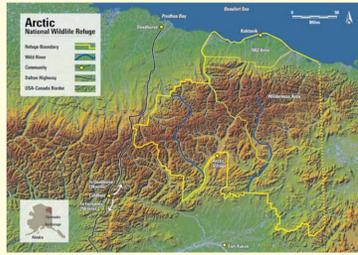




# Biological Monitoring and Research

## Arctic National Wildlife Refuge



The Arctic National Wildlife Refuge in northeastern Alaska encompasses arctic and subarctic habitats from the Beaufort Sea to the boreal forest. The diversity of habitats supports naturally functioning communities of plants and animals living in intact environments. Ecological diversity and integrity, in addition to wilderness values, were major factors in the Refuge's establishment. Arctic Refuge plays an important role in enhancing knowledge of ecological processes and contributing long-term observational data for detection of environmental change.

### Beginnings: 1950s-1960s

Several renowned scientists and conservationists, many of whom had conducted reconnaissance and ecological studies in northeastern Alaska, recommended the establishment of a large wilderness area in the region. They stressed this region's potential contributions to both science and society at large:

"For the immediate present, the most pressing need is to establish and maintain for scientific use an undisturbed research area of adequate size in the heart of the last and greatest remaining Arctic Wilderness region. For the future needs of Alaska and the entire nation, this superb area should be planned and dedicated now for perpetual preservation as a scientific field laboratory and also for the education, enjoyment, and inspiration of all outdoor minded people." - *George Collins and Lowell Sumner, "The Last Great Wilderness," Sierra Bulletin, 1952*

In 1960, Interior Secretary Fred A. Seaton created the Arctic National Wildlife Range by withdrawing 8.9 million acres for the purpose of preserving the area's unique wildlife, wilderness, and recreation values, and placed the area under the jurisdiction of the U.S. Fish and Wildlife Service (Service).

The Arctic National Wildlife Range is "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 the most suitable opportunity for protecting it as one of our remaining wildlife and wilderness frontiers." - *Fred Seaton, Secretary of the Interior, Press Release, 1959*



Olaus Murie at Last Lake

A special symposium was held on the newly-established Arctic National Wildlife Range in 1961, at which panelists spoke further on the area's promise for contributing basic knowledge about arctic ecology:

"There is so much for us to learn in the ecological balance of natural life. I feel that such an Arctic Wilderness should not be an experiment station for wildlife management to produce more game only. Rather, such an area should be for basic scientific research with the least possible equipment. It should be for the kind of scientific study based on thinking, based purely on close observation, trying to understand the relations among various animal forms and the changing environment. We need to understand and to interpret honestly what we see in wild country." - *Olaus Murie, The Wilderness Society*

"This is 'range' in the broad sense to include range requirements of carnivores as well as of herbivores, that is, the conditions of life of all animals...To my way of thinking the greatest value of the Range is as a control area, and thus, its management should consist of simply knowing as much about the workings of the animal and plant communities as is possible...The fact remains that the Arctic National Wildlife Range is our only chance to evaluate land use practices in the Alaskan Arctic." - *William O. Pruitt, University of Alaska*

### Early Studies: 1960s-1970s

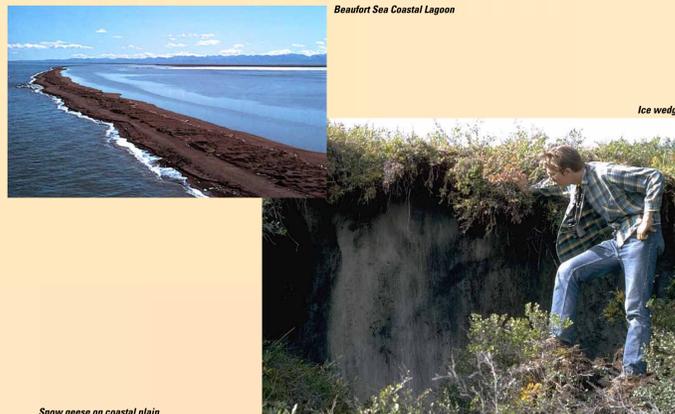


Lake Peters research camp, spring 1961

The Service set about to conduct or sponsor inventories of various biological resources in the Arctic Range during 1961-1969. Efforts built upon the scant but accumulating knowledge of arctic ecology that was gained primarily from earlier military reconnaissance and mineral explorations.

The growing use of airplanes facilitated range-wide aerial surveys to document the distribution and population status of wildlife, especially migratory species such as caribou and waterfowl. The U.S. Geological Survey and Naval Arctic Research Laboratory supported studies of vegetation, insects, fish, and wildlife as well as physical processes, which were conducted from a field station at Lake Peters in the Brooks Range during 1958-1980.

The 1968 discovery of oil and subsequent development of Prudhoe Bay, plus plans for a natural gas pipeline through the Arctic Range to Canada's MacKenzie River during the 1970s, stimulated a series of wildlife investigations in and near the Arctic Range. The Service, Alaska Department of Fish and Game, University of Alaska-Fairbanks and others conducted studies of barren ground caribou, Dall sheep, moose, muskoxen, snow geese, and coastal waterbirds.



Beaufort Sea Coastal Lagoon

Ice wedge

Snow geese on coastal plain



### Coastal Plain Baseline Studies: 1982-1994



Muskox research

Porcupine Caribou Herd

In 1980, the Alaska National Interest Lands Conservation Act (ANILCA) renamed the Range the Arctic National Wildlife Refuge, and more than doubled its size to 19.3 million acres. ANILCA also designated 8 million acres of the original Range as Wilderness, and mandated studies of both biological and geological resources of the Refuge's coastal plain.

During 1982-1986, baseline biological studies were conducted by the Service in cooperation with other federal resource agencies, Alaska Department of Fish and Game, University of Alaska-Fairbanks, Yukon Department of Renewable Resources, and Canadian Wildlife Service (Table 1) (extensive physical and social science studies were also conducted, but are not addressed here).

Table 2. Studies of potential effects of petroleum development on wildlife and their habitats conducted in the Arctic National Wildlife Refuge coastal plain, 1986-1994.

| Project category and title   | Lead Agency | Partners |
|--|-------------|----------|
| <b>Impacts on caribou numbers and distribution</b>                   |             |          |
| Population dynamics and demographics of caribou                      | ASC         | ANWR     |
| Effects of displacement and impacts of predators on calves           | ASC         | ANWR     |
| <b>Habitat requirements and impacts on caribou</b>                   |             |          |
| Reproductive performance of caribou and habitat                      | ADFG        | UAF      |
| Central Arctic caribou responses to development                      | ADFG        |          |
| <b>Distribution and quality of habitat</b>                           |             |          |
| Forage quality and quantity on caribou calving grounds               | ANWR        | ASC      |
| Porcupine caribou insect relief habitat                              | ANWR        | ASC      |
| Land-cover mapping   | ANWR        |          |
| Recovery of seismic trails   | ANWR        |          |
| <b>Effects on muskoxen</b>   |             |          |
| Distribution, movements and population dynamics                      | ANWR        |          |
| Assessment of winter habitat use                                     | UAF         | ANWR     |
| <b>Impacts on polar bears</b>  |             |          |
| Movements, population dynamics, feeding ecology and habitat use      | ASC         |          |
| Reproductive significance of land maternity dens                     | ASC         |          |
| <b>Impacts on snow geese</b>   |             |          |
| Distribution, population size, habitat, food and energy requirements | ASC         |          |
| Effect and mitigation of human activities                            | ASC         |          |

**Abbreviations:**  
 ADFG = Alaska Department of Fish and Game  
 ANWR = Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service  
 ASC = Alaska Science Center, U.S. Geological Survey, Biological Resources Division (formerly U.S. Fish and Wildlife Service Research Division)  
 CWS = Canadian Wildlife Service  
 FRO = Fisheries Resources Office, U.S. Fish and Wildlife Service  
 UAF = University of Alaska-Fairbanks Cooperative Fish and Wildlife Research Unit, Department of Biology and Wildlife, and Institute of Arctic Biology

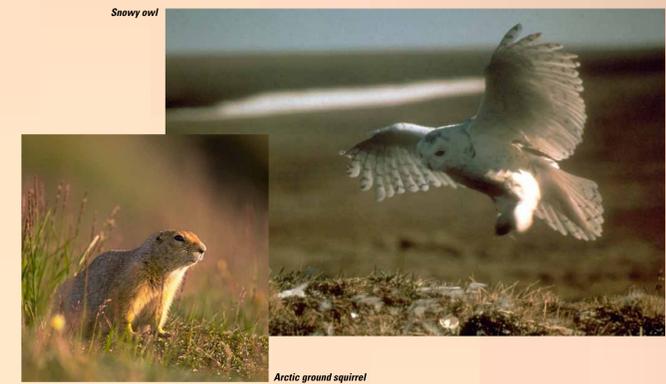


Porcupine River peregrine falcon survey

However, opportunities and funding to collect baseline information for large portions of the Arctic NWR remained limited.

### A Blueprint for the Future

The biological program at the Arctic NWR builds on this rich legacy of scientific investigations to provide information for refuge management and further understanding of arctic and subarctic ecology. The biological staff prepared an Ecological Inventory and Monitoring Plan that serves as a blueprint for comprehensive efforts to address biological data gaps, as well as to incorporate partnership-based landscape conservation strategies and address climate change. The status and trends of key ecosystem elements are assessed in five major ecological zones spanning the Refuge: coastal marine, coastal plain tundra, alpine, forest-tundra transition, and boreal forest. The importance of components for study and long-term monitoring are ranked based on Service mandates, ecological significance, existing level of knowledge, potential threats, importance to humans (e.g., for viewing or hunting), potential for partnerships, and logistics. In addition to biological parameters, physical components such as weather, permafrost, hydrology, coastal processes, and fire are also included.



Snowy owl

Arctic ground squirrel

### Implementation Strategies:

- Review and compile published literature, reports, and data sets;
- Inventory representative and unique areas to document the occurrence of plant and animal species;
- Monitor vegetation, birds, small mammals, invertebrates, permafrost and weather at representative sites within each ecological zone to assess long-term environmental change;
- Document status and trends in population size and distribution for vertebrates, including caribou, moose, muskox, Dall sheep, grizzly bears, shorebirds and raptors; and
- Engage in partnerships to support landscape conservation at regional, national, and international scales.

Successful implementation will rely on partnerships with adjacent landowners, other federal, state, and local resource agencies, academic institutions, and other organizations. The Refuge will participate in the Arctic and Northwestern Interior Forest Landscape Conservation Cooperatives and the National Wildlife Refuges Inventory and Monitoring Program, as well as in international efforts such as the Arctic Shorebird Demographics Network and the Arctic Council's Arctic Biodiversity Assessment. Field studies will be designed to incorporate minimum tools that balance scientific endeavors with protection of wilderness values.

The Arctic Refuge Comprehensive Conservation Plan (CCP) will include goals and objectives for stewardship of biological resources. Specific strategies for achieving these goals and objectives will be developed in a subsequent updated Ecological Inventory and Monitoring Plan. Through this approach, the Arctic Refuge will continue to serve the role envisioned by the founders—a living laboratory for the study of arctic and subarctic ecology.

Caribou Pass

