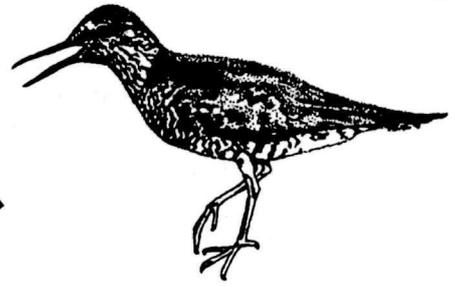


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POPULATION TRENDS OF WOLVES AND CARIBOU IN DENALI NATIONAL PARK, ALASKA

Management of gray wolves (*Canis lupus*) and their prey in Interior Alaska has been a subject of great controversy over the last three decades (Harbo and Dean 1983). Recently, heated debate was rekindled with renewed interest in conducting wolf control areas to bolster two populations of caribou (*Rangifer tarandus*). Our research in Denali National Park provides insights into the declines in caribou numbers over the last few years that are the basis of recent wolf control proposals. Our observations of fluctuating populations also illustrate the complexity of managing these predator-prey systems to meet a diverse array of public interests.

Wolves and caribou are two components of the large mammal community of Denali National Park, which also includes grizzly bears (*Ursus arctos*), moose (*Alces alces*), and Dall sheep (*Ovis dalli*). With the 1980 park expansion to over 18,800 km² (7,300 mi²) of central Alaska, this large mammal system became the only one of its kind that is virtually unaffected by human harvest. Therefore, Denali provides a unique opportunity to understand the natural interactions of these species and serves as a baseline for comparison with areas where hunting or other active wildlife management occurs.

Since 1986, with financial support from the National Park Service, we have studied Denali's wolves and caribou to determine their numbers and status, and to understand their natural interactions in this protected subarctic ecosystem. Our studies began near the end of over a decade of mostly light winter snowfalls of around 100 cm (39 in) per year. Since winter 1988-

89, we have experienced five winters in a row with above average snowfalls, including two record-setting years. During winters 1990-91 and 1992-93, over 390 cm (154 in) of snow fell or four times as much as in the early years of our study. This change in snowfall had profound effects on the wildlife in central Alaska. The population trends of Denali's caribou and wolves are strong evidence of the natural fluctuations to be expected in species inhabiting such dynamic and variable environments.

Counting Caribou and Wolves

Our research has relied heavily on radio-telemetry. We capture wolves and caribou during winter by darting them with immobilizing drugs from helicopters. Once they are immobilized, we fit them with radio-collars that last about 3 years. Each animal is weighed and examined, then released. These radio-collared individuals allow us great opportunity to study the dynamics of the wild populations they belong to. We can easily find our radio-collared study animals using signal-receiving equipment mounted in small airplanes (Mech 1975).

Locating radio-collared wolves allows us to count their packmates, determine the number of pups born to each pack, and determine the size and location of each pack's territory (Mech 1973). We estimate the abundance of wolves, expressed as density or wolves per km² (mi²), during winter by counting the wolves in each pack several times then dividing the total for all packs by the area within their combined territories. We also gain information on the survival and dispersal patterns of wolves by radio-tracking regularly throughout the year.

The size of the caribou herd is estimated annually with the aid of radio-collared cows in the herd

(Adams et al. 1994). Caribou herds are difficult to count because they are highly mobile, they occur in widely scattered groups that range from lone individuals to hundreds or even thousands of caribou, and males and females are separate for all but the breeding season. In late May, at the end of the calving season, most cows can be located on a 900-km² (350-mi²) calving ground at the foot of Mount McKinley. From a helicopter, we count the cows on the calving ground. Then, based on the proportion of radio-collared cows within the calving ground survey area that day, we can estimate of the number of cows in the herd. During the fall breeding season when cows, bulls, and calves are mixed together, we can estimate the number of bulls and calves per cow. We multiply that proportion by the estimated number of cows from the spring, arriving at the size of the entire herd. In addition, regular monitoring of radio-collared caribou provides information on calf production, survival of all age classes, and seasonal distribution of the herd.

Population Trends and Weather Effects

The Denali caribou herd grew from about 1,000 animals in 1975 to 2,600 by 1986, during a decade of mostly below-average snowfalls, and was increasing at about 7% per year in 1986 when our research began (see figure; Adams et al. 1994). Approximately 46 wolves inhabited the 10,000 km² (3,900 mi²) range of the caribou herd in the early years of our study (Meier et al. 1994). The number of wolves was lower than we expected based on the abundance of large prey species in Denali. Light snowfalls were favorable to caribou, and few died. Wolves preyed primarily on moose; the few caribou they took were primarily very young or very old (Mech et al. 1994). Times were tough for wolves with poor production of pups and high dispersal rates for young wolves. Also, fights between packs resulted in the deaths of several wolves.

With the onset of more severe winters, beginning with winter 1988-89, wolf numbers rapidly increased to 74 wolves in just 2 years (see figure; Meier et al. 1994), primarily because of higher pup production and less dispersal of young wolves. Caribou were more vulnerable to predation in the deep snow and replaced moose as the most important prey species for wolves. Losses of adult cows increased eight-fold to nearly 20% per year. Fewer than 9% of the calves survived to 4 months old, compared to nearly

60% following the light snow winters (Adams et al. 1994). The caribou herd stopped growing in 1990 at about 3,300 and plummeted to 1,700 by 1993, a 50% decline in only 3 years (see figure). With declining prey numbers, the wolves have also declined to about 60 wolves within the caribou herd's range, a 23% reduction between March 1990 and March 1993.

The fluctuations in wolf and caribou numbers observed in Denali National Park are probably indicative of normal adjustments to the highly variable winter weather of the region. In the short space of 8 years, the caribou herd increased by 36% and declined by 50%. At the same time, the wolves almost doubled in number and then declined half way back to their original numbers.

The trends noted for the Denali caribou herd are representative of population trends of several mountain caribou herds throughout central Alaska, including the Chisana and Mentasta herds in the Wrangell Mountains, and the Delta and Macomb herds east of Denali Park in the Alaska Range. Unlike the Denali herd, which has been closed to hunting for nearly 20 years, these other caribou herds are important resources for subsistence and sport hunters alike. Hunting seasons have been closed for all four herds because of the declines in the last few years. These reductions in hunting opportunities have led to clamorous debates over the merits of wolf control to provide more caribou for human harvest. Arguments regarding allocation of harvestable wildlife between subsistence and sport hunters will intensify when hunting seasons are reopened. Although the future of wolves and caribou in Interior Alaska is secure, natural fluctuations like those described here can be expected to generate continued controversy over the management and allocation of these important wildlife resources.

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LAYNE G. ADAMS; National Biological Survey; c/o National Park Service-Alaska Region.

L. DAVID MECH; National Biological Survey; North Central Forest Experiment Station.

ADAMS, Fig. 1

