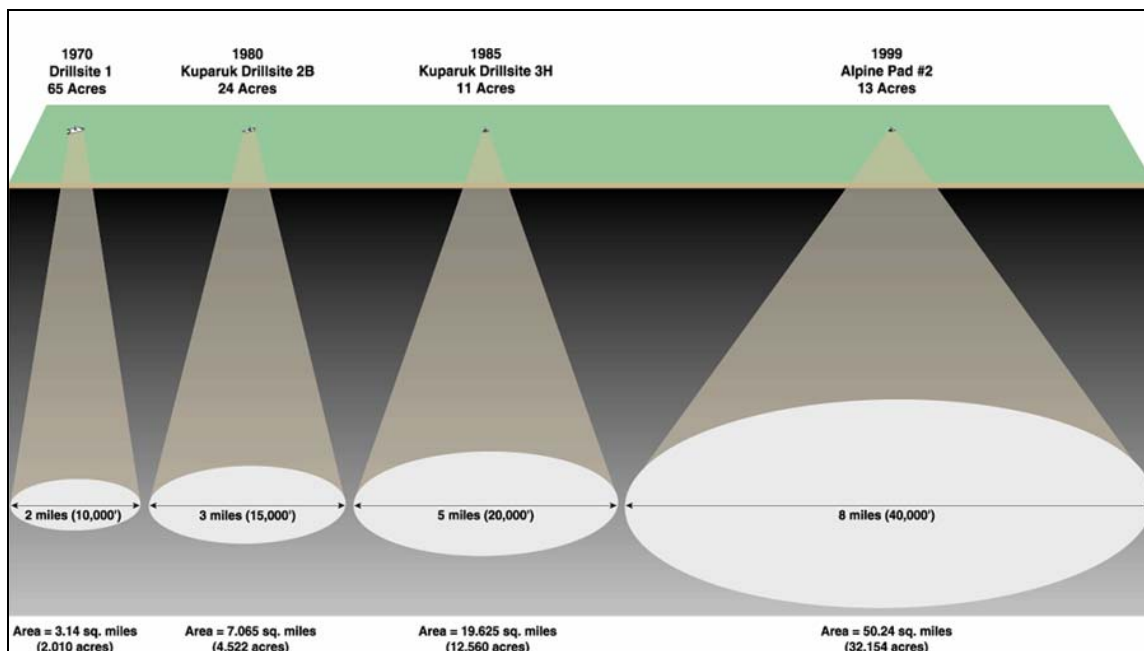
<sup>32</sup> EIA 2008, p. 6.

the projected profile of ANWR development and production activities prior to 2030... Therefore, this current analysis of projected production from ANWR through 2030 parallels our prior recent analyses ... that have used similar or identical information on ANWR resources notwithstanding the recent run-up in world crude oil prices.<sup>33</sup>

Reducing the footprints of development has been a major goal of industry, in an effort to reduce environmental impacts. As North Slope development proceeded after the initial discovery at Prudhoe Bay, oil field operators developed less environmentally intrusive ways to develop arctic oil, primarily through innovations in technology. New drill bits and fluids and advanced forms of drilling—such as extended reach, horizontal, and “designer” wells—permit drilling to reach laterally far beyond a drill platform, with the current record being seven miles (radius) at one site in China. Current industry standards in Alaska for down-hole operations are five miles in diameter around the surface well pad. (See **Figure 6.**) These drilling technologies are commonly more costly than simpler techniques, and may require expectations of a higher rate of return to be considered worthwhile.

Improved ice-based transportation infrastructure can serve remote areas during the exploratory drilling phase on insulated ice pads. During exploration, ice pads are approximately 10 acres in size, but can double in area during the production phase of a project. Such small pads are

**Figure 6. Evolution of Down-hole Operations**



**Source:** ConocoPhillips presentation, April 19, 2011.

**Notes:** Although the graphic shows that the down-hole operations can be up to eight miles in diameter, the normal area is still five miles in diameter according to ConocoPhillips.

unstaffed, and feasible when linked to larger pads providing worker housing, equipment storage and maintenance facilities, airfields, and other production support. The linkage may be by road or

<sup>33</sup> EIA 2008, p. 8.

small airfields, which provide access for periodic maintenance or servicing. However, for safety reasons, use of ice roads and pads may be limited in the more rolling terrain of the 1002 area: on a slope, gravel structures provide greater traction than ice structures, and have been permitted for exploration on state lands south of Prudhoe Bay.

While oil development is becoming more dependent on ice roads and pads in some areas of Alaska, warming trends in arctic latitudes have already shortened winter access across the tundra by over 50% over the last 30 years and led to changes in the standards for use of ice roads. If these trends continue, heavy reliance on ice technology could be unfeasible and might force greater reliance on gravel structures, with inherently longer-lasting impacts and higher costs. Rigid adherence to ice technology (instead of gravel construction) might put some marginal fields out of reach due to the high cost of exploration, development, or operation, due to shorter season or difficult terrain. Moreover, fields that begin with few roads may expand their gravel road network as the field expands. However, companies have adapted to the changing conditions: in some cases using two drilling rigs, rotating rigs at drill sites, starting ice road construction from both ends simultaneously, using aircraft to reach remote sites, and prepositioning equipment and materials, so that tasks can be accomplished more quickly during the shorter winter season. Nevertheless, it is expected that projects, such as the possible development of ANWR, will take longer to complete due to shorter operating seasons.

Proponents of opening ANWR agree that while these development and operating technologies are a major advance over earlier decades and would mitigate the environmental impacts of petroleum operations, they would not eliminate such impacts. Opponents maintain that facilities of any size would still be industrial sites and would change the character of the coastal plain, in part because the sites would be spread out in the 1002 area and connected by pipelines and probably roads. Instead of seeing the Alpine development (see Box: **The Alpine Development**) as an advance, they see its growing collection of footprints as a harbinger of the spread that would occur if the Refuge were opened for development.

### The Alpine Development Example

Because it is held as a model of modern development, the history of the Alpine field, located along the border of the NPRA west of Prudhoe Bay, is relevant to ANWR's possible development. Run by Houston-based ConocoPhillips, it is considered innovative because of the short road connecting the two initial pads, and the lack of a road connection with the remainder of North Slope development, except in winter via ice road. The two initial pads, their connecting road, and an airstrip totaled about 100 acres. Over the last ten years, two additional pads have been added, including one connected by an additional road of over three miles, plus a pipeline. The other pad is joined to the first two pads only by a pipeline; to compensate for the absence of a road, it has its own airstrip. A fifth pad has been approved. While its road access is not yet permitted, it will total about five more miles. Two other pads were also approved, but have not been built yet. Altogether, the expansion of the field will add roughly 27.5 miles of gravel roads to the first three miles of roads, and create 1,845 acres of disturbed soils, including 316 acres of gravel mines or gravel structures.<sup>34</sup> Approximately 150 miles of roads would be constructed if the field is fully developed. If ANWR development followed a similar pattern, it is unclear whether energy development could be held to a stringent limit on roads, gravel mines, airfields, pads, or other gravel construction and still allow producers to have access to otherwise economic fields.

<sup>34</sup> Bureau of Land Management, *Alpine Satellite Development Plan: Final Environmental Impact Statement*, Anchorage, AK, September 2004, Figure 2.4.6-1, <http://www.blm.gov/eis/AK/alpine/dspfefsfig.html>. Figures given here do not represent full development of the field over the next 20 years.

## Native Interests and Subsistence Uses

The Native community, both between and within its villages and organizations, is significantly divided on the question of energy development in the Refuge, but some patterns can be discerned. Generally, the Alaska Natives (Inuit) along the North Slope have supported ANWR development, while the Natives of interior Alaska (Gwich'in) have opposed it, though neither group is unanimous. Some parts of the Native community dependent heavily for their subsistence use on the caribou herd that calves in the 1002 area, and because of the lengthy migration of the caribou herds, this dependency is an important factor even at considerable distances from the coastal plain. Seeing energy development as a threat to the safety or success of calving season, these groups oppose drilling the Refuge. Among these opponents are most members of the Gwich'in tribe, whose members are found both south and east of the Refuge in Alaska and Canada.<sup>35</sup>

Among the Native groups supporting ANWR development are the Arctic Slope Regional Corporation (ASRC) and Doyon Limited (both Native regional corporations), and the Native Village of Kaktovik (a Native organization in Kaktovik, the only town within the coastal plain of ANWR). The chief arguments cited by these groups are the increases in both North Slope employment and revenues from increased business activity. They further argue that the current closure of the 1002 area to development unfairly prevents them from developing Native-owned inholdings. Many Native supporters argue that current development and production practices can be carried out so as to avoid damage to the caribou that calve in the area.<sup>36</sup> In support, they note that the Central Arctic Herd of caribou has increased, and this herd is found seasonally in the lands around Prudhoe Bay. (See "The Biological Resources" on caribou, below.)

## The Biological Resources

The 1002 report rated the Refuge's biological resources highly: "The Arctic Refuge is the only conservation system unit that protects, in an undisturbed condition, a complete spectrum of the arctic ecosystems in North America."<sup>37</sup> It also said: "The 1002 area is the most biologically productive part of the Arctic Refuge for wildlife and is the center of wildlife activity."<sup>38</sup> The biological value of the 1002 area rests on intense productivity in the short arctic summer; many species arrive or awake from dormancy to take advantage of this richness, and leave or become dormant during the remainder of the year. Caribou have long been the center of the debate over the biological impacts of Refuge development, but other species have also been at issue. Among the other species most frequently mentioned are polar bears (listed under the Endangered Species Act<sup>39</sup> (ESA) as threatened since the publication of the 1002 report), musk oxen, and the 135 species of migratory birds that breed or feed there. In addition, the effects of energy development on marine mammals (many of which are protected under ESA, and all are protected under the

---

<sup>35</sup> The Gwich'in Steering Committee is the lead organization expressing this view. See <http://www.gwichinsteeringcommittee.org/index.html/>

<sup>36</sup> For a sample of Native expressions of support, see statement of ASRC regarding ANWR development at [http://www.anwr.org/index2.php?option=com\\_content&do\\_pdf=1&id=52](http://www.anwr.org/index2.php?option=com_content&do_pdf=1&id=52).

<sup>37</sup> 1002 report, p. 46.

<sup>38</sup> 1002 report, p. 46.

<sup>39</sup> 16 U.S.C. §§ 1531ff. For more information on ESA, see CRS Report RL31654, *The Endangered Species Act: A Primer*, by M. Lynne Corn, Kristina Alexander, and Eugene H. Buck.

Marine Mammal Protection Act<sup>40</sup>) could become an issue, if infrastructure development onshore made offshore development more economically attractive.<sup>41</sup>

An updated assessment of the array of biological resources in the coastal plain was published in 2002 by the Biological Resources Division of USGS.<sup>42</sup> The report analyzed new information about caribou, musk oxen, snow geese and other species in the Refuge, and concluded that development impacts on wildlife would be significant. A subsequent memorandum<sup>43</sup> on caribou by one of the assessment's authors clarified that if development were restricted to the western portion of the refuge (an option that was being considered at that time by the George W. Bush Administration), the Porcupine Caribou Herd (PCH) would not be affected during the early calving period, since the herd is not normally found in the area at that time. Impacts that might occur when the herd subsequently moves into the area were not discussed in the memo.

A March 2003 report by the National Research Council (NRC) highlighted impacts of existing development at Prudhoe Bay on arctic ecosystems.<sup>44</sup> Among the harmful environmental impacts noted were changes in the migration of bowhead whales, in distribution and reproduction of caribou, and in populations of predators and scavengers that prey on birds. NRC noted beneficial economic and social effects of oil development in northern Alaska and credited industry for its strides in decreasing or mitigating environmental impacts. It also said that some social and economic impacts have been harmful.<sup>45</sup> The NRC report specifically avoided determining whether beneficial effects were outweighed by harmful effects. To the extent that the same conditions might prevail in the 1002 area effects could be similar.

In 2008, FWS listed polar bears as threatened under the Endangered Species Act (ESA).<sup>46</sup> Among the factors considered in listing the species was the effect of accelerated polar climate change on polar bears and their prey (primarily seals), threats to denning habitat, and effects of oil and natural gas development. The listing of polar bears could have a significant impact on energy development in ANWR, since the 1002 report stressed the unusual importance of the 1002 area as a location for dens of pregnant female polar bears. (See **Figure 7.**) Female polar bears are known to abandon their dens when disturbed—probably a fatal move for very young cubs.

---

<sup>40</sup> 16 U.S.C. §§ 1361ff. For more information on the Marine Mammal Protection Act, see CRS Report R41613, *Fishery, Aquaculture, and Marine Mammal Issues in the 112<sup>th</sup> Congress*, by Eugene H. Buck and Harold F. Upton.

<sup>41</sup> For more information on biological resources of the 1002 area, see CRS Report RL31278, *Arctic National Wildlife Refuge: Background and Issues*, by M. Lynne Corn et al.. The changes in the polar environment due to climate change are affecting polar ecosystems. How these changes will affect the ecosystem of the ANWR coastal plain is uncertain. For more on climate change effects on the polar environment, see CRS Report R41153, *Changes in the Arctic: Background and Issues for Congress*, coordinated by Ronald O'Rourke, and discussion of polar bears, below.

<sup>42</sup> USGS, Arctic Refuge Coastal Plain Terrestrial Wildlife Research Summaries, Biological Science Report, USGS/BRD/BSR-2002-0001.

<sup>43</sup> Brad Griffith, Memorandum to Director, USGS, "Evaluation of additional potential development scenarios for the 1002 Area of the Arctic National Wildlife Refuge" (April 4, 2002).

<sup>44</sup> National Research Council, *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope*, March 2003, p. 452, <http://dels.nas.edu/Report/Cumulative-Environmental-Effects/10639>.

<sup>45</sup> Examples of impacts include changes in cultural traditions to both inland (Gwich'in) and coastal (Inupiat) peoples, dependence on a monetary economy that would eventually require significant sources of external revenue to maintain, lack of jobs in industry, effects on subsistence hunting and whaling, health impacts, and more. See NRC report, p. 214-240.

<sup>46</sup> Listing: 73 *Fed. Reg.* 28211-28303, May 15, 2008; 50 C.F.R. § 17.11(h). Special rule: 73 *Fed. Reg.* 28305-28318, May 15, 2008; 50 C.F.R. § 17.40(q). Also see CRS Report RL33941, *Polar Bears: Listing Under the Endangered Species Act*, by Eugene H. Buck, M. Lynne Corn, and Kristina Alexander.

In December 2010, FWS designated a wide area in northern Alaska, including the 1002 area, and a considerable area offshore as critical habitat (CH) under ESA for the species.<sup>47</sup> The move would provide a stronger role for the ESA in any federal agency activities such as energy development inside the designated area. Federal agencies must avoid actions that jeopardize listed species or destroy or adversely modify their designated critical habitat.<sup>48</sup> The action agencies must consult with FWS (or the National Marine Fisheries Service for some species) to determine whether such jeopardy or destruction might occur. If there is such a risk, the action agency must modify the action to reduce the risk.<sup>49</sup> The risk to polar bears is not hypothetical: many female polar bears have responded to thinning or vanishing offshore ice by moving more of their dens to locations on shore and many females that historically denned on land to the west of Prudhoe Bay have moved their dens to the east, into or nearer the Refuge.<sup>50</sup> This shift increases the importance of the Refuge's coastal plain to the polar bear population and adds to the significance of consultation under ESA in any exploration, because exploration and development is more cost-effective in the winter season—the time when denning female polar bears are likely to be present.

---

<sup>47</sup> Fish and Wildlife Service, “Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States; Final Rule,” 75 *Fed Reg* 76086, Dec. 7, 2010.

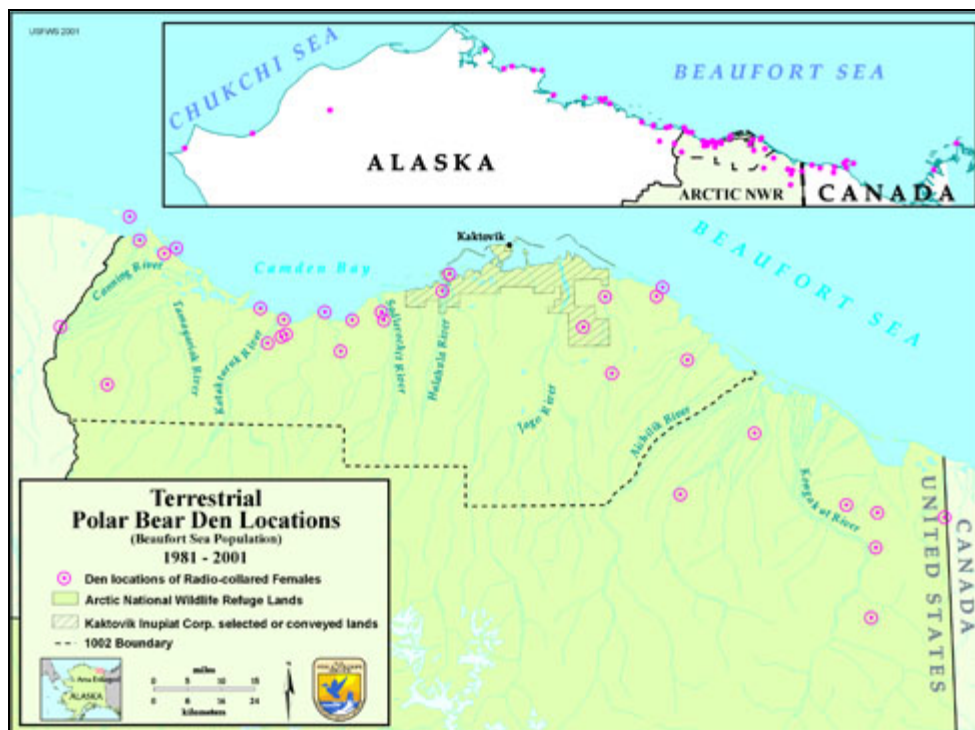
<sup>48</sup> 16 U.S.C. §1536.

<sup>49</sup> For a more detailed discussion of consultation under ESA § 7, see CRS Report RL31654, *The Endangered Species Act: A Primer*, by M. Lynne Corn, Kristina Alexander, and Eugene H. Buck.

<sup>50</sup> The proportion of dens on pack ice declined from 62% in 1985–1994 to 37% in 1998–2004. See A.S. Fischbach, S.C. Amstrup, and D.C. Douglas, “Landward and eastward shift of Alaskan polar bear denning associated with recent sea ice changes,” *Polar Biology*, 30 (2007), pp. 1395-1405. The authors concluded that the changes related to changing ice conditions.

**Figure 7. Terrestrial Polar Bear Den Locations**

1981-2001



Source: <http://arctic.fws.gov/pbdenning.htm>

## Major Legislative Issues Past and Present

Some of the issues that have been raised most frequently in the ANWR debate are described briefly below. In addition to the basic issue of whether development should be permitted at all, key aspects of the current debate include restrictions that might be specified in legislation, including the physical size—or footprints—of development; the regulation of activities on Native lands; the disposition of revenues; labor issues; oil export restrictions; compliance with the National Environmental Policy Act; and other matters. (References below to the “Secretary” refer to the Secretary of the Interior, unless stated otherwise.) The analysis below describes issues that have been raised repeatedly in past legislation.

### To Develop or Not to Develop?

The basic and most contentious ANWR question Congress has considered is whether to permit energy development in the 1002 area at all. Taking no action leaves current prohibitions on development in place; other options include designating the 1002 area as wilderness, designating it as a national monument, allowing exploration only, and taking no action.

The strongest protection for the 1002 area would be wilderness designation by Congress. Energy development is not permitted in wilderness areas, unless there are pre-existing rights or unless

Congress specifically allows it or reverses the designation.<sup>51</sup> Wilderness designation would tend to preserve existing recreational opportunities and related jobs, as well as the existing level of protection of subsistence resources, including the Porcupine Caribou Herd. In the 112<sup>th</sup> Congress, H.R. 139 and S. 33 would designate the 1002 area as part of the National Wilderness System.<sup>52</sup>

Supporters of wilderness designation argue that few places as untrammelled as the 1002 area remain on the planet, and fewer still on the same expansive scale. Any but the most transitory intrusions (e.g., visits for recreation, hunting, fishing, subsistence use, research) would, in their view, damage the integrity and the “sense of wonder” they see in the area. The mere knowledge that a pristine place exists, regardless of whether one ever visits it, can be important to those who view the debate in this light. On the one hand, development advocates would stress the advances in reducing development’s footprints, waste disposal, air pollution control, and the like. On the other, in terms that emphasize deeply held values about the nature of wilderness, humility in the presence of nature, and the like, wilderness supporters would hold that development in any form could not be accomplished in an acceptable manner, nor leave the ecosystem intact.

Some groups seeking to preserve the 1002 area advocate designating the area a National Monument, using the President’s power under the Antiquities Act.<sup>53</sup> However, §1326 of the Alaskan National Interest Lands Conservation Act (ANILCA) limits withdrawals from the public lands in Alaska for the establishment of a new conservation system unit unless Congress passes a joint resolution of approval within one year. Congress has the authority itself to designate the 1002 area a National Monument, but the conservation benefit from such an action is not apparent: it is unclear how a congressional monument designation could restrict development any more than ANILCA already accomplishes. However, supporters of monument status might see the new status as raising the bar to future development in a political sense, even if, in essence, it would simply reaffirm the ban that has been in place since 1980.

Some have argued that the 1002 area should be opened to exploration first, before a decision is made on whether to proceed to leasing. Those with this view hold that greater certainty about any energy resources in the area would lead to a better decision about opening some or all of the 1002 area for leasing. This idea has lost support over the years because various interests see insufficient gain from such a proposal.<sup>54</sup> Opponents have been concerned about environmental impacts from exploration, while supporters are concerned that any data gathered might reduce interest in future sales or inflate bid prices, depending on results.

Another option is to continue to take no action. Those supporting delay often argue that not enough is known about either the probability of discoveries or about the environmental impact if development is permitted. Others argue that oil deposits should be saved for an unspecified “right time.” Because current law prohibits development unless Congress acts, the no action option also prevents energy development on both federal and Native lands because of the provisions of ANILCA and the 1983 Agreement. (See “Legislative History of the Refuge,” above.)

---

<sup>51</sup> CRS Report R41649, *Wilderness Laws: Statutory Provisions and Prohibited and Permitted Uses*, by Ross W. Gorte.

<sup>52</sup> As with any legislation, a later Congress could still reverse the designation and authorize development. For examples, see CRS General Distribution Memorandum “Legislated Deletions from Designated Wilderness Areas” by Ross W. Gorte, Jan. 24, 2011.

<sup>53</sup> 16 U.S.C. § 431. See, for example, Sierra Club Press Release of Dec. 6, 2010, “Arctic 50<sup>th</sup> Anniversary: Make It a Monument, Citizens Say,” <http://action.sierraclub.org/site/PageNavigator/E-Newsletters/Pressroom>.

<sup>54</sup> CRS Report RL31278, *Arctic National Wildlife Refuge: Background and Issues* discusses the pros and cons of this approach.



## Environmental Protection

If Congress authorizes development, it could address environmental matters in several ways. Congress could impose a higher standard of environmental protection because the 1002 area is in a national wildlife refuge or because of the fragility of the arctic environment, or it could legislate a lower standard to facilitate development. The choice of administering agency and the degree of discretion given to it could also affect the approaches to environmental protection. For example, Congress could make either FWS or BLM the lead agency (with many observers assuming that FWS management would give more support to protecting wildlife values). It could include provisions requiring use of “the best available technology” or “the best commercially available technology” or some other general standard. Existing laws such as NEPA and ESA already require consideration of various environmental impacts of federal actions. Congress could choose to limit judicial review under NEPA, ESA, or other laws, of some or all of a development program, including standards and implementation. Or, Congress could leave much of the environmental direction to the Secretary.

## The Size of Footprints

Newer technologies permit greater consolidation of leasing operations, which tends to reduce the size and the environmental impacts of development. One aspect of the debate in Congress has focused on the size of the footprints in the development and production phases of energy leasing. The term *footprint* does not have a universally accepted definition (e.g., the inclusion of exploratory structures, roads, gravel mines, port facilities, etc.), and therefore the types of structures falling under a “footprint restriction” are arguable.<sup>55</sup> In addition, it is unclear whether exploratory structures, or structures on Native lands, would be included under any provision limiting footprints.<sup>56</sup> The map accompanying S. 1932 in the 109<sup>th</sup> Congress (and subsequently cited in various other bills in the 110<sup>th</sup> Congress) includes the Native lands in its definition of the area to be leased, but how the federal leasing program would apply to those lands was not clear.

Development advocates have emphasized a 2,000-acre limit on the acreage of surface disturbance.<sup>57</sup> In contrast, opponents have emphasized the dispersal of not only the structures themselves but also their impacts over much of the 1.5 million acres of the 1002 area, where the human activity, plus the roads, pads, pipelines,<sup>58</sup> and other structures could deter caribou cows from calving in areas that have been most frequently used in the past, or deter other species that use the 1002 area. Development facilities would have to be dispersed, because one single

---

<sup>55</sup> See CRS Report RL32108, *North Slope Infrastructure and the ANWR Debate*, by M. Lynne Corn, for more information.

<sup>56</sup> For discussion of an acreage limit, see CRS Report RS22143, *Oil and Gas Leasing in the Arctic National Wildlife Refuge (ANWR): The 2,000-Acre Limit*, by M. Lynne Corn and Pamela Baldwin.

<sup>57</sup> It is unclear where the specific figure of 2,000 acres originated. It first appeared in legislation in the 107<sup>th</sup> Congress on August 1, 2001, when the House passed the Sununu amendment to H.R. 4 to limit specified surface development of the 1002 area to a total of 2,000 acres (228-201, recorded vote #316). With small variations (e.g., see S. 352 in the 112<sup>th</sup> Congress), it has been a common feature of ANWR development bills since that date. The language of the provision is not entirely clear on whether all surface disturbance necessary to development would be included under the restriction.

<sup>58</sup> There is debate on how to count the footprint of a pipeline. Industry supporters generally would count only the actual area of the soil disturbed by the supports that hold a pipeline above the ground. Wilderness advocates would count, at minimum, the entire area underneath a pipeline, and usually some area beyond that, to account for disturbance to wildlife, any changes in vegetation, or any other affects. To date, legislative limits on footprints have uniformly counted only the area covered by pipeline supports.

consolidated facility of 2,000 acres (3.1 square miles) would not permit full development of the 1002 area. Dispersal is necessary due to the limits of lateral (or extended reach) drilling. If the current North Slope record (about 4 miles out from the point of origin) for this technology were matched on all sides of a single pad, at most about 4% of the 1002 area could be developed. Even if the current world record (7 miles) for lateral drilling were matched, only about 11% could be accessed. Instead, full development of the 1002 area would require that facilities, even if limited to 2,000 acres in total surface area, be widely dispersed. However, it is important to remember that the location and dispersal of any potential oil and natural gas in ANWR remains unknown.

While the cost of lateral drilling has declined somewhat, it is still more expensive than simpler methods. As a result, strict adherence to the 2,000-acre limit could make some marginal fields uneconomic or inaccessible. If so, the policy choice would be between failing to develop such fields, or expanding the allowed limit on the footprint of development. This expansion would likely be opposed by those who argue that energy facilities have impacts on recreation, subsistence, vegetation, and wildlife well beyond areas actually covered by development.

In the 112<sup>th</sup> Congress, S. 351 takes a new approach to the question of development's footprints. It appears to open only the westernmost portion of ANWR to development by forbidding surface occupancy in lease sales. If North Slope records for lateral drilling could be reached economically along the western border, about 75,000 to 100,000 acres (and one of the seismically mapped prospects shown in **Figure 5**) would be accessible. (World records at lateral drilling would increase the acreage, but not add any additional prospects unless there are more western prospects that were unknown when the map was made.<sup>59</sup>) However, if partial opening of the 1002 area were to trigger opening of Native lands in the opened areas, these Native areas might not be subject to the restrictions on surface occupancy.<sup>60</sup> In any event, mandatory lateral drilling would likely add to the cost of developing any discoveries, and require a larger discovery to make production profitable.

## **Native Lands**

As noted above, if oil and natural gas development were authorized for the federal lands in the Refuge, development would also then be allowed or become feasible on the nearly 100,000 acres of Native lands. Any acreage limitation applying to development on the federal lands might or might not affect Native lands, depending on how development legislation was framed. The extent to which the Native lands could be regulated to protect the environment is uncertain, given the status of allotments and some of the language in the 1983 Agreement cited above. None of the current bills specifically address development on the Native lands in ANWR. (See also CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR)*, by Pamela Baldwin, and "Evolving Maps" below.)

---

<sup>59</sup> §4 of S. 351 further requires that the first lease sale offering be not less than 200,000 acres. If so, some offered acres might be technically inaccessible, given the statutory restriction on surface occupancy.

<sup>60</sup> At least one Native allotment, near the coast, appears to fall within the zone that could be reached from drill pads located to the west of the 1002 boundary, according to a BLM map ("Arctic National Wildlife Refuge Native Allotments, 8/14/2001"). However, the allotment does not overlay the westernmost prospect shown in **Figure 5**.

## Evolving Maps

During the 109<sup>th</sup> Congress, bills in both the House and Senate would have created ANWR leasing programs, and new definitions of the term *Coastal Plain* by referencing maps that had not been used in past legislation. (See CRS Report RS22326, *Legislative Maps of ANWR*, by M. Lynne Corn, hereafter cited as CRS Report RS22326.) The Coastal Plain was first defined in §1002 of ANILCA as the area indicated on an official August 1980 map referenced in ANILCA. An administrative articulation of the boundary by the Secretary of the Interior was authorized by §103(b) of ANILCA, and has the force of law. The 1980 map is now missing from FWS files.<sup>61</sup> Because the 1980 map is missing, evaluating whether the administrative description (48 *Fed. Reg.* 16858, Apr. 19, 1983; 50 C.F.R. Part 37, App. I) properly reflected that map is now impossible. The description excluded three Native townships from the articulated Coastal Plain (1002 area).<sup>62</sup> (Some bills in various Congresses also have excluded these same Native lands from the 1002 area by referring to the 1980 map and the administrative description.) As noted, the fourth Native township (selected later) is not excluded from the Coastal Plain (1002 area) by that description. In any event, the choice of new or old maps or new or old legal descriptions with their varying inclusions and exclusions may affect Native rights, environmental restrictions, and development costs.

## Revenue Disposition

Another issue is whether Congress may validly provide for a disposition of revenues other than the (essentially) 90% state - 10% federal split mentioned in the Alaska Statehood Act.<sup>63</sup> A court indicated that the language in the Statehood Act means that Alaska is to be treated like other states for federal leasing conducted under the Mineral Leasing Act (MLA), which contains (basically) a 90% - 10% split.<sup>64</sup> Arguably, Congress can establish a different, non-MLA leasing regimen—such as the existing separate leasing arrangements that govern the National Petroleum Reserve-Alaska, where the revenue sharing formula is 50% - 50%—but this issue was not before the court and hence remains an open issue.<sup>65</sup> Most development bills have opted for a 50% - 50% federal-state split, often allocating a small part of the federal share to aid Alaska in dealing with impacts of development and the remainder to benefit one or more federal conservation, land acquisition, or energy efficiency programs. Sometimes these last provisions provide for mandatory spending.

## Project Labor Agreements (PLAs)

In general, this recurring issue in federal and federally funded projects concerns whether project owners or contractors should be required, by agreement, to use union workers under Project

---

<sup>61</sup> Felicity Barringer, “Arctic Map Vanishes, and Oil Area Expands,” *New York Times*, October 21, 2005. The cause of the map’s disappearance is not known.

<sup>62</sup> Questions continue to surround this description. See CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR)*.

<sup>63</sup> For more on the sharing of federal revenues with states, see CRS Report R41770, *Leasing and Selling Federal Lands and Resources: Receipts and Their Disposition*, coordinated by Ross W. Gorte.

<sup>64</sup> *Alaska v. United States* (35 Fed. Cl. 685, 701 (1996)).

<sup>65</sup> For more on this issue, see CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR)*.

Labor Agreements (PLAs). Such agreements have been a feature of most ANWR development bills over the last 20 years. PLAs establish the terms and conditions of work that would apply for the particular project, and may also specify a source to supply the craft workers. Construction and other unions strongly support PLAs, and argue that PLAs ensure a reliable, efficient labor source, help keep costs down, and ensure access for union members to federal and federally funded projects. PLA provisions in past ANWR bills have led to labor endorsements from some unions. (Union support of ANWR development has not been unanimous however, as some unions see more job creation in other energy strategies.) Opponents, including nonunion firms and their supporters, believe that PLAs inflate costs, reduce competition, and unfairly restrict access to those projects. There is little independent information to weigh the validity of the conflicting assertions. In the 112<sup>th</sup> Congress, all three bills that would open ANWR for development contain provisions to require PLAs.

## **Oil Export Restrictions**

Export of North Slope oil in general, and any ANWR oil in particular, has been an issue, beginning with the authorization of the Trans Alaska Pipeline System (TAPS). The export issue could continue into the current ANWR debate, in light of high gasoline prices, since some argue that greater domestic production could reduce domestic oil prices. (See “Oil Resource Potential” above, for discussion of impacts of any ANWR oil on broader markets.) The export issue was illustrated in the Trans Alaska Pipeline Authorization Act,<sup>66</sup> which specified that oil shipped through it could be exported internationally, but only under restrictive conditions. In the mid-1990s, high volumes of Alaskan oil that could legally be shipped only to the four western states resulted in locally falling oil prices.<sup>67</sup> As California prices fell below the world market in the mid-1990s, there were complaints from both North Slope and California producers. Congress responded by amending the MLA to provide that oil transported through the pipeline may be exported unless the President finds, after considering specified criteria, that exports are *not* in the national interest.<sup>68</sup> North Slope exports rose to a peak of 74,000 bbl/day in 1999, or 7% of North Slope production. These exports ceased voluntarily in May 2000 as west coast buyers had to pay more to compete with foreign buyers for Alaskan oil. Exports from Alaska have since been minimal to none, due to high demand domestically.

For several reasons, the effect of a restriction on export of any ANWR oil is difficult to predict. While oil prices are generally set by world markets, export restrictions could depress oil prices on the West Coast again. Producers could allocate the ANWR oil to the domestic market, while selling other North Slope oil to meet demand from other nations. Moreover, the nature of the restriction could be important. Congress could chose to restrict ANWR oil export via a restriction on shipment through TAPS, or could restrict actual export regardless of the form of shipment. If Congress chose to limit exports by applying the restriction to oil transported through TAPS, the restriction might not be effective ... oil shipment via tanker could become practical if current warming trends in the Arctic continue and if crude oil prices are high enough to provide sufficient incentive.

---

<sup>66</sup> P.L. 93-153, 43 U.S.C. §§ 1651 et seq.

<sup>67</sup> Very minor amounts also went through the Panama Canal to refineries on the Gulf of Mexico.

<sup>68</sup> P.L. 104-58, 30 U.S.C. § 185(s).

## **NEPA Compliance**

The National Environmental Policy Act of 1969 (NEPA, 43 U.S.C. §§ 4321-4347) requires the preparation of an environmental impact statement (EIS) to examine major federal actions with significant effects on the environment, and to provide public involvement in agency decisions. The last full EIS examining the effects of development in ANWR was the 1002 report which was completed in 1987. Some observers assert that a new EIS would be needed to support development now. NEPA requires an EIS to analyze an array of alternatives, including a “no action” alternative—a process which can take years for complex or controversial actions. To hasten development in ANWR, some supporters would like to see the process truncated, in light of past analyses. Development opponents, and NEPA supporters, argue that the 24-year gap and changed circumstances since the last analysis necessitate a thorough update if development is authorized, and stress the flaws they found in the 1987 1002 report.

## **Compatibility with Refuge Purposes**

Under current law for the management of national wildlife refuges (16 U.S.C. § 668dd), and under 43 C.F.R. § 3101.5-3 for Alaskan refuges specifically, an activity may be allowed in a refuge only if it is compatible with the purposes of the particular refuge and with those of the National Wildlife Refuge System as a whole. Many past bills have addressed this issue by stating that the energy leasing program and activities in the 1002 area are deemed to be compatible with the purposes for which ANWR was established and that no further findings or decisions are required to implement this determination. This language appears to eliminate the usual compatibility determination that would be conducted by FWS. If a bill did not specify that development is to be considered compatible, the extent of leasing “activities” that might be determined to be compatible is debatable. For example, a compatibility test that rejected necessary support activities, such as construction and operation of port facilities, bridges, gravel mines, staging areas, and personnel centers could prevent development.

## **Judicial Review**

Development proponents urge that any ANWR leasing program be put in place promptly and argue that expediting, curtailing, or prohibiting judicial review is desirable to achieve that goal. Congress can expedite judicial review through procedural changes such as reducing the time limits within which suits must be filed, avoiding some level(s) of review, curtailing the scope of the review, or increasing the burden imposed on challengers. On the other hand, many argue the prospect of judicial review leads to better decision-making by the agency, in full consideration of all statutory factors, and that judicial review provides the opportunity to correct any errors.

## **Special Areas**

Some have supported setting aside certain portions of the 1002 area to protect of their ecological or cultural values. This could be done by designating the areas specifically in legislation, or by authorizing the Secretary to set aside areas to be selected after enactment. The 1002 report identified four special areas that together total more than 52,000 acres. The Secretary could be required to restrict or prevent development in these areas or any others that may seem significant, or to select among areas if an acreage limitation on such set-asides is imposed. Many development bills have contained provisions that limit the Secretary to a specific number of acres

(commonly 45,000 acres) in which leasing, or leasing with surface occupancy, could be prohibited.

## For Additional Reading

NOTE: See Box **Old Geological Data, Old Prices, and New Interest** (p. 2), for discussion of using older publications and their data.

CRS Report RL33941, *Polar Bears: Listing Under the Endangered Species Act*, by Eugene H. Buck, M. Lynne Corn, and Kristina Alexander.

CRS Report RL33716, *Alaska Natural Gas Pipelines: Interaction of the Natural Gas and Steel Markets*, by Stephen Cooney and Robert Pirog.

CRS Report RL33523, *Arctic National Wildlife Refuge (ANWR): Controversies for the 109<sup>th</sup> Congress*, by M. Lynne Corn, Bernard A. Gelb, and Pamela Baldwin.

CRS Report RS22304, *ANWR and FY2006 Budget Reconciliation Legislation*, by Bill Heniff Jr. and M. Lynne Corn.

National Academy of Sciences, *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope* (March 2003). 452 p. (See <http://www.nas.edu/>.)

C. Nellemann and R. D. Cameron, "Cumulative Impacts of an Evolving Oil-field Complex on the Distribution of Calving Caribou," *Canadian Journal of Zoology*, 76 (1998), p. 1425.

U.S. Department of Energy. Energy Information Administration. "Analysis of Crude Oil Production in the Arctic National Wildlife Refuge." May 2008. 18 p. (See [http://www.eia.doe.gov/oiaf/servicerpt/anwr/pdf/sroiaf\(2008\)03.pdf](http://www.eia.doe.gov/oiaf/servicerpt/anwr/pdf/sroiaf(2008)03.pdf).)

U.S. Department of the Interior. Bureau of Land Management. *Overview of the 1991 Arctic National Wildlife Refuge Recoverable Petroleum Resource Update*. Washington, DC, April 8, 1991. 2 maps.

U.S. Department of the Interior. Fish and Wildlife Service, Geological Survey, and Bureau of Land Management. *Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment*. Report and Recommendation to the Congress of the United States and Final Legislative Environmental Impact Statement. Washington, DC, 1987.

U.S. Department of the Interior. Geological Survey. *The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge 1002 Area, Alaska*. 1999. 2 CD set. USGS Open File Report 98-34.

U.S. Department of the Interior. Geological Survey. *Arctic Refuge Coastal Plain Terrestrial Wildlife Research Summaries*. Biological Science Report USGS/BRD/BSR-2002-0001.

U.S. Department of the Interior. Geological Survey. "Evaluation of additional potential development scenarios for the 1002 Area of the Arctic National Wildlife Refuge." Memorandum

from Brad Griffith, Assistant Leader, Alaska Cooperative Fish and Wildlife Research Unit, to Charles D. Groat, Director, U.S. Geological Survey. April 4, 2002.

U.S. Department of the Interior. Geological Survey. *Economics of 1998 U.S. Geological Survey's 1002 Area Regional Assessment: An Economic Update*. USGS Open File Report 2005-1359. Washington, DC, 2005.

U.S. General Accounting Office (now the Government Accountability Office). *Arctic National Wildlife Refuge: An Assessment of Interior's Estimate of an Economically Viable Oil Field*. Washington, DC. July, 1993. GAO/RCED-93-130.

U.S. National Energy Policy Development Group. *National Energy Policy*. Washington, DC. May, 2001.

## **Author Contact Information**

M. Lynne Corn  
Specialist in Natural Resources Policy  
lcorn@crs.loc.gov, 7-7267

Kristina Alexander  
Legislative Attorney  
kalexander@crs.loc.gov, 7-8597

Michael Ratner  
Analyst in Energy Policy  
mratner@crs.loc.gov, 7-9529

## **Acknowledgments**

Bernard A. Gelb, Specialist in Industry Economics (retired) contributed to an earlier version of this report.