U.S. Fish & Wildlife Service

Arctic

National Wildlife Refuge

Potential Impacts of Proposed Oil and Gas Development on the Arctic Refuge's Coastal Plain: Historical Overview and Issues of Concern

History of the Arctic Refuge as it relates to Oil in Alaska

Interest in the oil resources of northern Alaska began with reports in the early 1900s of surface oil seeps along the arctic coast east of Point Barrow. In 1923, the 23-million acre Naval Petroleum Reserve No. 4 was established in northwestern Alaska to secure a supply of oil for future national security needs. That area was later renamed the National Petroleum Reserve-Alaska (NPR-A). Extensive government-sponsored exploration for oil and gas occurred in the NPR-A during the 1940-1950s.

During World War II, the entire North Slope of Alaska - 48.8 million acres - was withdrawn from entry under the public land laws and thus held for exclusive use by the U.S. government for military purposes.

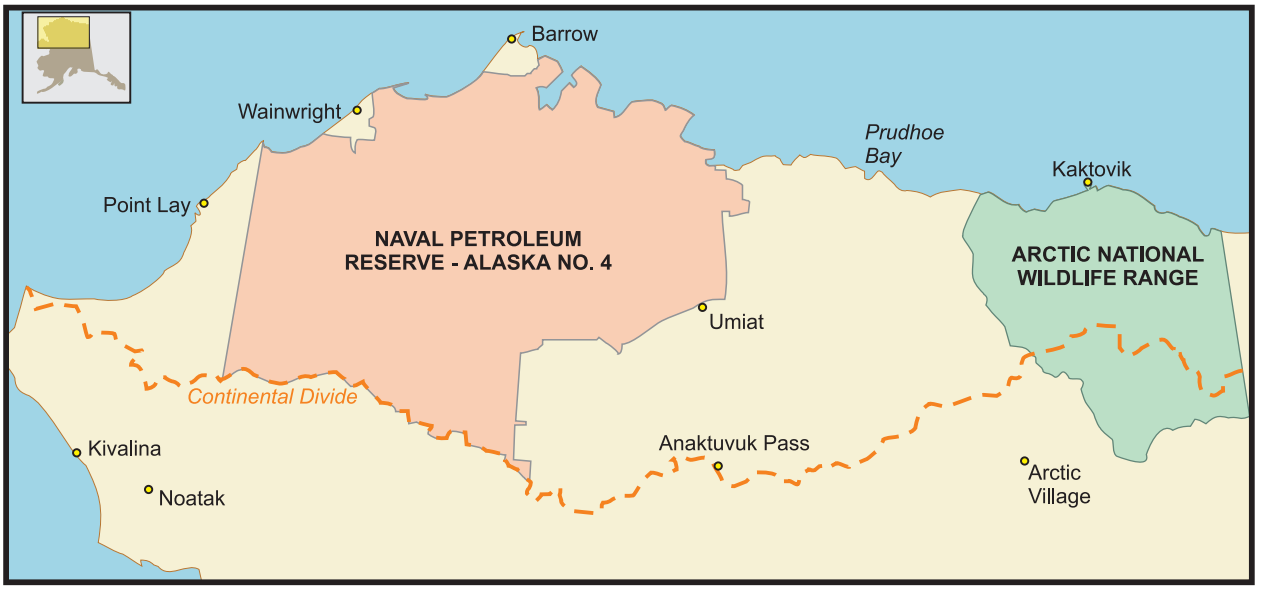
In the 1950s, post-war construction and accelerating resource development across Alaska raised concerns about the potential loss of this region's special natural values. In 1952-53, government scientists conducted a comprehensive survey of potential conservation areas in Alaska. Their report, "The Last Great Wilderness," identified the undisturbed northeast corner of Alaska as the best opportunity for protection.

Two major consequences followed:

- In 1957, Secretary of Interior Fred Seaton of the Eisenhower Administration revoked the previous military withdrawal on 20 million acres of the North Slope of Alaska to make it available for commercial oil and gas leasing. This was in addition to the previously established 23 million acre Naval Petroleum Reserve.

- In 1960, Secretary Seaton designated 8.9 million acres of coastal plain and mountains of northeast Alaska as the Arctic National Wildlife Range to protect its "unique wildlife, wilderness and recreation values."

These two actions laid out a general land use pattern for northern Alaska by setting aside about 43 million acres for multiple land uses including oil and gas development, while the northeastern corner was protected for wildlife and wilderness conservation.



Generalized view of land status by 1961. The majority of the tan area north of the Continental Divide was ultimately selected by the State under the Alaska Statehood Act (1959) or by Native Corporations established by the Alaska Native Claims Settlement Act (1971).

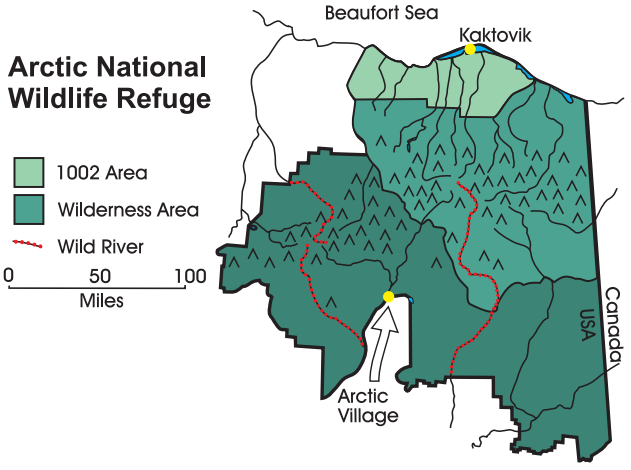
The largest oil field in North America was discovered on state land in the Prudhoe Bay area in 1968, and additional petroleum discoveries have more recently been made on Alaska's North Slope. Oil is transported from the North Slope by the 800-mile Trans-Alaska Pipeline System, from Prudhoe Bay to Valdez in south-central Alaska, where it is then transferred to oil tankers.

Reserves of oil were believed to also exist in the Arctic National Wildlife Range. The fate of the Range was extensively debated in Congress for years before passage of the Alaska National Interest Lands Conservation Act (ANILCA-1980).

The U.S. House of Representatives passed legislation in 1978 and 1979 designating the entire original Range, including the now contested arctic coastal tundra, as Wilderness. The Senate's version, however, required studies of wildlife and petroleum resources, and the potential impacts of oil and gas development within the northern part of the Range. It postponed the decision to authorize oil and gas development or Wilderness designation. Differences between the House and Senate were not worked out by a conference committee in the usual manner. Instead, following the 1980 election, the House accepted the Senate bill and President Carter signed ANILCA into law. ANILCA doubled the size of the Range, renamed it the Arctic National Wildlife Refuge, and designated most of the original Range as Wilderness.

The part of the original Range that was not designated Wilderness was addressed in Section 1002 of ANILCA, and is now referred to as the "1002 Area." Section 1002 outlined additional information that would be needed before Congress could designate the area as Wilderness, or permit oil development. Studies of the 1002 Area included a comprehensive inventory and assessment of the fish and wildlife resources, an analysis of potential impacts of oil and gas exploration and development on those resources, and a delineation of the extent and amount of potential petroleum resources.

In Section 1003 of ANILCA, Congress specifically stated that the "production of oil and gas from the Arctic National Wildlife Refuge is prohibited and no leasing or other development leading to production of oil and gas from the [Refuge] shall be undertaken until authorized by an act of Congress."



The U.S. Fish and Wildlife Service conducted fish and wildlife baseline studies of the 1002 Area beginning in 1981, and the results were published in several volumes, culminating with a final report in 1986. During the winters of 1984 and 1985, seismic exploration was conducted along 1,400 miles of survey lines in the area. This work was conducted by a private exploration firm and funded by a group of oil companies. Several oil companies independently conducted other geological studies including surface rock sampling, mapping and geochemical testing. Follow-up studies continued to assess the impacts of the winter exploration program on fish and wildlife and their habitats. (See references at the end of this report.)

A land exchange completed in 1983 transferred the subsurface title of Kaktovik village corporation lands (Kaktovik Inupiat Corporation (KIC)) from the Federal government to the Arctic Slope Regional Corporation (a for-profit Native corporation established by the Alaska Native Claims Settlement Act). This allowed for an exploratory well to be drilled by industry in 1985 within the Refuge's boundary on these private lands. The well was later plugged and abandoned, and the results of the drilling operations remain confidential.

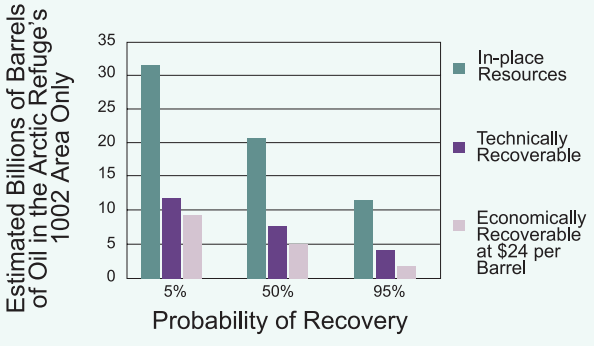
1990 photo of the KIC exploratory well drilled in 1985, showing KIC well pad and reserve pit after closure.

Information gathered from the biological, seismic and geological studies was used to complete a Legislative Environmental Impact Statement (LEIS) that described the potential impacts of oil and gas development. This LEIS included the Secretary's final report and recommendation, and was submitted to Congress in 1987. The report concluded that oil development and production in the 1002 Area would have major effects on the Porcupine Caribou herd and muskoxen. Major effects were defined as "widespread, long-term change in habitat availability or quality which would likely modify natural abundance or distribution of species." Moderate effects were expected for wolves, wolverine, polar bears, snow geese, seabirds and shorebirds, arctic grayling and coastal fish. Major restrictions on subsistence activities by Kaktovik residents would also be expected. In the report, the Secretary of Interior recommended that Congress authorize an oil and gas leasing program that would avoid unnecessary adverse effects on the environment.

Congress failed to act on the recommendation, first in 1989 following the Exxon Valdez oil spill, and again in 1991 when a provision to open the Arctic Refuge to development was dropped from the National Energy Policy Act. In 1995, Congress passed budget legislation that included a provision to allow drilling in the Refuge. Citing a desire to protect biological and wilderness values, President Clinton vetoed the bill.

How much Oil is in the Arctic Refuge?

The U.S. Geological Survey (USGS) updated its estimates of potential petroleum resources in the Refuge in 1998 by re-analyzing the original seismic data from 1984-1985 along with more recent data from seismic surveys and drilling in adjacent areas. Using the updated report and recent oil prices, the USGS estimated in 2000 that, assuming a price of $24 per barrel, there is

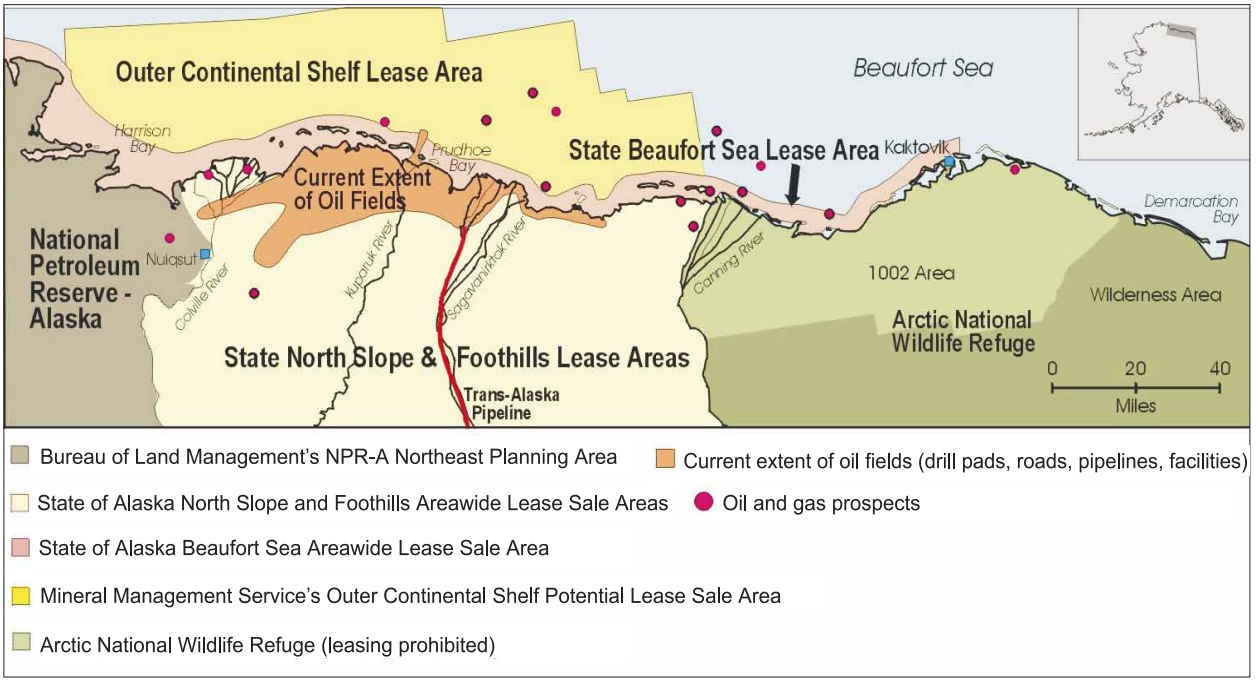


Data from 1) USGS Briefing Materials, April 2000, and 2) "Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998," USGS Fact Sheet FS-040-98, May 1998.

a 95% chance of finding 1.9 billion barrels (BBO) of economically recoverable oil in the Arctic Refuge's 1002 Area; a 5% chance of finding 9.4 BBO; and a 50% chance of finding 5.3 BBO. Reported estimates of 16 BBO from the 1002 Area and adjacent private lands and offshore State waters do not factor in the costs of developing the oil field.

At prices less than $16 per barrel, there is reportedly no economically recoverable oil in the 1002 Area. (Present oil prices are ranging between $20 to $25 per barrel.) Nearly 1 million barrels of oil a day are produced from the existing oil fields in areas west of the Arctic Refuge, and new wells are brought into production each year. Americans use 19 million barrels of oil each day, or 7 billion barrels of oil per year. There is, therefore, a 50% chance of finding a 9 month's supply of oil in the 1002 Area, at $24 per barrel.

Ongoing leasing activities and advancing oil recovery technologies on Alaska's North Slope and Beaufort Sea continue to provide the industry with new opportunities for exploration and development outside the boundaries of the Arctic Refuge.



The Unique Conservation Values of the Arctic Refuge

The Arctic National Wildlife Refuge is the largest unit in the National Wildlife Refuge System. The Refuge is America's finest example of an intact, naturally functioning community of arctic/subarctic ecosystems. Such a broad spectrum of diverse habitats occurring within a single protected unit is unparalleled in North America, and perhaps in the entire circumpolar north.

When the Eisenhower Administration established the original Arctic Range in 1960, Secretary of Interior Seaton described it as:

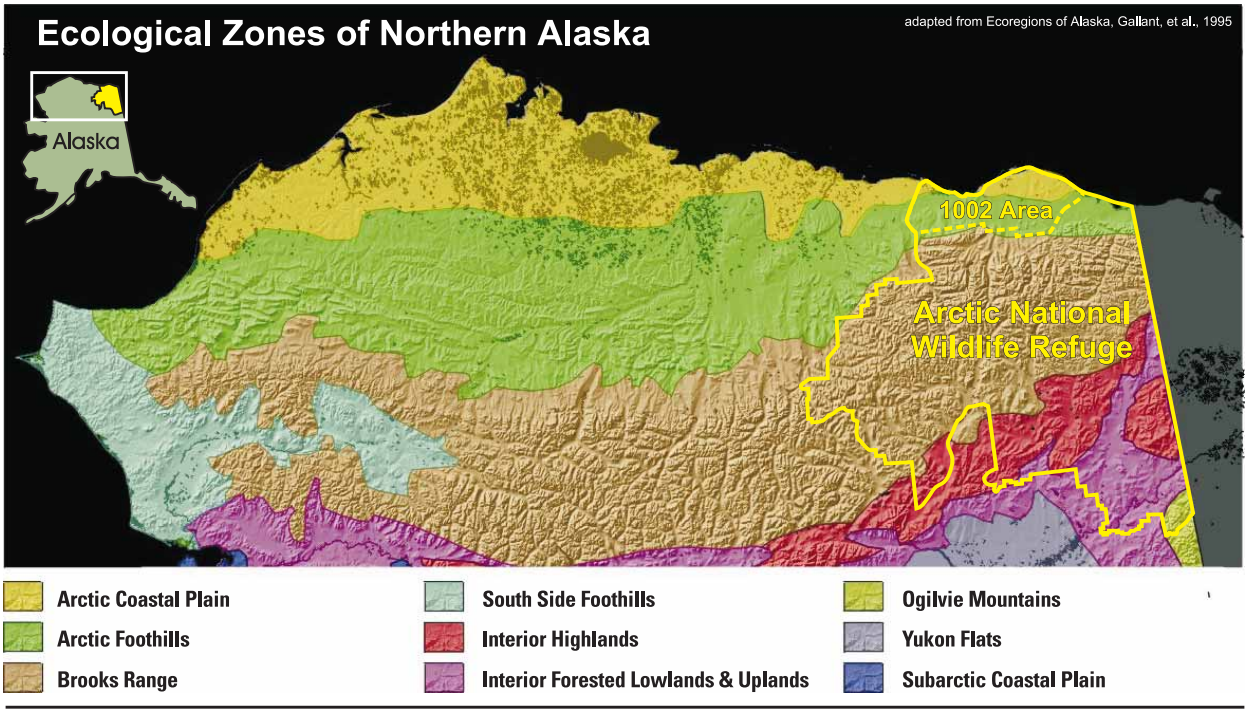
> one of the world's great wildlife areas. The great diversity of vegetation and

topography in this compact area, together with its relatively undisturbed condition, led to its selection as ... one of our remaining wildlife and wilderness frontiers.

Within the Arctic Refuge, the Brooks Range mountains compress the coastal plain and foothills tundra to a 20-40 mile wide band between the mountains and the sea. In contrast, the mountains further west rise far away from the Arctic Ocean coast, creating broad coastal tundra ranging 100-200 miles north to south in the Prudhoe Bay and NPR-A areas.

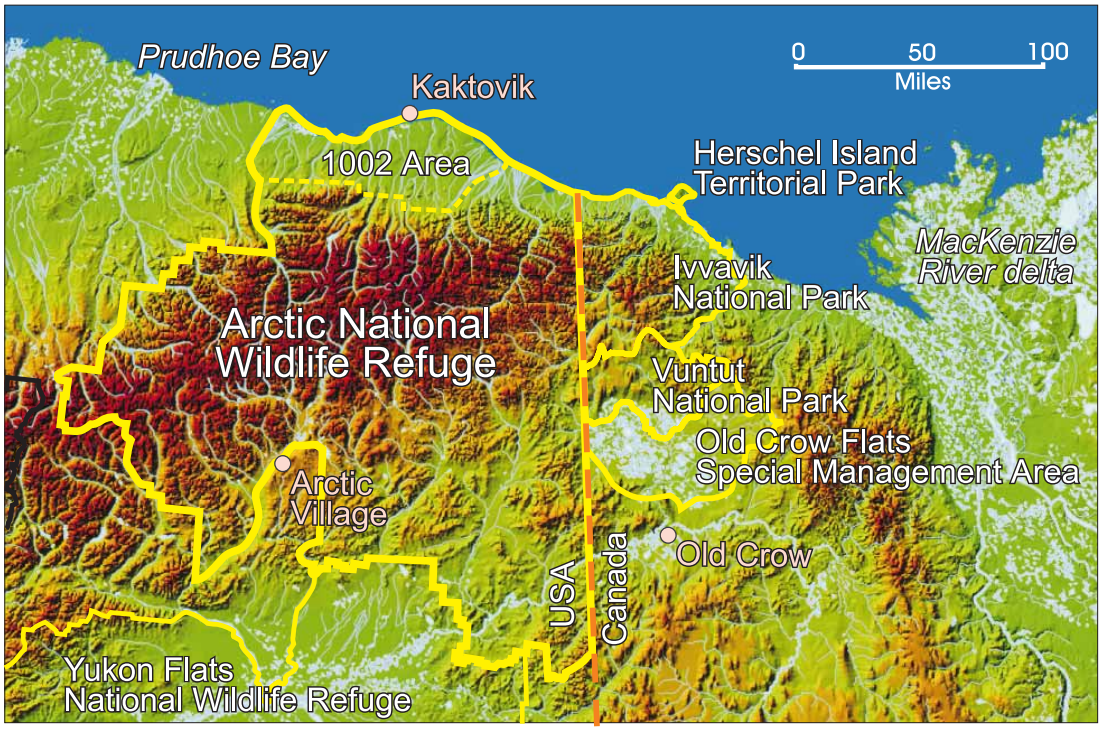
Although the 1002 Area is only 10% of the total Refuge acreage, it includes most of the Refuge's coastal plain and arctic foothills ecological zones. The 1002 Area contains just 4% of Alaska's coastal plain and foothills zones.

The Arctic Refuge is the only area on Alaska's North Slope where petroleum development is specifically prohibited by Congress. The rest of the region is available for oil and gas development through administrative decisions by the Secretary of the Interior on NPR-A and the Beaufort Sea, or by the Commissioner of the Alaska Department of Natural Resources on State lands and waters.



The 1002 Area is critically important to the ecological integrity of the whole Arctic Refuge, providing essential habitats for numerous internationally important species such as the Porcupine Caribou herd and polar bears. The compactness and proximity of a number of arctic and subarctic ecological zones in the Arctic Refuge provides for greater plant and animal diversity than in any other similar sized land area on Alaska's North Slope.

The Refuge is also an important part of a larger international network of protected arctic and subarctic areas. In Canada's Yukon Territory, the government and First Nations people protected the coastal tundra and adjacent mountains by establishing Ivvavik and Vuntut National Parks, where oil exploration and production are not allowed.



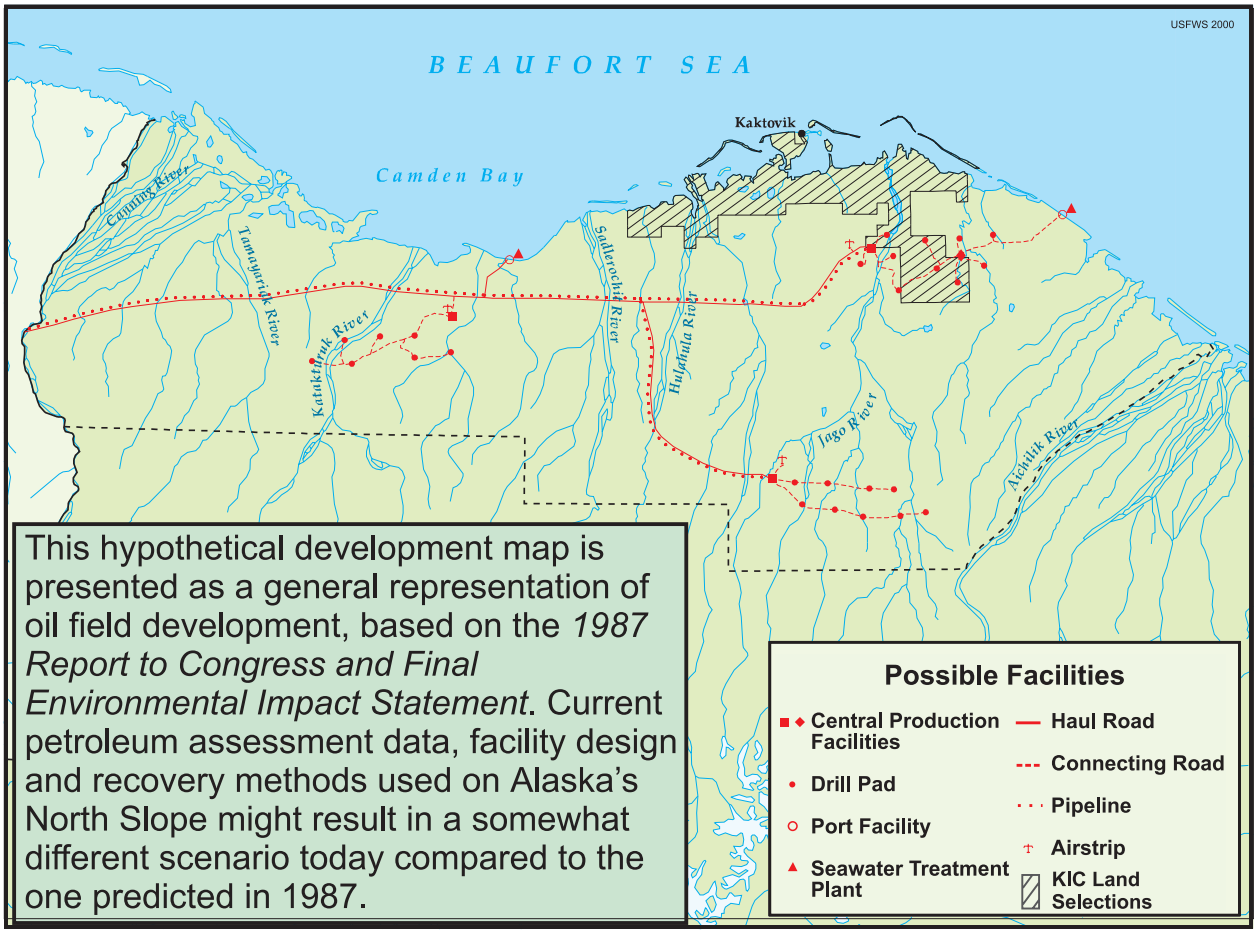
Potential Impacts of Oil and Gas Development on Refuge Resources

Newer technologies that are applied today in Alaska's expanding North Slope oil fields include directional drilling that allows for multiple well heads on smaller drill pads; the re-injection of drilling wastes into the ground, which replaces surface reserve pits; better delineation of oil reserves using 3-dimensional seismic surveys, which has reduced the number of dry holes; and use of temporary ice pads and ice roads for conducting exploratory drilling and construction in the winter. As the oil fields expand east and west, additional oil reserves are consequently being tapped from smaller satellite fields that rely on the existing infrastructure at Prudhoe Bay and Kuparuk.

Although technological advances in oil and gas exploration and development have reduced some of the harmful environmental effects associated with those activities, oil and gas development remains an intrusive industrial process. The physical "footprint" of the existing North Slope oil facilities and roads covers about 10,000 acres, but the current industrial complex extends across an 800 square mile region, nearly 100 miles from east to west. It continues to grow as new oil fields are developed.

The 100-mile wide 1002 Area is located more than 30 miles from the end of the nearest pipeline and more than 50 miles from the nearest gravel road and oil support facilities. According to the U.S. Geological Survey, possible oil reserves may be located in many small accumulations in complex geological formations, rather than in one giant field as was discovered at Prudhoe Bay. Consequently, development in the 1002 Area could likely require a large number of small

production sites spread across the Refuge landscape, connected by an infrastructure of roads, pipelines, power plants, processing facilities, loading docks, dormitories, airstrips, gravel pits, utility lines and landfills.



A substantial amount of water is needed for oil drilling, development, and construction of ice roads. Water needed for oil development ranges from eight to 15 million gallons over a 5-month period, according to the Bureau of Land Management. If water is not available to build ice roads, gravel is generally used. Water resources are limited in the 1002 Area. In winter, only about nine million gallons of liquid water may be available in the entire 1002 Area, which is enough to freeze into and maintain only 10 miles of ice roads. Therefore, full development may likely require a network of permanent gravel pads and roads.

Cumulative biological consequences of oil field development that may be expected in the Arctic Refuge include:

- blocking, deflecting or disturbing wildlife
- loss of subsistence hunting opportunities
- increased predation by arctic fox, gulls and ravens on nesting birds due to introduction of

garbage as a consistent food source
- alteration of natural drainage patterns, causing changes in vegetation
- deposition of alkaline dust on tundra along roads, altering vegetation over a much larger area than the actual width of the road
- local pollutant haze and acid rain from nitrogen oxides, methane and particulate matter emissions
- contamination of soil and water from fuel and oil spills

Impacts of Winter Exploration

While the exploration of oil typically occurs during the winter months when caribou and birds are absent from the 1002 Area, there are several arctic-adapted species that remain in the area during winter would likely be affected, most notably muskoxen and polar bears, but also wolverine, arctic fox, and arctic grayling. Winter exploration could also impact the sensitive arctic tundra vegetation.

Muskoxen:

About 250 muskoxen live year-round in the 1002 area of the Arctic Refuge. They use smaller areas in winter when snow limits available habitat. In order to survive cold weather and poor forage conditions, muskoxen reduce their activity and movements in winter to conserve energy. Muskoxen give birth four to six weeks before summer forage is available. Therefore, females must maintain body fat throughout the winter to successfully rear a calf. Calf production and animal survival is influenced by environmental conditions such as snow depth and the length of the snow season. In recent years, the number of muskox calves produced in the 1002 Area has declined.

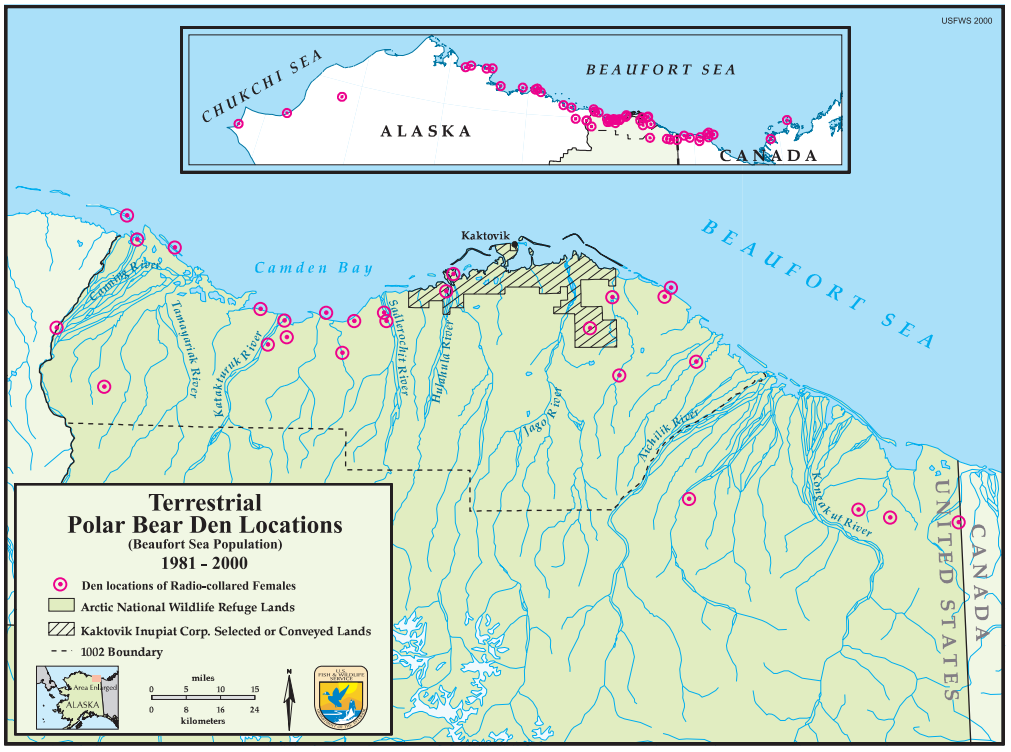
Muskoxen respond to predators and other disturbances by moving into a defensive group from which they protect themselves with sharp horns. If groups are disturbed enough, they will run. This can result in the deaths of young calves that are left behind. Muskoxen in the 1002 Area are most frequently found along or adjacent to large rivers flowing across the coastal plain. During petroleum exploration and development, large rivers are regularly used for gravel and water removal as well as transportation corridors. Concerns associated with oil field activities along river corridors include:

- displacement of muskoxen from preferred winter habitat
- increased energy needs related to disturbance and displacement
- decreased body condition of females
- increased incidents of predation
- decreased calf production and animal survival

Polar Bear:

Female polar bears that are going to give birth to cubs build dens in the winter. These females den on either ocean ice or on land, and those that den on land choose sites along shoreline bluffs or along steep creek banks where snow drifts early in the winter. The Arctic Refuge's coastal tundra provides the most important land denning habitat for the Beaufort Sea polar bear population.

According to studies of radio-collared polar bears of the Beaufort Sea population between 1981 and 2000, 53 dens were located on the mainland coast of Alaska and Canada. Of these 53 dens, 22 (42%) were within the Arctic Refuge's 1002 Area.



Current seismic exploration methods require numerous vehicles to move in a grid pattern across the tundra. Maternal polar bears with newborn cubs can be prematurely displaced from their winter dens by the noise, vibrations and human disturbance associated with oil exploration activities. This displacement may result in potentially fatal human-bear conflicts, and may expose the cubs to increased mortality due to harsh winter conditions for which they are not yet prepared.

Vegetation:

Seismic exploration involves sending sound waves into the ground, recording how the sound reflects back, and interpreting the results to construct an image of subsurface geology to determine if oil may be present. A seismic exploration program on Alaska's North Slope is typically a large operation with many people and vehicles driving across the tundra in a grid pattern. Although such exploration is conducted only in winter, snow cover on the 1002 Area is often shallow and uneven, providing little protection for sensitive tundra vegetation and soils.

The impact from seismic vehicles and lines depends on the type of vegetation, texture and ice content of the soil, the surface shape, snow depth, and type of vehicle.

Two-dimensional (2-D) exploration was authorized by Congress in the 1002 Area in the winters of 1984 and 1985. Monitoring of more than 100 permanent plots along the 1,400 miles of seismic lines has documented that while many areas recovered, some trails had still not recovered by 1999. Some of the trails have become troughs visible from the air. Others show changes in the amount and types of tundra plants. In some areas, permafrost (permanently frozen soil) melted and the trails are wetter than they were previously.

1,400 miles of seismic lines were surveyed in the 1002 Area during the winters of 1984 and 1985 to determine the amount and distribution of petroleum resources.

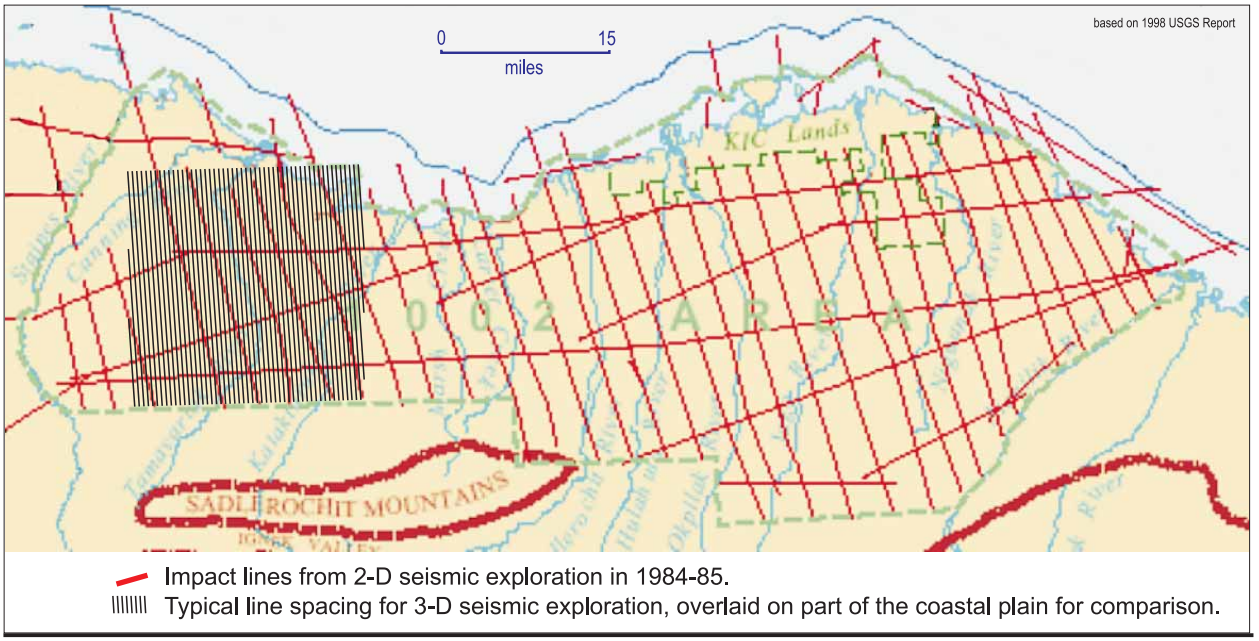
Vehicles in March, 1985, compacted the snow and damaged underlying plants during seismic exploration activities.

A winter 1984 seismic trail in the 1002 Area seen in June 2000.

Trail damage to tussock tundra the summer following winter seismic surveys.

Seismic trail near Marsh Creek in the 1002 Area:

Seismic exploration is conducted every winter on the North Slope of Alaska, west of the Refuge. New vehicle tracks and older ones in various stages of recovery are visible on the tundra in the summer. Today, 3-dimensional (3-D) seismic surveys, as conducted west of the Refuge boundary, require a much more dense grid of lines to collect all the data necessary for creating 3-D images of oil reserves. While the 1984-85 2-D trails on the Arctic Refuge were 4 miles apart, 3-D trails would be one half mile or less apart. The impact to vegetation and soils on the Refuge would likely be much greater from 3-D seismic surveys than from the 2-D seismic surveys conducted in the 1980s.



Impacts of Year-Round Oil Field Development

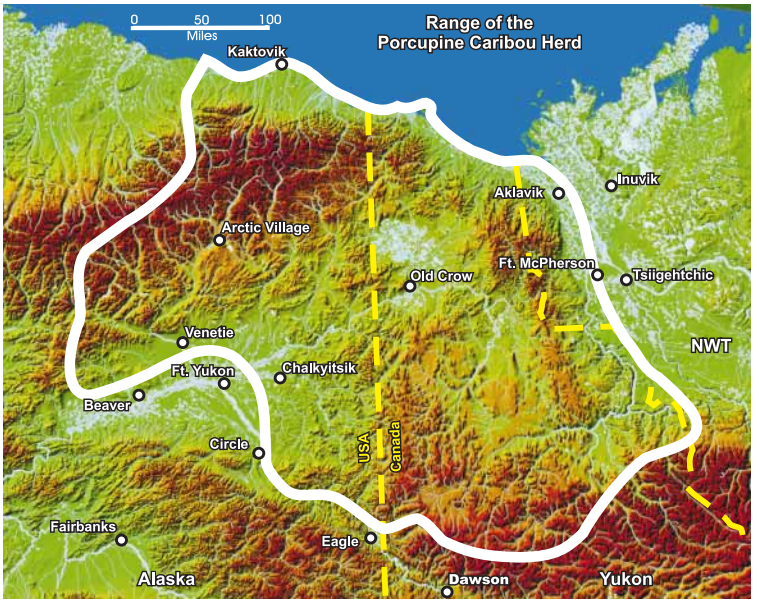
If winter exploration activities, including seismic surveys and drilling, find economical amounts of oil, then full-scale construction and development of oil fields might occur to produce oil and

gas on a year-round basis. In addition to affecting muskoxen, polar bears and other arctic-adapted resident species, oil and gas production would likely also impact caribou and birds that migrate to the 1002 Area during the brief summer period for calving and nesting.

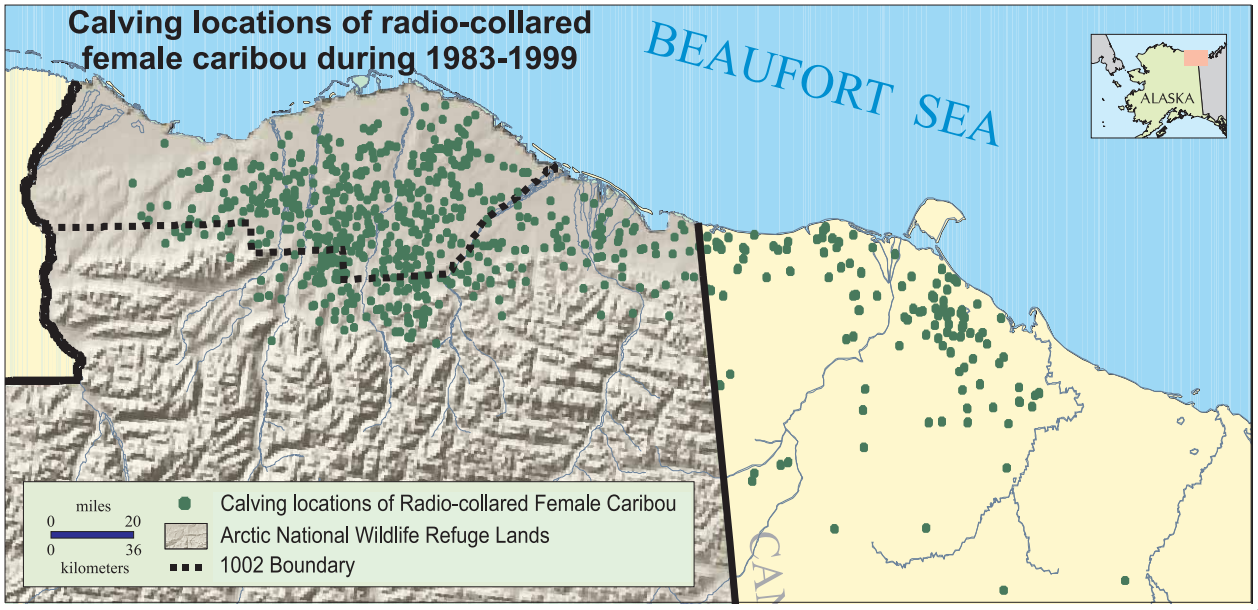
Caribou:

In late spring, just as the snow recedes and the tundra plants turn green, the Porcupine Caribou herd, numbering 129,000, migrates from south of the Brooks Range in the Arctic Refuge and Canada to give birth to their young on the arctic coastal tundra.

The caribou's preferred food during calving season is higher in nutrition, more digestible, and more available within the 1002 Area than in surrounding areas. To successfully reproduce, female caribou must be able to move freely throughout the 1002 Area to find adequate food resources to build up their fat reserves and milk. This allows them to produce healthy calves. Cows with newborn calves are particularly sensitive, and commonly move as much as 1.5 miles away from human disturbance. This has been well-documented in the vicinity of existing North Slope oil fields.



The Arctic Refuge's coastal tundra has been the birthing ground for the majority of Porcupine Caribou cows in all but three of the last 18 years. In



those 3 years (1987, 1988 and 2000), snow remained on the tundra longer than usual, forcing the caribou to have their calves in areas farther east or inland. Calf survival was poorer in those years due to lower food nutrition and higher levels of predation.

Caribou populations naturally fluctuate in response to weather and forage conditions, and all the arctic caribou herds in North America increased under favorable conditions in the 1980s. There are fundamental differences between the calving areas of the Central Arctic and the Porcupine herds. In the case of the Central Arctic herd, there is a greater amount of alternative calving area available for displaced cows to move to because the mountains are much farther from the ocean. The 1002 Area is only one-fifth the size of the area used by the Central Arctic caribou herd, but six times as many caribou use the 1002 Area. In the Arctic Refuge, where the mountains are close to the coast, few alternative areas would be available for displaced cows. If the 1002 Area was developed, the associated pipelines, roads, and structures would potentially impact the Porcupine Caribou herd by:

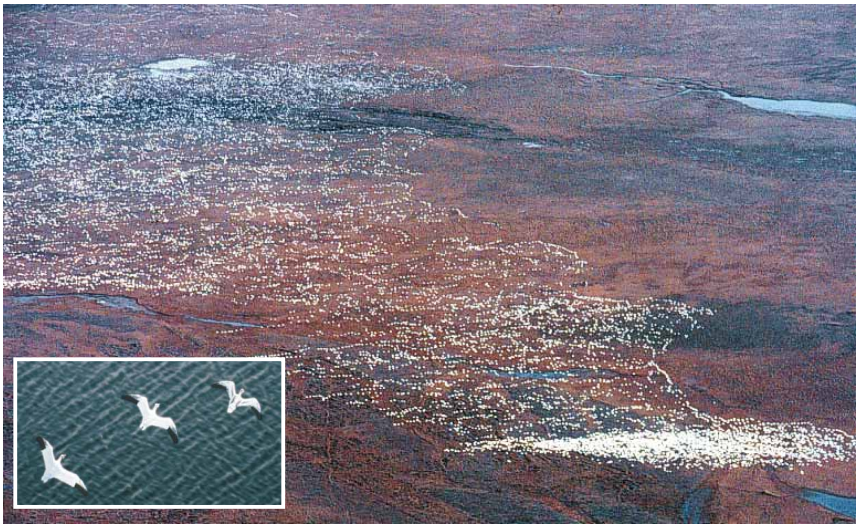
- reducing the amount and quality of preferred forage available during and after calving,
- restricting access to important coastal insect-relief habitats,
- exposing the herd to higher predation, and
- altering an ancient migratory pattern, the effects of which we can not predict.

A reduction in annual calf survival of as little as 5% would be sufficient to cause a decline in the Porcupine caribou population.

Birds:

135 species of birds are known to use the 1002 Area, including numerous shorebirds, waterfowl, loons, songbirds, and raptors. One notable example is snow geese. Large numbers of snow geese, varying from 15,000 to more than 300,000 birds, feed on the Arctic Refuge coastal tundra for three to four weeks each fall, on their way from nesting grounds on Banks Island in Canada to wintering grounds primarily in California's Central Valley. They feed on cottongrass and other plants to build up fat reserves in preparation for their journey south, eating as much as a third of their body weight every day. The rich vegetation of the coastal tundra enables them to increase fat reserves by 400% in only two to three weeks.

Snow geese feed on small patches of vegetation that are widely distributed across the Refuge's coastal tundra, so a large area is necessary to meet their needs. They are extremely sensitive to disturbance, often flying away from their feeding sites when human activities occur several miles distant.



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