

**UNITED STATES  
DEPARTMENT OF THE INTERIOR**

**DRAFT**

**ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA,  
COASTAL PLAIN RESOURCE ASSESSMENT**

**Report and recommendation to the Congress of the United States  
and legislative environmental impact statement**

**NOVEMBER 1986**

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**EXECUTIVE SUMMARY**

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**Prepared by the U.S. Fish and Wildlife Service  
in cooperation with the U.S. Geological Survey  
and the Bureau of Land Management**

# ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA, COASTAL PLAIN RESOURCE ASSESSMENT

Draft Legislative Environmental Impact Statement, November 1986

## EXECUTIVE SUMMARY

In December 1980, the Congress passed the Alaska National Interest Lands Conservation Act (ANILCA)-- landmark legislation setting aside more than 100 million acres of Federal lands in Alaska in conservation system units (that is, parks, refuges, and so on). Prior to ANILCA, the Arctic National Wildlife Range occupied 8.9 million acres of northeastern Alaska. ANILCA enlarged the unit to 17.9 million acres and changed its name to the Arctic National Wildlife Refuge.

Of special interest to the Congress during its ANILCA debates was the coastal plain of the Arctic Refuge. Not only was the area prized for its outstanding wildlife values, it was also suspected of having the most outstanding oil and gas potential of any unexplored onshore area in the country. The Congress created section 1002 of ANILCA to develop information about wildlife and energy values of the 1.5-million acres Arctic Refuge coastal plain ("1002 area"). Section 1002 required further study of the area's fish and wildlife resources, and limited exploration of its oil and gas potential. A report to the Congress on the results of these studies and recommendations by the Secretary of the Interior for future management of the coastal plain area were also required.

In the years since ANILCA was passed, the U.S. Fish and Wildlife Service conducted a series of biological studies of the area's fish and wildlife resources and their habitats. During the same period, the Bureau of Land Management, the U.S. Geological Survey, and exploration crews from private industry conducted surface geologic studies. Approximately 1,300 gravity readings and more than 1,300 line miles of seismic data were acquired by industry, under special-use permits issued by the Fish and Wildlife Service.

The Department's analysis of the geologic studies and surveys predicts a 95-percent chance of the 1002 area containing more than 4.8 billion barrels of oil and 11.5 trillion cubic feet of gas in-place. There is a 5-percent chance that the area contains more than 29.4 billion barrels of oil and 64.5 trillion cubic feet of gas in-place. The average of the range of in-place estimates yields a mean estimate of 13.8 billion barrels of oil and 31.3 trillion cubic feet of gas in-place. The area is clearly the most outstanding oil and gas frontier remaining in the United States, and could contribute substantially to our domestic energy supplies. Moreover, development of 3.2 BB of recoverable oil resources could yield Net National Economic Benefits from \$79.4 billion, based on an oil price of \$33 per barrel, to more than \$325 billion, if a more optimistic economic and resource assumption of 9.2 BB of

recoverable oil at \$40 per barrel is used (1984 dollars). These benefits would be manifested in jobs, lower balance-of-trade deficits, and increased tax revenues to all levels of government.

These oil resources are likely to be found in the 26 identified subsurface structures scattered across the coastal plain, and each represents an opportunity for a significant oil discovery. Additionally, other areas within the coastal plain have excellent potential for containing hydrocarbon accumulations in stratigraphic traps and other structures that cannot be defined with currently available geologic data.

A range of options exists for the future management of the 1002 area. In light of the information obtained, the entire coastal plain, or portions thereof, have the resource potential for a successful oil and gas leasing program. Or, to acquire more definitive data, an exploration program obtaining additional seismic surveys and drilling offshore exploratory wells in selected areas could be authorized by the Congress. On the other hand, the Congress could take no further legislative action and the 1002 area would be managed as an integral part of the entire refuge under the direction of its comprehensive conservation plan. Finally, the Congress could designate the area as a wilderness addition to the refuge's current 9 million wilderness acres.

On the basis of the analysis presented, and in consideration of this country's need for domestic sources of oil and gas, the Department proposes that the Congress authorize the Secretary to lease the entire 1002 area for oil and gas exploration and development. An area of approximately 242,000 acres in the southeast part of the 1002 area is used as a core calving area by the Porcupine caribou herd. To afford protection to this special area, the Department would want to structure a leasing program that offered this area last for leasing. This would permit experience obtained from development in the rest of the 1002 area to be applied in developing mitigation for activities in the calving area. The Congress would also be asked to grant authority to the Department to impose any restrictions necessary to ensure that unnecessary adverse effects are avoided and to require compensation in the event of significant unavoidable losses of habitat quality.

Section 1002 also required an assessment of potential environmental consequences if oil and gas development occurred in the 1002 area. To facilitate this assessment, scenarios were developed using the mean estimated recoverable oil and gas resource figures for the

area, considering prospects that would be economically recoverable under a most likely situation. Using these scenarios, the U.S. Fish and Wildlife Service determined possible environmental consequences.

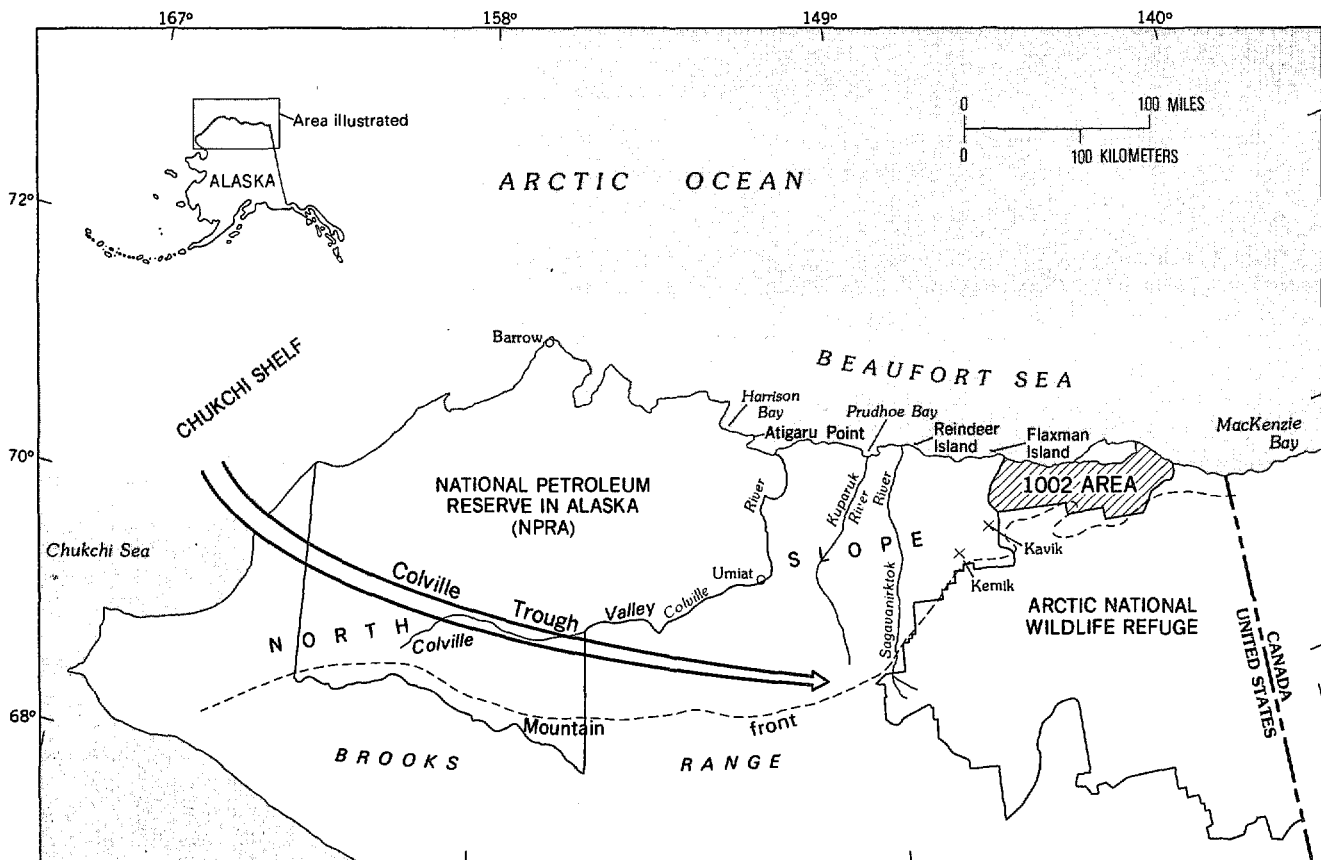
The assessment predicted environmental consequences of developing the entire 1002 area to be some long-term effects on the area's water resources, on caribou from the Porcupine herd, and on muskoxen. The presence of infrastructure supporting oil and gas development and a pipeline to transport the oil to the near by Prudhoe Bay area would eliminate the wilderness character of the 1002 area. Most adverse effects would be minimized or eliminated through carefully applied mitigation, using the lessons learned and technology acquired from development at Prudhoe Bay and from construction of the Trans-Alaska Pipeline System (TAPS). The evidence generated during the 18 years of exploration and development at Prudhoe Bay indicates minimal impact on wildlife resources. Hence, it is reasonable to assume that development can proceed on the coastal plain and generate similar minimal effects.

Highlights of the report to the Congress, prepared by the U.S. Fish and Wildlife Service, in cooperation with the Bureau of Land Management and the U.S. Geological Survey, follow.

## THE 1002 AREA

The 1.55-million-acre 1002 area, part of the tundra-covered Arctic Coastal Plain Province, is located in the remote northernmost part of the Arctic Refuge. It is bounded on the east by the Aichilik River, on the west by the Canning and Staines Rivers, to the north by the Beaufort Sea, and to the south by township lines through the foothills of the Brooks Range. The 1002 area constitutes about 75 percent of the total coastal plain of the refuge; the rest is east of the Aichilik River to the Canadian border, and is part of the refuge's designated wilderness area.

Its arctic marine climate has extremely cold winters and short, cool summers. Summer temperatures average about 40°F; in the winter temperatures drop well below 0°F, with wind-chill factors to minus 80°F. Persistent winds blow throughout the year. Precipitation over the 1002 area is light but frequent, with summer drizzle and light winter snows. Regardless of season, clear days on the coastal plain are uncommon. Fog and stratus clouds prevail during the summer. In the winter, fog and blowing snow reduce visibility. The sun is continuously above the horizon from mid-May to the end of July, and continuously below the horizon from the end of November to mid-January.



Freezeup begins by mid-September, and the ground in the 1002 area remains frozen until June. Snowfall is greatest from September through November, and again in January. Numerous measurements indicated that average snow accumulations were 12 inches in 1984 and 9 inches in 1985. The almost-continuous winds redistribute the snow, filling valleys and swales, but leaving ridgetops bare. Drifts along stream cutbanks can be as high as 20 feet. Rivers are fed by melting snow in the foothills and do not begin to flow until mid-May. Only a few large lakes occur and most of these are so shallow they freeze to bottom in winter. A few shallow thaw lakes are found near the coast, east of the Canning River delta.

The entire 1002 area is underlain by continuous permafrost except for a small area near the warm Sadlerochit Spring which flows year round. The upper layer of the surface of the ground that freezes and thaws annually is called the "active layer."

### **Vegetation and Terrain Types**

Despite its barren and desolate appearance, the 1002 area actually consists of a variety of tundra vegetation and landform types.

Foothills cover about 45 percent of the 1002 area. These areas are rich in mosses and lichens, important components of the tundra vegetation. Barren deltas and braided river channels of the river flood plains make up as much as 25 percent of the area. Gently rolling, hilly coastal plains cover 22 percent of the 1002 area. Here numerous slightly elevated ridges and depressions cover the landscape. Vegetation includes sedges, mosses, lichens and prostrate shrubs in well-drained areas. Tussock tundra occurs frequently in this hilly terrain, and its vegetative complement includes cottongrass, dwarf willows, and birches. Flat thaw-lake plains comprise only about 3 percent of the 1002 area, and contain unusual surface features called polygons, a ground pattern similar in appearance to rice paddies. Polygons are caused by seasonal thawing and freezing of the active layer in wetter areas. Vegetation in the thaw-lake plains is dominated by aquatic and wet tundra species. Virtually the entire 1002 area can be classified as wetland.

Sadlerochit Spring is one of the largest perennial springs on the Alaskan North Slope. Located in the foothills in the southern part of the 1002 area, the spring and its surrounding area of approximately 4,000 acres has been nominated as a National Natural Landmark. The spring is unique owing to its large warm water discharge which maintains an open channel for nearly 5 miles downstream during the coldest part of the year.

### **Fish and Wildlife Species**

Except for muskoxen and denning or burrowing animals such as polar bears and arctic ground squirrels, the harsh winters drive most species from the 1002 area.

The brief spring, summer, and fall seasons, however, find the area host to large numbers of mammals and birds which use the coastal plain for important parts of their annual life cycles.

### **CARIBOU**

Caribou of the Porcupine and Central Arctic herds are the most numerous large mammals using the 1002 area.

The Porcupine caribou herd, named for the Porcupine River in Canada where they winter, is the larger of the two herds that use the refuge. The Porcupine herd is currently estimated by the Alaska Department of Fish and Game at 180,000 animals. Each year the herd returns to its traditional calving grounds between the Babbage River in Canada and the Canning River in Alaska. Although distribution on the calving grounds varies from year-to-year, most calving usually takes place in the area between the Hulahula River and the Canadian border. Certain areas appear to be favored by pregnant cows for calving. During the last 14 years, a 2.1-million-acre area has been identified by biologists as a concentrated calving area. Of this, 934,000 acres, or 44 percent of the area, is within the 1002 area. In 1985, 82 percent of the pregnant cows in the Porcupine caribou herd used the 1002 area for calving.

The Central Arctic caribou herd uses a range entirely north of the Continental Divide, from the Itkillik and Colville Rivers on the west to the Sadlerochit River on the east. The TAPS, Dalton Highway, and Prudhoe Bay and Kuparuk oil fields all lie within this herd's range. Despite this, the herd has been increasing, and in 1985 numbered about 12,000 to 14,000 animals. Cows tend to calve in an area on or near the Canning and Staines River deltas; calving activity has been concentrated near the lower Kuparuk River and Canning River delta. Most years as many as 1,000 females calve on the Canning River delta within the 1002 area, with some scattered calving as far east as the Sadlerochit River.

After calving in late May and early June, when huge swarms of mosquitoes emerge, caribou from both herds cluster in large aggregations and travel to coastal habitats for relief from insect harassment on points, river deltas and mudflats. Some groups may move to higher elevations in the southern mountains for relief.

In early July most of the Porcupine caribou move east and south, and vacate the 1002 area by mid-July, heading for their wintering grounds in Canada and in the southern Brooks Range. Occasionally, remnant groups may winter in the northern mountains and foothills. In late summer and fall, caribou of the Central Arctic herd are found scattered across the coastal plain south of Camden Bay, in the foothills north of the Sadlerochit Mountains, and in uplands south of the Sadlerochit Mountains where they winter. During most winters scattered groups of caribou of the Central Arctic herd range throughout the 1002 area west of the Katakturuk River and the adjacent uplands to the south.

## OTHER MAMMALS

Muskoxen were exterminated from the North Slope by the late 1800's by hunters. The animal's instinctive defense of forming a circle of bulls surrounding cows and calves, although effective against predators, makes them especially vulnerable to hunters. In 1969 and 1970, 69 muskoxen were reintroduced to the Arctic Refuge to establish an indigenous population. High productivity and low natural mortality caused this population to expand rapidly. In 1985, the refuge population was estimated at 476 animals. Muskoxen move with seasonal changes in vegetation and snow cover. In summer and fall they frequent major drainages to feed on willows and forbs. In winter and spring many animals move to the uplands where snow cover is light and tussock sedges readily available.

Polar bears roam the pack ice of the Arctic Ocean throughout most of the year. Some females move to coastal areas and inland during October and November to seek suitable maternity den sites. Pregnant polar bears and, later, their cubs probably spend more time on the 1002 area than other segments of the population. At least 15 dens have been located in the 1002 area; 5 dens have been found on ice near the 1002 area.

Brown bears use the 1002 area seasonally. At their time of greatest abundance on the area, about 108 bears are found on the coastal plain. The bears appear in late May and remain through June and July to prey on caribou, ground squirrels and rodents. Food habits change with the seasons--spring finds a combination of meat and vegetation in their diets, and mid- to late summer, almost all berries and vegetation. Although the bears breed while on the 1002 area, they leave in September and October for den sites in the foothills and mountains.

Other predators using the 1002 area include wolves, wolverines, and arctic foxes. There are very few wolves and wolverines on the 1002 area. Arctic fox populations tend to fluctuate according to the abundance of the small rodents on which they prey.

Ringed and bearded seals, and, occasionally, spotted seals occur along the coast of the Beaufort Sea. The endangered bowhead and gray whale, as well as beluga whale, migrate through waters north of the 1002 area.

Other mammals using the 1002 area include small numbers of moose and Dall sheep, which are near the northern limits of their range, and large numbers of arctic ground squirrels and other rodents. Although these animals are of lesser importance, they indicate the biological diversity of the area.

## BIRDS

The majority of bird species using the coastal plain are migratory, and occur in large numbers from May to September. A total of 108 species have been recorded.

Six species are considered permanent residents--rock and willow ptarmigan, snowy owl, common raven, gyrfalcon, and American dipper, which winters in the warmer area around the Sadlerochit Spring. The lagoon systems are important feeding areas for oldsquaw, eider, scoter, and other ducks; loons, phalaropes, terns, gulls, jaegers and black guillemots. Raptors nesting in the area include rough-legged hawks, golden eagles, gyrfalcons, snowy owls, short-eared owls, and threatened arctic peregrine falcons.

Tundra swans are common breeding birds of the thaw-lake plains. As many as 150 nests and 400-500 adult swans have been counted on the 1002 area during annual surveys. Black brant and Canada, greater white-fronted, and lesser snow geese regularly use the 1002 area. Canada geese and black brant breed there each year. Part of the Banks Island, Canada, population of lesser snow geese use the 1002 area as a staging area for their annual fall migration. At their maximum, as many as 325,000 snow geese have been counted on the area.

Erect riparian willow stands support a diversity of perching birds such as hoary redpolls and white-crowned, American tree and savannah sparrows. Snow buntings are found on coastal bluffs. Lapland longspurs are the most abundant species, and nest in all tundra types.

## FISH

Fish in the Arctic survive because of extreme adaptations to a harsh environment. Relatively few species occur in the marine, estuarine, and fresh-water environments of the 1002 area. Arctic char, arctic cisco, arctic flounder, arctic cod, boreal smelt, and fourhorn sculpin have been reported offshore of the 1002 area. The nearshore waters are important spawning and overwintering areas. Arctic char, arctic grayling, arctic cisco, arctic flounder, fourhorn sculpin, least cisco, round whitefish, broad whitefish, ninespine stickleback, chum salmon, and burbot have been reported in the Canning River system. Other streams that support fish populations include the Tamayariak, Sadlerochit, Hulahula, Akutoktak, Okpilak, and Aichilik Rivers, and Itkilyariak Creek. The remaining streams in the 1002 area apparently do not support major fish populations, most probably because they freeze to bottom or otherwise fail to provide suitable overwintering habitat.

## KAKTOVIK AND ITS INUPIAT VILLAGERS

The village of Kaktovik, located on Barter Island on the Beaufort seacoast, is the only village within the boundaries of the Arctic Refuge. Nearly 90 percent of its 200 residents are Native Inupiat Eskimo, who have strong cultural links to lands in and adjacent to the 1002 area.

Barter Island was an important trading center for centuries. Canadian Inuit people met on the island to trade with Barrow area residents; inland people came down from the mountains to trade. Barter Island was an important stop for commercial whalers during the 1890's and later,

but it was not until 1923 that a permanent settlement was established as a trading post, which served as an exchange point for furs and was the beginning of the village of Kaktovik.

Kaktovik has survived as a community because of strong family and cultural ties, ties to the land, and economic opportunity for both jobs and subsistence. Participation in subsistence activities is a major aspect of Kaktovik residents' life. Approximately 68 percent of Kaktovik's present subsistence land use is within the Arctic Refuge, including the entire 1002 area. Kaktovik residents depend primarily on caribou, Dall sheep, bowhead whales, fish, waterfowl, and other birds. Seals, polar bears, furbearers, and small game are secondary. Brown bears and moose are taken occasionally. A few residents harvest berries, wild rhubarb, and roots.

Changes in the economy have changed the living patterns of Kaktovik residents. The Inupiat traditionally have had a subsistence economy. However, increasing contact with other cultures has changed the nature of their economic system. Since 1890 economic activity has vacillated from whaling, to trapping, reindeer herding, and construction of the Distant Early Warning (DEW Line) system on Barter Island. Kaktovik residents have relocated their village three times since 1947. The current village was established in 1964, and was incorporated as a second-class city in 1972.

Economic activity in the area has recently increased in response to the passage of the Alaska Native Claims Settlement Act (ANCSA) in 1971, to oil and gas development in the Prudhoe Bay area, to the capital improvement program of the North Slope Borough, and to the KIC/ASRC exploratory well drilled on Native land. Kaktovik Inupiat Corporation (KIC), the village profit corporation formed as a result of ANCSA, operates a village store, selling fuel oil, aviation fuel, and snowmachines. Kaktovik residents are also shareholders in the Arctic Slope Regional Corporation (ASRC), the regional profit corporation organized under ANCSA.

## **OIL AND GAS POTENTIAL OF THE 1002 AREA**

A high potential for significant discoveries of oil and gas in the 1002 area has long been recognized. Explorers at the turn of the century found oil seeps and oil-stained sands on this part of the Arctic coastal plain.

Oil and gas exploration in the Arctic began in 1944 on the National Petroleum Reserve-Alaska. Exploration by oil companies on Federal and State lands east of the Colville River in the 1960's culminated in 1968 in the discovery of the Prudhoe Bay oil field, the largest in North America. In 1982 the adjacent Kuparuk River field came on line, and the Milne Point field was productive by 1985.

Exploration offshore in the Beaufort Sea began in the mid-1970's. In 1978, the Endicott field was discovered near the Sagavanirktok River delta; it is scheduled to begin production in 1987. The joint State-Federal Lease Sale BF in 1979 increased the pace of offshore exploration. Federal Lease Sale 71 in 1980 resulted in two discoveries. Exploration began in the summer of 1985 on Federal Sale 87. State lease sales within the 3-nautical-mile limit along the coast of the 1002 area in Camden Bay have been scheduled for 1987, and near Demarcation Point for 1988.

Section 1002(a) of ANILCA authorized oil and gas exploration on the 1002 area in a manner that avoided significant adverse effects to fish and wildlife and other resources. Exploration included surface geological and geophysical exploration, but not exploratory drilling. The favorable geology of the 1002 area, which lies between areas where significant oil discoveries have been made, was confirmed by recent surface geology studies and seismic surveys.

During the summers of 1983-85, exploration crews from 15 companies visited the 1002 area by helicopter. The crews made field observations and measurements, and collected rock samples that were analyzed for age and geochemistry (hydrocarbon-generation potential) and porosity and permeability (potential reservoir characteristics). Approximately 1,300 gravity readings along a 1x2-mile grid covering the 1002 area were collected by a helicopter-supported gravity survey during the late summer of 1983. Seismic operations, permitted during two winter seasons in 1983-84 and 1984-85, acquired more than 1,300 line miles of seismic data. The seismic program provided the detailed subsurface data on the area's oil and gas potential.

The U.S. Geological Survey and Bureau of Land Management analyzed these data in assessing the hydrocarbon potential of the area. The results indicate that the 1002 area has the geologic elements necessary for hydrocarbon formation and entrapment. Sedimentary rocks in the area include organic source rocks necessary to produce oil, and thick sequences of reservoir rock where hydrocarbons can accumulate. Equally as important, the area appears to have favorable geologic structures for trapping and holding hydrocarbons, such as the Marsh Creek anticline in the western portion of the 1002 area.

The U.S. Geological Survey and Bureau of Land Management made, based on their analyses, estimates of the potential volumes of oil and gas in-place and likely to be economically recoverable. Although the geologic indications and seismic interpretations are extremely encouraging, only exploratory drilling can confirm the presence of oil. The estimates contain a high degree of uncertainty as reflected in the methods and assumptions used by each agency. In-place and recoverable figures are presented as ranges of probability from the 5-percent probability level to the 95-percent probability level.

There is a 95-percent chance the 1002 area contains more than 4.8 billion barrels of oil and 11.5 trillion cubic feet of gas in-place. There is a 5-percent chance the area contains more than 29.4 billion barrels of oil and 64.5 trillion cubic feet of gas in-place. The average of the range of in-place estimates yields a mean estimate of 13.8 billion barrels of oil and 31.3 trillion cubic feet of gas in-place.

Total recovery of oil and gas in-place is impossible. To estimate the amount of in-place resources that may be recoverable, technological and economic conditions were applied to in-place resource estimates for the area. This resulted in an estimated 95-percent chance of 0.6 billion barrels of oil recoverable, a 5-percent chance of 9.2 billion barrels of oil recoverable, and an average conditional economically recoverable resource estimate of 3.2 billion barrels of oil.

The Department did not include gas in its recoverable calculations as it was determined that the gas resources were unlikely to be economic at any point in the 30-year period considered in the report.

The onshore basins in the United States that hold the greatest potential for very large discoveries have already been explored, except for the 1002 area. Although there are some very attractive offshore areas yet to be explored, the 1002 area is particularly promising because it contains extensions of other producing trends; wells on adjacent properties show highly favorable evidence of petroleum deposits. These evidences, combined with the 26 structural traps mapped or inferred for the area, indicate that the 1002 area is currently the unexplored area in the U.S. with the greatest potential of containing giant (100 million barrels or more), or supergiant (500 million barrels or more) fields.

### **DEVELOPMENT AND TRANSPORTATION OF OIL FROM THE 1002 AREA**

Generic scenarios were devised for the exploration, development, production, and transportation of economic quantities of oil from the 26 potential oil prospects located throughout the 1002 area. Gas production was not considered.

These scenarios were used for assessing environmental consequences. In assessing development requirements, it became apparent that the water and gravel necessary for construction and development are in very limited supply on the 1002 area.

An inland pipeline, roughly bisecting the 1002 area from east to west, was selected for transporting oil to Prudhoe Bay to connect with the existing TAPS. This pipeline would be elevated across most of the area to protect the permafrost. The distance from the easternmost development in the 1002 area to TAPS Pump Station 1 would be about 150 miles, including the 50 miles of State of Alaska land between the western boundary of the 1002 area and Pump Station 1. Declines in Prudhoe Bay oil

production would coincide with the time at which production might begin in the 1002 area. Therefore, it was assumed that TAPS would have the capacity to transport oil from the 1002 area.

The development scenarios depicted typical infrastructures in three areas for full development of the 1002 area, and in two areas if the Porcupine caribou core calving area was not leased.

### **ENVIRONMENTAL CONSEQUENCES OF OIL DEVELOPMENT ON THE 1002 AREA**

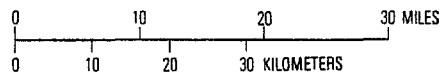
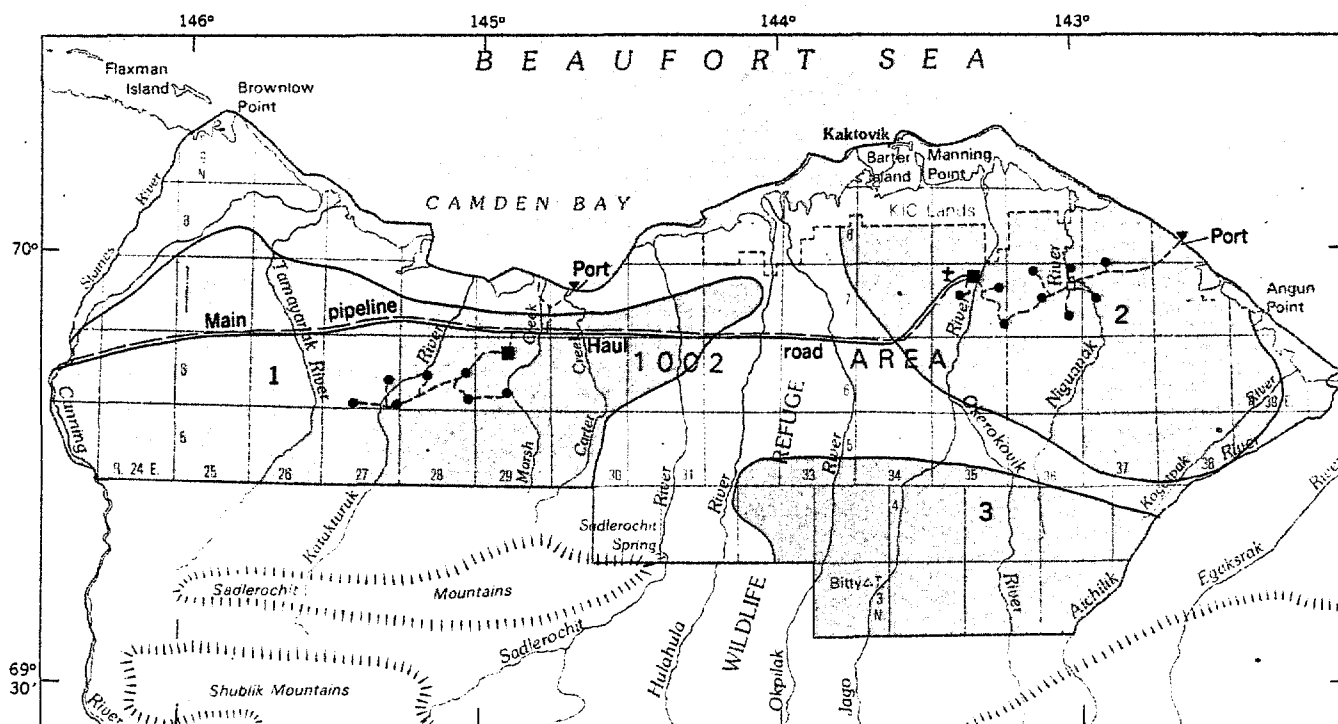
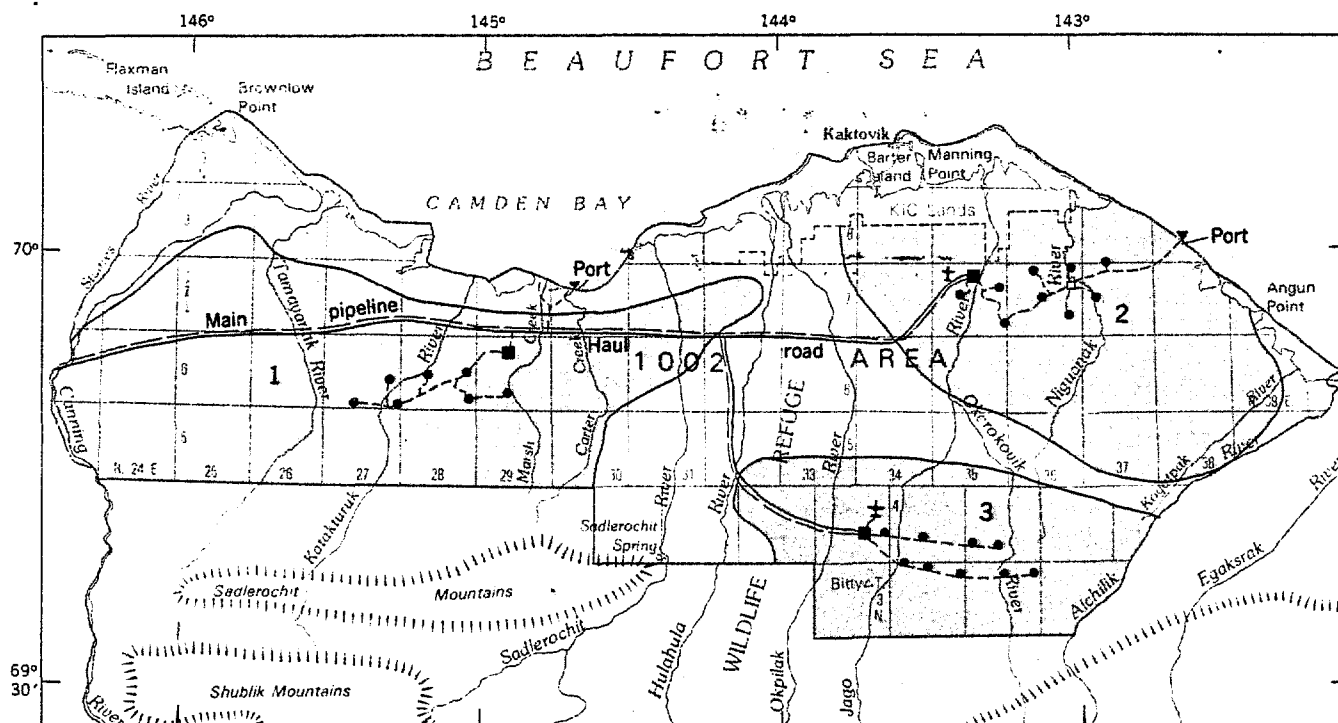
Biologists from the U.S. Fish and Wildlife Service assessed potential effects of each alternative: A--Full leasing of the 1002 area; B--Leasing limited to a portion of the 1002 area; C--Further oil and gas exploration; D--No further Congressional action; and E--Wilderness designation.

Alternatives D and E would result in no adverse impacts on the fish and wildlife resources of the 1002 or on its wilderness value; however, they would preclude further exploration to determine the real hydrocarbon potential of the 1002 area and production of any economically recoverable resources.

Short-term activities associated with further exploration, such as exploratory wells, of the 1002 area will lead to generally short-term displacement and disturbance of fish and wildlife resources and Native subsistence users. There will probably be little or no residual or long-term effect on wildlife populations. Wilderness attributes of the area will be affected for a longer period of time.

Long-term losses in fish and wildlife resources, subsistence uses, and wilderness values would be the inevitable consequences of a long-term commitment to oil and gas development, production, and transportation. If producing fields were discovered, petroleum operations would last for 30-90 years. Oil and gas discovery will lead to industrial development. There will be pressure to use this area as a base to service exploration and development on the outer continental shelf, or to intertie with projected oil and gas development in the Canadian Arctic. An oil development infrastructure in the 1002 area would be an impetus to develop State lands between the Canning River and the TAPS. Infrastructure in the 1002 area would serve potential offshore or other fields, adding to the long-term industrial commitment.

Oil and gas development will result in widespread, long-term changes in wildlife habitats, wilderness environment, and Native community activities. Changes could include displacement and reduction in the size of the Porcupine caribou herd. The amount of reduction and its long-term significance for herd viability is highly speculative. Geography apparently limits the availability of suitable alternative calving or insect-relief habitats for the herd. Mitigation measures can minimize some adverse effects to



#### EXPLANATION

- |                             |                              |                            |
|-----------------------------|------------------------------|----------------------------|
| Central production facility | • Drill pad—23 acres         | — Connecting road          |
| ■ 90 acres                  | ✚ Airstrips—30 and 130 acres | ▼ Seawater treatment plant |
| □ 40 acres                  |                              |                            |

Hypothetical generalized development of the 1002 area under full leasing (upper) or limited leasing (lower) if economic quantities of oil are discovered.

Numbers indicate three localities (shaded) having typical prospect characteristics.



the Porcupine caribou herd as well as to other wildlife species, wilderness characteristics, and subsistence uses.

Industrial development could profoundly affect the Native culture. Although it may provide jobs for villagers from Kaktovik, it will hasten changes from a life style based on subsistence and community sharing and a dependence on the land to a society with a cash-based economy. Increased education, employment, and health services would be positive benefits of this change in life style.

## **THE CONTRIBUTION TO U.S. NEEDS FOR DOMESTIC ENERGY SOURCES**

The 1002 area's oil fields could be the largest domestic fields discovered since Prudhoe Bay and Kuparuk River. Except for these, no U.S. field with reserves exceeding 1 billion barrels of oil has been discovered since 1948. Today, Prudhoe Bay contributes approximately 20 percent of domestic production, but production from Prudhoe Bay has peaked and a decline is expected by 1988.

A leasing program on the 1002 area could contribute billions of barrels of additional oil reserves toward the national need for domestic sources. Oil consumption in the U.S. has exceeded domestic production for more than 20 years. Not only might discovery of a giant or supergiant field significantly contribute to domestic reserves and production, it could do so at a relatively low average cost per barrel because of economies of scale.

Oil from the 1002 area could also help achieve several national economic and security objectives. Since 1970 this Nation has been heavily dependent on petroleum imports to meet domestic demand. Imports in 1985 were expected to supply about one-third of domestic oil needs. The most recent forecast by the Department of Energy indicates that U.S. dependence on oil will increase significantly by the end of the century due to declines in domestic reserves.

As imports have increased, the U.S. has become vulnerable to the actions of oil-exporting countries. Because domestic production supplants imports, benefits accrue not only from savings that result when domestic oil costs are lower than imported oil costs, but also from the reduction in economic vulnerability to disruptions of supply.

Continued dependence on imports for a substantial portion of total U.S. oil consumption creates national security concerns. The potential for supply disruption limits flexibility in foreign security policy, including the ability to respond to threats to national security. The United States could potentially be drawn into dangerous political and military situations involving the exporting nations.

Another objective of leasing the 1002 area would be production of additional domestic sources of oil as one means of achieving a more favorable balance of international trade. In 1984 the gross cost of importing crude oil and refined petroleum products amounted to almost 50 percent of the trade deficit. Production from the 1002 area not only would reduce the need to import oil, but would reduce the amount of foreign exchange required to pay for the imported oil.

The economic benefits from producing oil on the 1002 area would include an increase in Net National Economic Benefits expected to accrue as bonuses, royalties, rental fees, taxes, and after-tax business profits. If the entire 1002 area were leased, these benefits could be almost \$15 billion in discounted dollars. Lease production would generate revenues to the public as lease bonus payments and rentals, royalties, Federal corporate income taxes, severance tax payments to the State, and State corporate income taxes.

## Proposed Recommendation

The Arctic National Wildlife Refuge, comprising more than 19 million acres, is unique and one of the largest units of the National Wildlife Refuge System. The coastal plain portion of the refuge contains a variety of habitats that support fish and wildlife species such as muskoxen, snow geese, arctic char, and caribou of both Central Arctic and Porcupine herds. At the same time, the 1.5-million-acre 1002 area of the coastal plain has been predicted to contain as much as 29 billion barrels of oil and 64 trillion, cubic feet of gas, making it the most outstanding oil and gas frontier area in North America.

Because of the enormous hydrocarbon potential of the 1002 area and its potential contribution to the vital need for domestic sources of oil and gas, the Department of the Interior recommends that the Congress enact legislation making the entire 1002 area of the Arctic Refuge available for oil and gas leasing, and authorize the Secretary of the Interior to impose necessary and appropriate measures to protect refuge resources and values and ensure coordinated and efficient oil and gas activities. Despite its remote location and hostile environment, the 1002 area is the most attractive onshore petroleum exploration target in the United States today. Development of its potential oil and gas resources could make a significant contribution to the economy and security of this Nation, and could be done in an environmentally responsible manner based on lessons learned at Prudhoe Bay, on the 1002 area, at the KIC/ASRC exploratory well, and elsewhere.

Leasing the 1002 area of the Arctic Refuge coastal plain would provide industry the opportunity to explore for and develop what is believed to be the last onshore area of significant oil and gas potential in the United States. The geology of the 1002 area indicates the potential for a very substantial contribution to domestic oil reserves. Data from nearby wells in the Prudhoe Bay area of Alaska and in the Canadian Beaufort Sea and Mackenzie delta, combined with the promising seismic data gathered on the 1002 area, indicate extensions of producing trends and other geologic conditions extremely favorable for discovery of one or more giant (reserves exceeding 100 million barrels) or supergiant (reserves exceeding 500 million barrels) oil fields in the 1002 area.

Alaska North Slope crude oil, particularly from Prudhoe Bay, now contributes almost 20 percent of domestic production. But contributions from Prudhoe Bay have peaked and a decline is expected no later than 1988. It has been estimated that shrinking American oil reserves will plunge by 1990 to their lowest levels since shortly after World War II, based on current drilling rates. The decline predicted from the 1985 reserve figure of 28.4 billion barrels of oil (BBO) is down to 25.1 BBO in 1990, and perhaps to as low as 23.2 BBO in 1995. Most significant declines in

reserves will occur in the older, traditional oil-producing areas of the western United States, Texas, the Gulf Coast, and the Midcontinent. The onshore basins in the U.S. with the greatest potential for giant fields have already been explored, with the exception of the 1002 area. On the 1002 area and other frontier regions in Alaska and offshore, prospects are better for substantial reserve additions.

The U.S. oil demand predicted by the Department of Energy for the year 2005 is 16.5 million barrels per day. The Department of Energy further predicts that the U.S. will need to import 7.6 million barrels of foreign oil per day by the year 2005. Since the 1960's, the U.S. domestic oil production has not been adequate to fully supply the economy's need for competitively priced oil production, and this Nation's increasing demand for petroleum and petroleum-based products continues to surpass our ability to meet the demand domestically. As imports have increased, the Nation has become vulnerable to the actions of oil-exporting countries and cartels such as OPEC. Production of oil from the 1002 area could reduce this foreign dependence by almost 9 percent in the year 2005.

In addition to reducing the dependence on foreign oil, contributions from the 1002 area would enhance the national security of the country, produce a more favorable balance of trade by saving \$8.1 billion in the year 2005 on the cost of imported oil, and provide overall enhanced economic benefits to the Nation. The contribution made by oil from the 1002 area could be expected to span over 30 years from the start of production. Based on the mean recoverable value of 3.2 billion barrels, production of oil from the 1002 area in the year 2005 could account for almost 4 percent of the daily U.S. oil demand and nearly 8 percent of the daily U.S. production. The net national economic benefits expected to accrue from oil production on the 1002 area could approximate \$14.6 billion (present discounted value). The Federal leasing revenues from a program on the 1002 area are expected to total \$8.0 billion (present discounted value). The State of Alaska would receive a share of that Federal revenue, and also it could receive an estimated \$3.6 billion in tax payments related to leasing.

While our domestic oil supply picture has grown darker, the production of oil from North America's largest oil field at Prudhoe Bay has taught us much about how to protect environmental values. Even though the billions of barrels of oil reserves have been brought on line and the infrastructure developed to bring that oil to U.S. markets, the fish and wildlife resources of the Prudhoe Bay area remain extremely healthy. The Central Arctic caribou herd has increased substantially during the period that development has occurred within the heart of its range.

Estimated at about 3,000 animals in 1972, the herd now numbers more than 13,000. Similarly, important waterfowl species continue to successfully nest and rear their broods within the developed area. Although circumstances within the 1002 area may be somewhat different, the evidence derived from the Prudhoe Bay experience leads one to be quite optimistic about the ability to explore for and develop the hydrocarbon potential of the 1002 area without significant deleterious effects on the unit's wildlife resources.

Clearly, an area of such high natural resource value should be afforded special protection and steps must be taken to conserve the fish and wildlife and their habitats on the 1002 area. Therefore, the Department recommends that the Congress enact specific legislation that will provide the Department of the Interior with sufficient authority to control the development of oil and gas resources in the 1002 area by imposing appropriate mitigation measures. Those aspects of the opening legislation dealing with the elements of the leasing program itself should be patterned after the act authorizing leasing of the National Petroleum Reserve-Alaska, and should address other appropriate matters such as unitization, drainage, and suspension, as well as incorporate the Mineral Leasing Act of 1920 to the extent that it would not be inconsistent with this special legislation. Provisions should include the authority to issue regulations that ensure environmental integrity in all oil and gas operations in the area. This special legislation should grant the Secretary of the Interior maximum authority to structure a leasing program that permits the exploration, development, and production of these oil and gas resources in a manner that results in no unnecessary adverse effects on the refuge's fish and wildlife and their habitats and avoids unnecessary duplication of oil and gas activities. Further, such a program must ensure that any unavoidable habitat losses are fully compensated.

Because the area has not been fully explored by using exploratory drilling, it cannot be precisely determined where or how much development is likely to occur in the 1002 area. To assess anticipated impacts, the Fish and Wildlife Service (FWS) biologists based their analysis on development scenarios using the mean estimated recoverable resource figures for prospects in the 1002 area considered economical under the most likely scenario. If the entire 1002 area were leased and subsequently developed, the assessment predicts that there may be some long-term, widespread effects on the area's water resources, the Porcupine caribou herd (PCH), muskoxen, and the wilderness values of the area, for at least as long as oil and gas development activities influence the area. Overall, however, most adverse environmental effects would be minimized or eliminated through mitigation based on the vast amount of information and technology acquired during the development of the Prudhoe Bay area and from

construction and operation of the 800-mile Trans-Alaska Pipeline. Development would proceed with the goal of no net loss of habitat quality, and unnecessary adverse effects would not be allowed to occur.

Therefore, if the Congress authorizes leasing of the 1002 area, the program would be designed by the Department to permit leasing first what the Department considers the more prospective areas. In this way, additional exploration, including off-structure test wells and delineation drilling, could get underway to determine the location and size of any oil and gas reserves on the coastal plain. Although preliminary data indicate excellent oil and gas potential in the southeastern corner of the 1002 area, leasing would be phased so the "core calving" area of the PCH would be last to be explored or developed. This phased leasing would allow time to study the effects of oil and gas development and transportation on other parts of the 1002 area, and to evaluate the types and degree of impacts on snow geese that stage in the core calving area and on the PCH. These studies would be used to develop any additional mitigation measures necessary to avoid or reduce impacts, and to determine compensation required in the event of significant unavoidable losses of habitat quality.

Authority for administering the leasing program should be vested in the Department, to be exercised through the FWS and Bureau of Land Management (BLM). As the agency with direct jurisdiction over these lands, the FWS must be delegated primary responsibility for overseeing all aspects of oil and gas exploration, development, and production within Arctic Refuge boundaries that could affect surface resources and values. BLM would use its expertise in mineral leasing and development to assist FWS in administering the leasing program. Competitive lease sales would be held in accordance with a timetable established by BLM, after consultation with FWS regarding environmental considerations. Development of the leases must be designed to avoid or minimize disturbance to wildlife and other surface resources; produce oil and gas in the most orderly, efficient, and economical manner; and maximize the contribution of the 1002 area's oil and gas production to the national need for additional domestic sources of energy.

In accordance with the August 9, 1983, agreement between Arctic Slope Regional Corporation (ASRC) and the Department, "no leasing or other development leading to production of oil and gas from ASRC lands shall be undertaken until Congress authorizes such activities on Refuge lands within the coastal plain or on ASRC lands, or both." Adoption of this recommendation by the Congress, even without specific reference to the ASRC lands, would open those lands to the production of oil and gas.