WOLF — PREY RELATIONSHIPS IN INTERIOR ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

WOLF-PREY RELATIONSHIPS IN INTERIOR ALASKA

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WILDLIFE TECHNICAL BULLETIN NO. 6

1983

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SUMMARY

1. Moose and caribou populations reached peak abundance in the experimental area in the 1960s following Federal predator control in the 1950s. In 1965-66, the moose population crashed and continued to decline until wolf control in 1976. Caribou began a decline about 1970 that continued until wolf control in 1976. Dall sheep were abundant throughout the 1970s in the experimental area but were considered a minor part of this predator-prey system.

2. The initial crash in the moose population during 1965-66 was due primarily to deep snow. The primary factors causing the subsequent moose decline until 1976 included wolf predation, harvest by man, and periodic deep snow. The mortality from deep snow and harvest by man resulted in lowering the moose:wolf ratio, which increased the impact of predation on moose. During the early 1970s, hunters removed 6 - 19% of the moose population annually; the average harvest rate equaled the average addition of yearlings to the population. After 1974, harvest annually accounted for 2% of the population. By 1973, wolf predation alone could probably have sustained the decline in the moose population; predation, in combination with hunting, caused a rapid decline of moose.

3. Hunting by man and wolf predation were also the primary causes of the decline of caribou. However, even without hunting, a significant decline would have occurred because of extremely high calf mortality from 1971-75.

4. Early in 1976, the wolf population was reduced by an average of about 60%; however, an 80% reduction occurred in an area inhabited by calf caribou during their first 2 months of life. After the wolf reduction, notable increases were immediately observed in the moose and caribou populations. Calf and yearling moose survival increased 2- to 4-fold and adult mortality decreased sharply after wolf control. Caribou calf survival increased about 6-fold. Increased survival and population increase were directly related to lowered numbers of wolves.

5. Misunderstanding of the wolf-moose relationship in the 1970s, prior to wolf control, resulted in serious errors in managing moose in the experimental area. Management techniques have been altered substantially as a result of this and other recent studies of predator-prey relationships.

6. Recent studies have indicated that a low abundance of calves in a moose or caribou population is not necessarily indicative of a population limited by food, but instead may indicate high predation rates. In the 1960s and early 1970s, it was commonly thought that when young animals were scarce in an ungulate population, hunting seasons needed to be liberalized to reduce ungulate populations and protect food resources. Now we recognize that hunting seasons often need to be restricted and/or wolves need to be controlled in areas where wolves are abundant and moose or caribou calf survival is low.

7. Recent predator-prey studies also indicate that mortality from severe winters, hunting, and wolf predation are largely additive. That is, a high moose harvest by hunters does not necessarily reduce the number of moose killed by wolves or deep snow. Therefore, great caution must be applied in regulating harvests of moose and caribou in areas where wolf management is not practiced.

8. Current information strongly indicates that there is no sensitive, fast-acting feedback process that regulates numbers of wolves relative to declining prey density. That is, when a moose population declines, due perhaps to a severe winter, the wolf population will likely remain high for an extended period sustaining a further decline in the moose population. The result is that prey populations can reach extremely low densities under natural conditions, contrary to the "balance of nature" concept.

9. Natural recovery of prey populations from control by predators appears to be an infrequent and short-lived event. Therefore, it appears virtually impossible to maintain high densities of ungulates for extended periods without occasionally reducing predation.

10. Quickly assessing the effect of predation on moose populations through moose:wolf ratios will assist in making more timely and effective management decisions.

Radio-collared moose have provided biologists with valuable information on wolf-moose relationships. D.M. Johnson Photo.

INTRODUCTION

Beginning with statehood, the Alaska Department of Fish and Game (ADF&G) initiated programs and policies that progressively phased out wolf control, gave wolves considerable legal protection, and elevated their status from "vermin" to a desired component of Alaska's native fauna. The elevated status included classifying them both as furbearers and big game and initiating a public education program emphasizing that wolves were not a major limiting factor on Alaska's big game.

Following 15 years of progressive protection and elevation of status for the wolf, the ADF&G in the mid-1970s began announcing that predation by wolves was a major factor in the crashes and continued low population levels in many of the State's big game herds. Seemingly even more inconsistent was the ADF&G's reversal from eliminating wolf control to advocating it in limited areas.

Why the change? Was the ADF&G actually changing attitudes about wolves? Was the wolf merely a scapegoat? Or had the understanding of the basic relationship between wolves and their prey actually changed?

The rapid increase of moose and caribou in portions of Interior Alaska following wolf control in 1976 suggested that the ADF&G was correct in assuming that wolves were the limiting factor prior to the control. But could it be that the moose and caribou increase was purely coincidental to wolf control and actually occurred because of more favorable weather and reduced hunting?

This bulletin answers these questions by briefly summarizing an in-depth study of the effects of wolf control on moose, caribou, and sheep populations in Game Management Unit (GMU) 20A in Interior Alaska. This bulletin also discusses ADF&G's changing attitudes toward wolves and wolf management. The wolf control program in GMU 20A became the focus of a renewed State and national controversy about both the effects of hunting and wolf predation on big game populations and the role of predator control in big game management. We hope this information will help clarify this controversial subject. The material in this bulletin is based on The Wildlife Society's Wildlife Monograph number 84 printed in July 1983 and titled Interrelationships of Wolves, Prey, and Man in Interior Alaska by W. Gasaway, R. Stephenson, J. Davis, P. Shepard, and O. Burris. The Wildlife Society granted permission to use this material.

PREDATOR-PREY RELATIONSHIPS

Study Area

Information in this bulletin was gathered from a primary experimental area and 7 nearby unmanipulated areas in eastcentral Alaska (Fig. 1). The primary experimental area and focus of research and wolf control included the 6,588 square mile area immediately south of Fairbanks, including GMU 20A and a part of GMU 20C. This area included the Tanana Flats and the northern face and foothills of the Alaska Range south of Fairbanks. Seven areas in the remainder of GMUs 20 and 12 were referred to as unmanipulated areas because no wolf control was conducted in them. Information from these 7 areas aided in assessing the results of wolf control by allowing comparisons between ungulate populations in areas where wolves were at natural versus controlled densities.

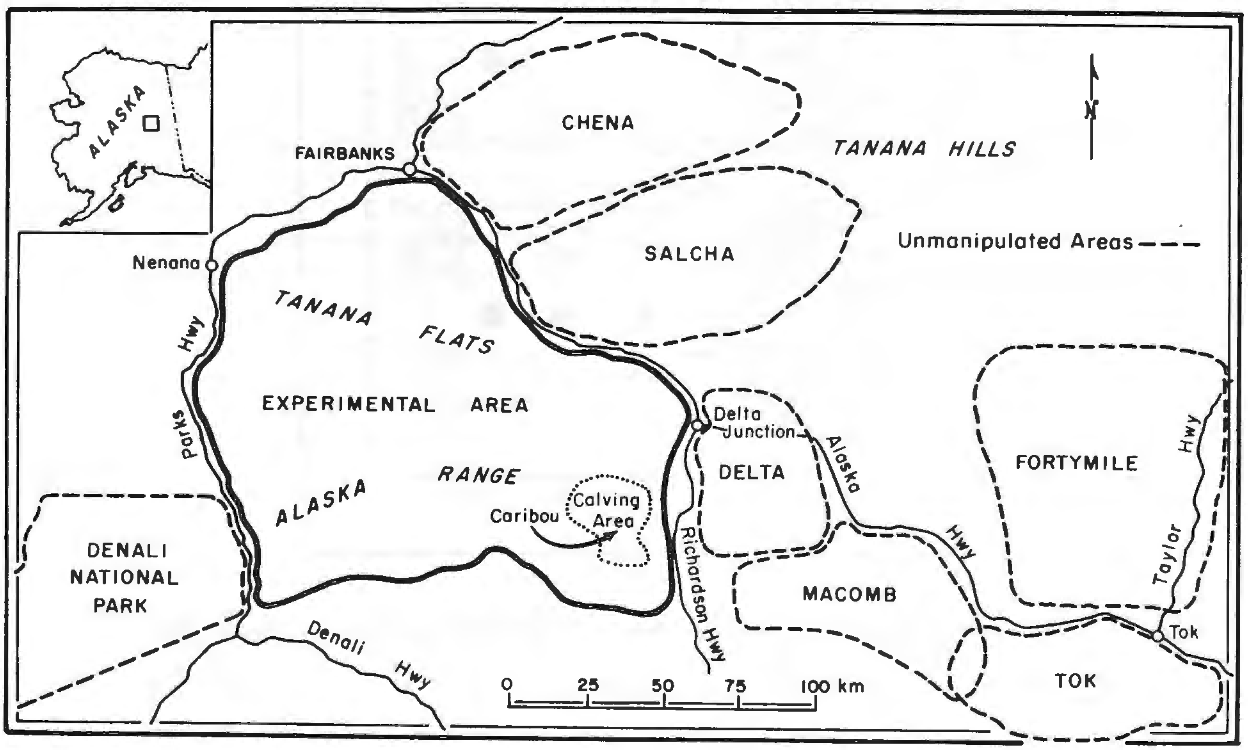

Fig. 1. Study area in Interior Alaska. Wolf control took place only in the experimental area, not in unmanipulated areas.

Status of Predators and Prey Before Wolf Control (Pre-1976)

Wolves

Federal predator control drastically lowered the number of wolves in the experimental area during the early 1950s (Fig. 2). Wolves were scarce by 1957; however, after predator control ended in 1960, wolves increased. They reached peak abundance during the late 1960s and early 1970s in the experimental area.

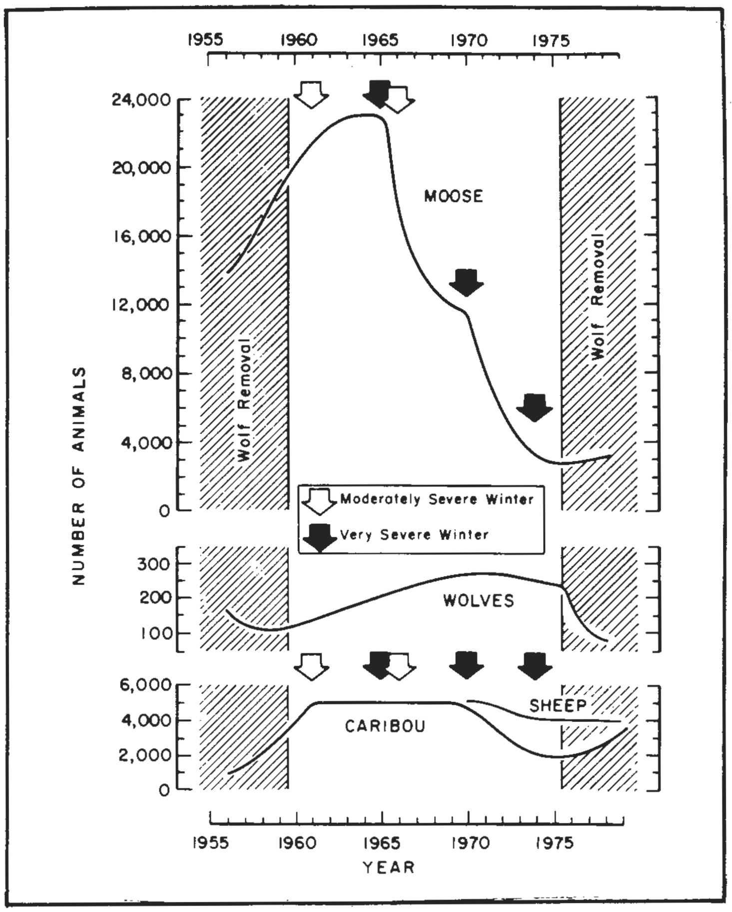

Fig. 2. Estimated numbers of moose, wolves, caribou, and sheep in the experimental area in Interior Alaska, 1956-79.

Wolves were intensively censused in the experimental area in winter 1975-76 when at least 239 wolves in 23 packs inhabited the area (Fig. 3), a number probably below peak abundance. The wolves fed primarily on moose and secondarily on caribou. Dall sheep, snowshoe hares, mice, and birds were less important prey. When moose and caribou became scarce in the mid-1970s, wolves probably began to have some difficulty obtaining food. Wolf litter size declined from an average of 6.6 in the 1960s to 4.6 in the mid-1970s, possibly due to food shortages.

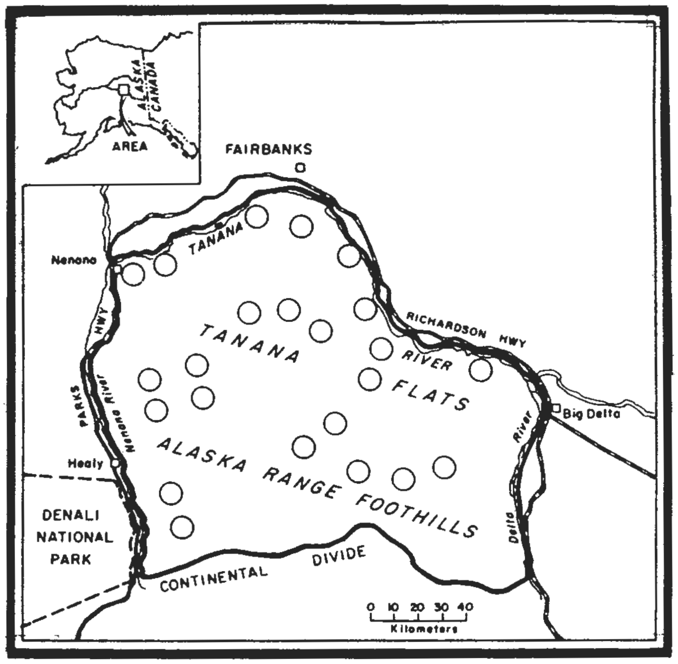

Fig. 3. General locations of 23 wolf packs observed during aerial surveys from January-April 1976.

Black and Grizzly Bears

Presently, there are no accurate estimates of black or grizzly bear density or population size in the experimental area. Black bears were fairly common during the 1970s on the Tanana Flats moose calving grounds but were rare in the mountainous portion of the area. Grizzly bears were rarely observed on the moose calving grounds but were moderately abundant in the mountainous areas used by many moose during fall and winter. However, black and grizzly bears, in the experimental area, were much less abundant than on the Kenai Peninsula and the upper Susitna River drainage, where studies have shown that bear predation on moose calves can be significant. Grizzly bears were common on the caribou calving grounds during the 1970s, but appeared less common in the late 1970s.

Moose

The moose population in the experimental area grew in the 1950s following initiation of wolf control, peaked at about 20,000 animals in the early 1960s, crashed between 1965 and 1967 and again in 1970-71 because of severe winters, and continued to decline to a low of approximately 3,000 moose in 1975 (Fig. 2). A major question was why did the moose population decline instead of stabilizing or increasing?

An increasing scarcity of calf and yearling moose (Fig. 4) and a high rate of adult mortality were found to be the primary reasons for the continued decline of the moose population through the mid-1970s (Fig. 2). The population declined because the number of young moose that lived to reproductive age was lower than the number of adults dying.

The scarcity of young moose in the experimental area resulted from high calf mortality rather than low calf production. The pregnancy rate was normal for North American moose, based on 58 cow moose captured on the Tanana Flats in May 1975. We estimated that 100 cows 2 years old and older would have produced about 111 calves. However, aerial surveys in 1970-75 showed that only 15 to 33 calves for every 100 cows survived until November (Fig. 4). Additional evidence of high calf mortality came from observations of calves of collared cow moose between 1973 and 1975. Few of these calves survived until August (Fig. 5).

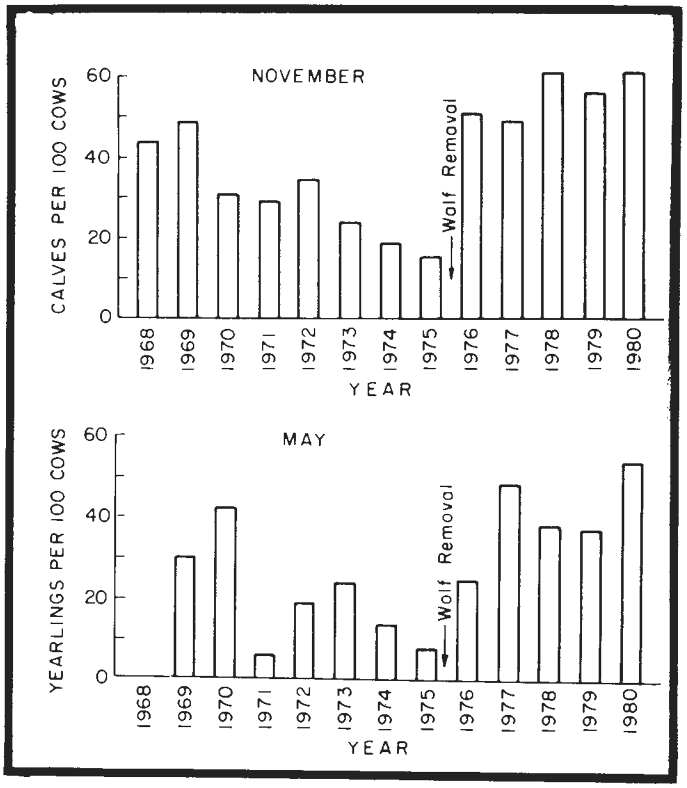

Fig. 4. The relative abundance of calf and yearling moose in the experimental area during November and May, 1968-80.

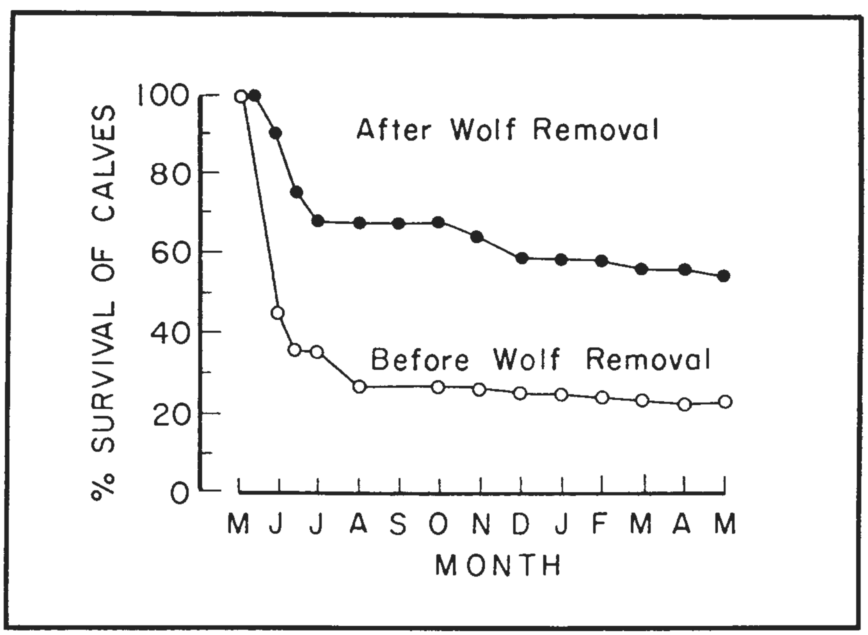

Fig. 5. Percent survival of calves of radio-collared cow moose that lived year-around in the study area.

Although food shortages can cause low calf survival and moose population declines, the evidence suggests that food limitations in the experimental area were not a major factor after the mid-1960s crash. Low to moderate browsing rates were found on the moose's preferred willow species in 1972-73 and again in the late 1970s. Furthermore, if food had declined enough to limit calf survival, we would have expected low calf production. However, calf production was normal.

Deep snow during winters 1965-66, 1966-67, and 1970-71 (Fig. 6) caused high calf mortality as well as the loss of some adults, resulting in population declines. Additionally, winter 1974-75 was severe, although no unusual amount of mortality was observed. The direct impact of deep snow on the moose population should have been short-lived; that is, calf survival should have rebounded in subsequent winters. However, in the experimental area, calf survival remained low from 1971 through 1975, which demanded explanation.

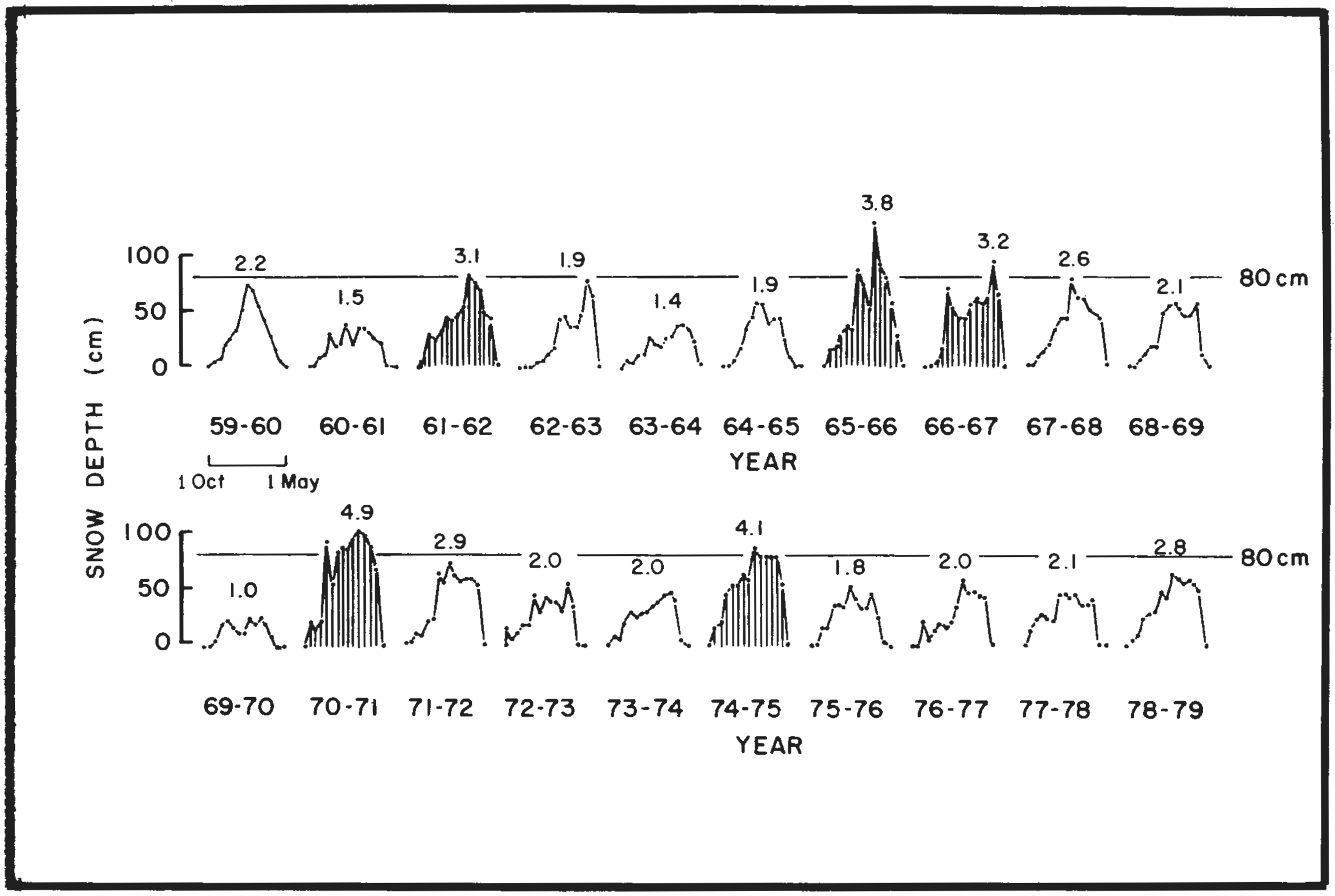

Fig. 6. Snow depth on the ground during winters 1959-60 through 1978-79 at Fairbanks, Alaska. Severe winters are shaded. Eighty cm snow depth, indicated by the solid line, is considered the critical depth for calf moose in Interior Alaska. Numerals above each curve are relative snow depth indices.

The 2 substantial declines in moose population size resulting from deep snow probably had a long-term influence on the population. The declines produced a more favorable relationship between the remaining moose and their food supply, which should have improved calf survival in subsequent years. However, this positive benefit was offset by adverse effects. Most significantly, the rapid declines in moose numbers caused by severe winters markedly changed the ratio between moose and wolves--that is, there were fewer moose present per wolf (Fig. 7). This change sharply increased the impact of predation on the moose population and explains, in part, why calf survival continued to decline from 1969 through 1975.

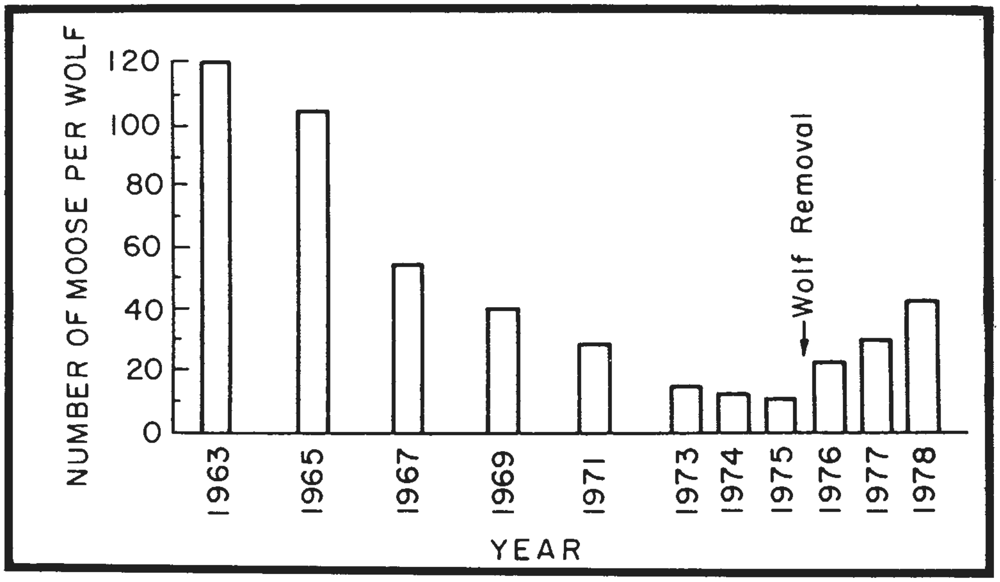

Fig. 7. The approximate number of moose per wolf in the experimental area during early winter, 1963-78.

Overhunting, in addition to wolf predation, maintained the rapid decline started during winter 1970-71. From 1970 through 1974, hunters killed a large number of cow and bull moose (Fig. 8): 19% of the population was harvested in 1973 alone. From 1970 through 1974, the average kill was 11% of the population annually, which equaled the average addition of yearlings to the population. As a result, additional sources of adult natural mortality, such as predation, made a decline inevitable. The kill by hunters, like severe winters, increased the potential effect of predation on moose by lowering the number of moose available per wolf.

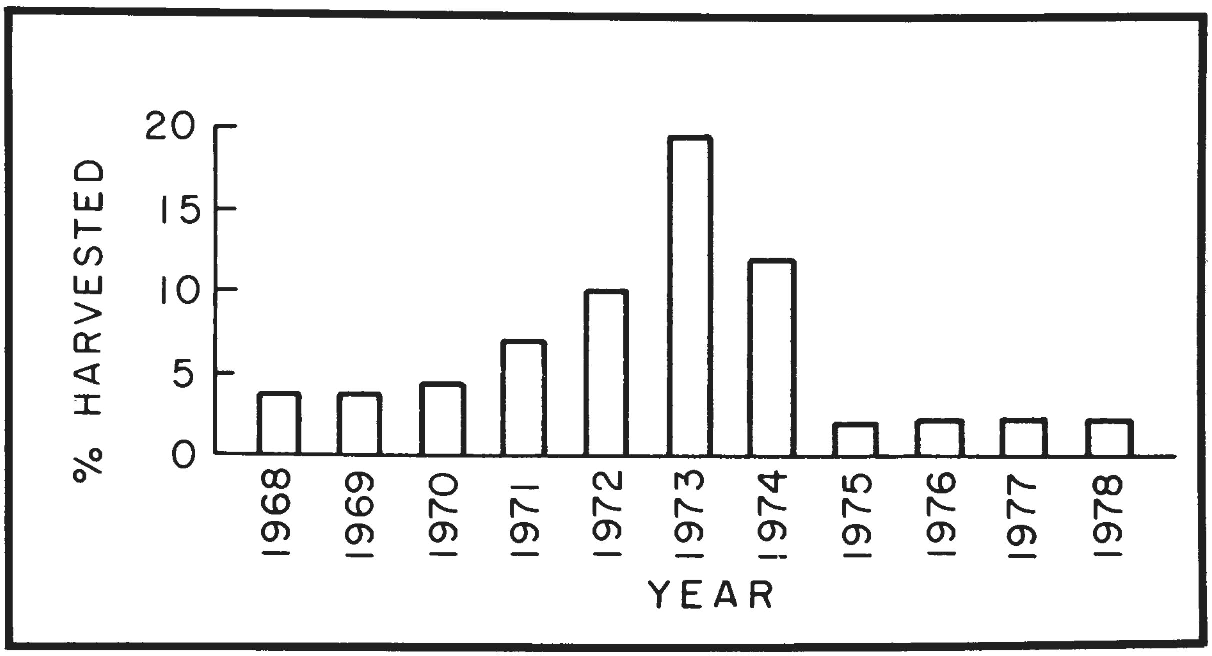

Fig. 8. The percentage of the moose population in the experimental area that was harvested annually by hunters, 1968-78.

The rapid decline in the moose:wolf ratio (Fig. 7) had a drastic effect on the moose population. By 1975, only 12 moose per wolf were present. At this ratio, we calculated that wolves probably killed 600 to 1,200 moose during a 7-month winter period in 1973-74 and 1974-75. These calculations were based on kill rates observed elsewhere in North America, where wolf packs relying primarily on moose usually make a kill every 3 to 6 days in winter. We also assumed that the 23 packs in our study area relied on moose for 75% of their winter food.

Additional evidence from radio-collared moose confirmed that wolf predation was severely limiting the population. The natural mortality rate of radio-collared moose was 20% annually from 1973 to 1975, and all observed mortality was attributed to wolf predation. We concluded from these estimates of mortality that wolf predation alone could have caused the moose population to decline after 1973.

Caribou

The Delta caribou herd ranges largely in the experimental area. The herd increased following wolf control in the 1950s, peaked in the 1960s, and began to decline rapidly about 1970 (Fig. 2). The herd declined from about 5,000 in 1970 to about 2,000 by 1975.

High calf mortality was a major cause of the decline in numbers of caribou. Declining calf:cow ratios in the experimental area indicated calf mortality during summer and fall progressively increased from 1970 through 1974 (Fig. 9), when virtually all calves died prior to winter. Reduced calf production was originally assumed to explain the low calf abundance. However, in testing this assumption, we determined that productivity was normal.

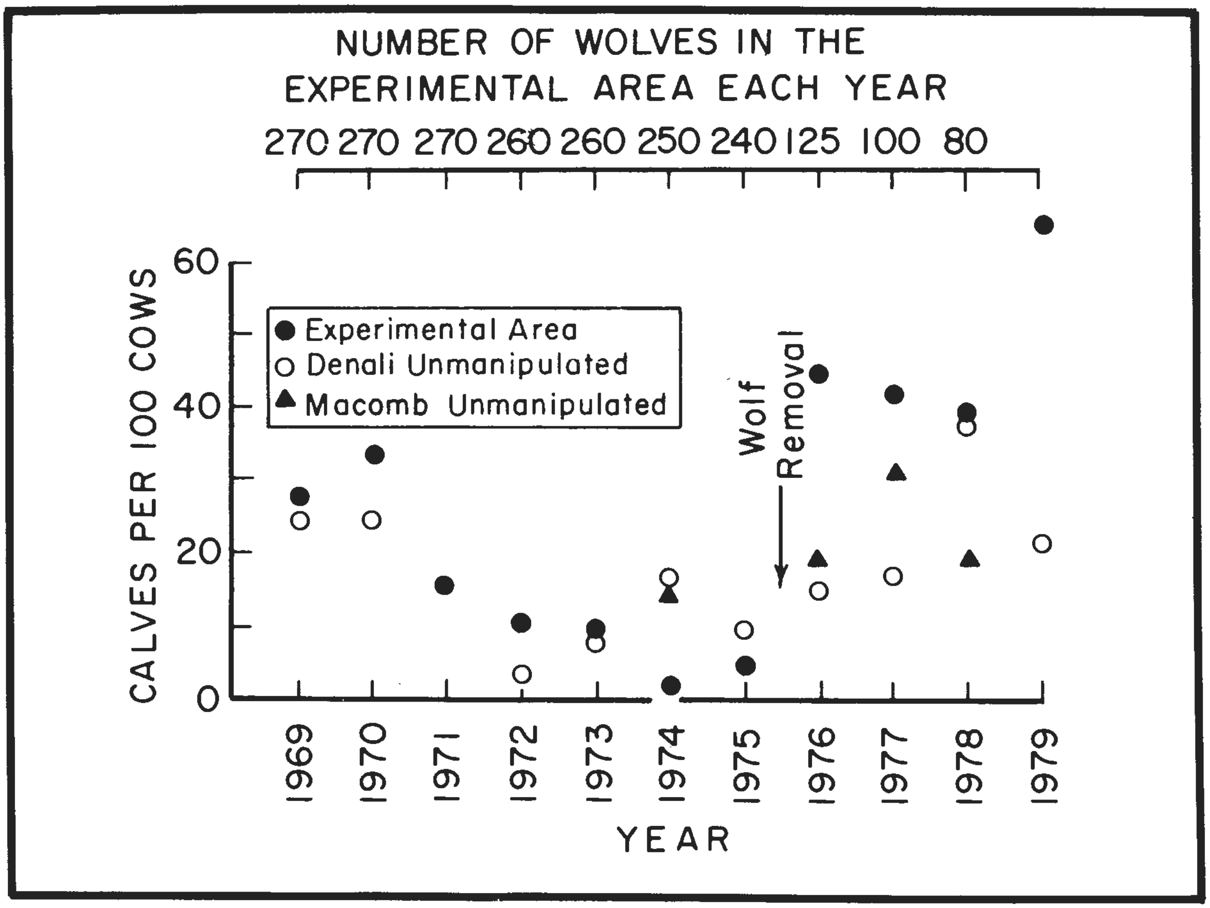

Fig. 9. Calves per 100 cow caribou in the experimental area and 2 unmanipulated areas in relation to wolf removal in the experimental area, 1969-79.

Newborn caribou calves are extremely susceptible to wolf predation. J.L. Davis Photo.

Another factor accelerating the population decline was high adult mortality from hunting. Annual harvest rates ranged from 7 to 19% of the population during the early 1970s (Fig. 10). The hunting season was closed in 1973 when the detrimental effects of the harvest were realized, yet the herd made no increase as a result of the closure.

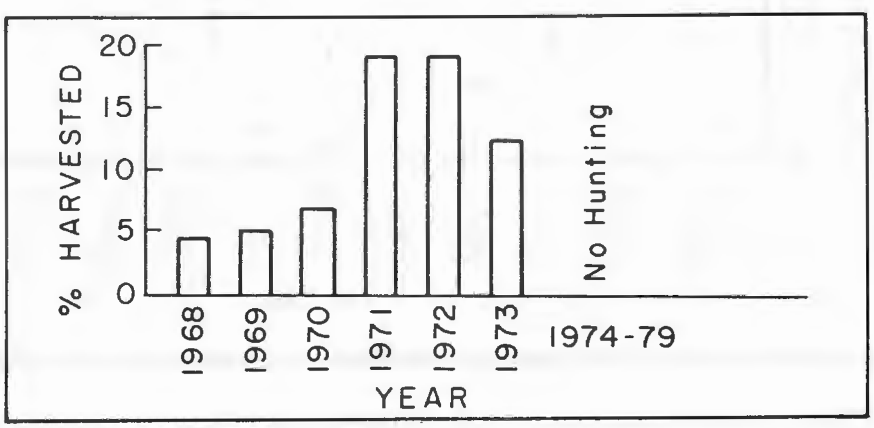

Fig. 10. The percentage of the Delta caribou herd harvested annually by hunters, 1968-79.

Sheep

Dall sheep were abundant in the experimental area throughout the 1970s despite a small decline in numbers between 1970 and 1975.

The Wolf Control Program

Wolf control began in the experimental area during winter 1975-76. Control was accomplished by local trappers and ADF&G personnel using conventional trapping and aerial shooting techniques.

Effectiveness of wolf control varied in different portions of the area. The population was reduced by an average of about 60% during the 1975-76 winter and maintained near this reduced level through 1979. The greatest reduction of wolves occurred on the Tanana Flats, which included the principal moose calving and summering area. Wolves were also reduced by about 80% in the caribou calving area. Control was least effective in the southwestern foothills and mountains because snow cover was unsuitable for tracking wolves.

Retaining a viable wolf population was ensured by specifying the critical minimum number of wolves to be left in the area. This minimum was expressed as a ratio of 1 wolf:100 moose during early winter or about 30 to 35 wolves in 1976. However, wolf control efforts only achieved ratios of 1 wolf:24-44 moose between 1976-78, with at least 75 wolves present throughout the study during fall.

Ungulate Response to Wolf Control

Moose

Dramatic increases in moose survival and population growth occurred in the experimental area as a result of wolf control beginning in 1976. Continued low moose survival was observed in unmanipulated areas, except in those areas where moose migrated from the experimental area (Fig. 11). During summers 1976 through 1978, the survival of calves produced by radio-collared cows in the experimental area more than doubled from levels observed in 1974 and 1975 (Fig. 5). Improved summer calf survival was also confirmed by 2- to 3-fold increases in calf:cow ratios observed during early winter surveys from 1976 to 1979. Each year an estimated additional 400 to 800 calves survived to November from 1976 to 1978. Calves produced during and after 1976 survived well through 18 months of age (Fig. 4). Lower natural mortality rates of radio-collared adult moose also indicated improved survival in the population. After 1976, only 6% of the adults died annually compared with 20% from 1973-75. Increased calf survival and decreased adult mortality together produced a population increase.

We concluded that the growth of the moose population beginning in 1976 was primarily due to decreased predation by wolves resulting from wolf control. Other factors could not logically account for the dramatic increase in moose numbers beginning in 1976. For instance, habitat did not improve in the mid-1970s. In fact, effective fire suppression caused a slow decrease in habitat quality during the 1970s. Differences in snow depth cannot explain the moose population increase since snow accumulation was near or below average between 1972 and 1979, except in winter 1974-75. The reproductive rate of female moose was normal throughout the 1970s before wolf control, and it could not have increased enough after 1976 to account for the increase in calves. Bears probably had only a small effect on moose during the 1970s as bear abundance appeared relatively constant and not at a high level. The occurrence of high moose calf survival immediately after the wolf reduction indicates bears were not numerous enough during the 1970s to be major predators on moose. In comparing moose calf survival in unmanipulated areas, where moose lived all or most of the year outside the wolf control area, we found that calf survival improved only among moose that were calving in the wolf control area but wintering elsewhere, specifically moose in the Chena and Delta unmanipulated areas (Fig. 11). Therefore, the evidence suggests that the improved calf survival in the experimental area was not simply coincidental, but a direct result of wolf control.

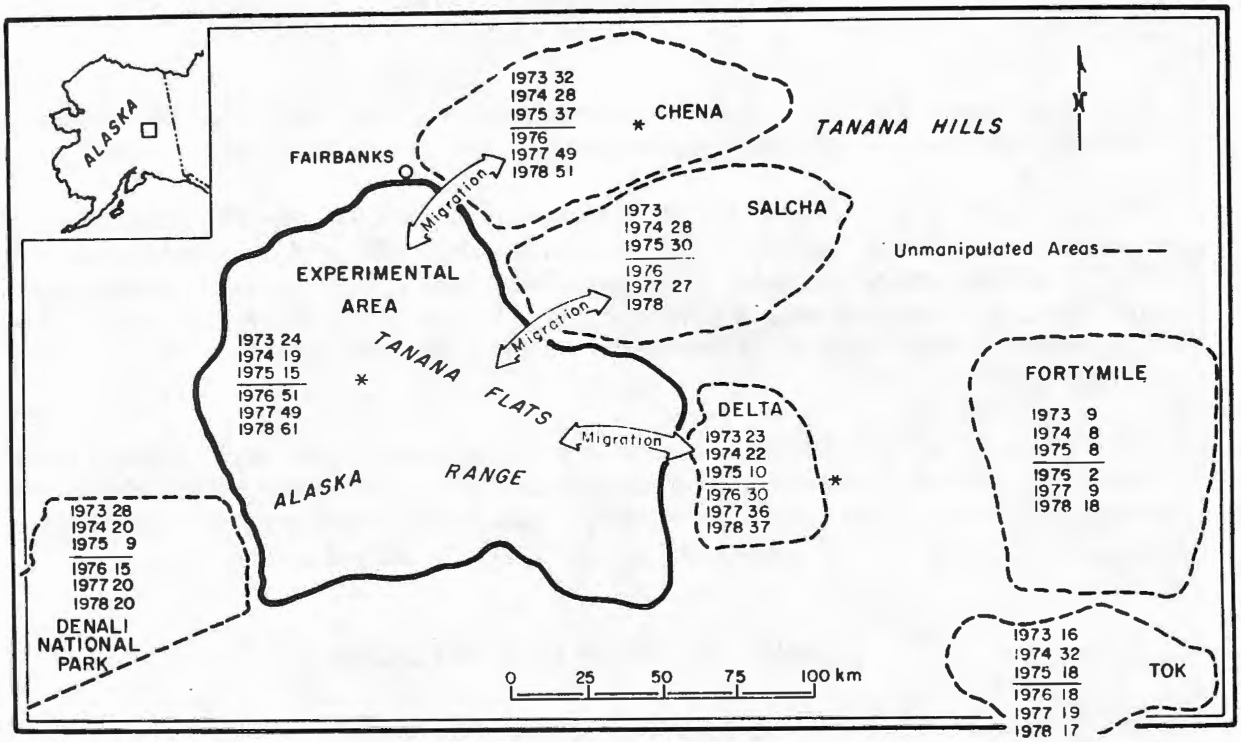

Fig. 11. Calves per 100 cow moose greater than 30 months of age in early winter in the experimental area and 6 unmanipulated areas. Calf ratios before (1973-75) and after (1976-78) wolf control are separated by a solid line. Asterisks (*) indicate significant differences in ratios pre- versus post-wolf control.

We do not know when a natural decline in wolves would have occurred to allow the moose population to increase to a level that would provide for desired levels of hunting and nonconsumptive human uses. However, we strongly suspect that without wolf control, predation would have continued to limit moose for an extended period, even though wolves would eventually have declined from their 1975 population level.

Caribou

Increased calf survival and overall caribou population growth in the experimental area coincided with the beginning of wolf control in 1976 (Fig. 9). Caribou populations in the adjacent Macomb and Denali unmanipulated areas neither increased sharply in 1976 nor showed comparable sustained calf survival after 1976. Our observations strongly suggest that wolf predation was the primary cause of low calf survival and the continued decline of caribou prior to 1976.

Sheep

The response of the sheep population to wolf control was small compared with the response in moose and caribou populations. At best, wolf control may have stabilized a slowly declining sheep population.

Lamb and yearling abundance in the experimental area and adjacent Denali National Park closely paralleled each other, suggesting wolf reduction had little influence on lamb survival. The infrequent occurrence of sheep remains in the stomachs of wolves killed in or near sheep habitat also indicated that wolves killed relatively few sheep at least during winter. From these data, we conclude that sheep were a minor part of this wolf-prey system.

Conclusions about Wolf Control

1. Predator control from 1976 to 1979 reduced the wolf population by 60 to 70% when averaged for the entire experimental area.

2. Coinciding with wolf control, moose and caribou populations grew and survival of young increased, suggesting a cause-and-effect relationship between predator control and population growth of these prey species.

3. The response of the sheep population to wolf control was small. At best, wolf control may have stabilized a slowly declining sheep population.

4. Predator control in the 1950s was also followed by rapid growth in the moose and caribou populations.

5. Wolf control is considered an appropriate tool for responsible management of wolf-moose-caribou systems where it is desirable or necessary to increase the numbers of moose and caribou and/or to restore desired levels of hunting and nonconsumptive use of moose and caribou in a timely manner.

MANAGEMENT IMPLICATIONS OF PREDATOR-PREY RELATIONSHIPS

The last decade has seen a substantial increase in our understanding of predator-prey relationships as a result of many excellent studies in North America. This insight has changed, and will continue to change, the way ADF&G manages moose, caribou, wolves, and bears.

Predation Obscuring the Relationship Between Ungulates and Food

Calf production, calf survival, and age structure in the population were previously thought to be good indicators of the relationship between an ungulate population and its food resources. That is, an abundance of calves and young adults was viewed as a reliable indication of a population with plenty of food. Conversely, when few calves were present and a population included many old animals, it was thought that the population was facing food shortages. These relationships often hold when few predators are present but are unreliable when predators are abundant. We now recognize that predation on calves can obscure the true relationship between ungulates and their food supply.

Misjudging the relationship between ungulates and food in areas where wolves and/or bears are common has resulted in inappropriate management of ungulates and predators in Alaska. In a number of situations, insufficient food and the lingering effects of severe winter weather were thought to be causing low production and survival when, in fact, the birth rate was near maximum and predation was lowering survival. To supposedly improve nutrition, game managers encouraged the reduction of ungulate densities. This action increased the effect of predation and further lowered survival. Much of the confusion caused by such situations has dissipated as a result of recent predator-prey studies.

Controls on Ungulate Population Size

It has become apparent that mortality of moose and caribou from predation, hunting, and severe winters is often largely additive. That is, the number of animals dying from one cause does not affect the number dying from other causes. This type of mortality contrasts with compensatory mortality, where an increase in the number of animals dying from one cause will reduce the number dying from other causes. Additive mortality directly affects the rate of population increase or decline and, thus, controls population size. Predation sometimes results in a special form of control (called antiregulatory control) in which the effect of predation decreases as a prey population grows and increases when a prey population declines. This is very important because, if the effect of predation increases as a population declines, the prey population is headed toward a very low density and perhaps extinction.

Predation by wolves has been shown to sustain declines in deer in Minnesota, moose on Isle Royale, and moose, caribou, and deer in Alaska. In each case, prey declines occurred as a result of a combination of factors (for example, deep snow, hunting, predation, and overuse of food by a high-density prey population). Wolf predation alone did not appear to limit growth of these populations prior to or during the initial phase of the declines. However, wolves increasingly controlled prey numbers because rapid declines in numbers of prey coincided with very slow declines or even increases in numbers of wolves. Prey reached relatively low densities because wolves exerted sufficient control to sustain the declines. In one area in Minnesota deer were temporarily eliminated by wolves. The conclusion is that declines in prey initiated by many causes may be maintained by wolf predation.

Response of Wolves to Declining Prey

Current information indicates no sensitive, fast-acting feedback process exists that regulates numbers of wolves relative to declining prey density. Feedback is a process where a change in prey density or vulnerability affects the size of the wolf population or its rate of predation. For example, if a fast-acting feedback process existed, a decline in a moose population would result in a decline in the predation rate of wolves through lowered pup production or survival, thereby allowing the moose population to increase. The problem is that a notable lag-time exists before wolves begin to decline. The examples in which wolves have prolonged the declines of deer, caribou, or moose until prey reached low densities, or were locally eliminated, demonstrate the ineffectiveness and slow-acting nature of the feedback system.

From the standpoint of the wildlife manager, only feedback mechanisms that rapidly reduce the impact of predation on declining ungulate populations are effective in maintaining acceptable numbers of prey. Since wolf populations do not always respond quickly, man's intervention through wolf control can be beneficial in maintaining adequate moose or caribou populations.

The "balance of nature" concept is firmly established in the public's mind and has also underlain the thinking of many biologists. The balanced predator-prey system envisioned is one that generally remains near an equilibrium level through fast-acting feedback mechanisms. The result of the delayed feedback process is that predation can sometimes cause prey populations to fluctuate widely. Therefore, the "balance of nature" concept does not accurately describe some simple predator-prey systems. Instead, it is important to recognize that large fluctuations in predator and prey numbers occur naturally, and that reductions in harvest by man will not automatically allow prey to increase because of the dominant influence of predation.

Recent studies have led to increased awareness of the wolf's effectiveness as a predator. R.O. Stephenson Photo.

Recovery of Moose Populations from Control by Wolves

Ungulates have coexisted with wolves for millenia, apparently with infrequent elimination over large areas and occasionally with rapid growth in the presence of naturally regulated wolf populations. Therefore, natural mechanisms exist that allow moose, caribou, and deer populations, brought to low densities by predation, to eventually escape control by wolves. However, if under pristine conditions the escape and subsequent increase of prey is infrequent and short-lived (as suggested by prominent biologists such as A. Bergerud, D. Pimlott, and L. Keith), then wildlife managers, hunters, and nonconsumptive users of wildlife are faced with a serious dilemma. In Alaska no pristine ecosystems remain, but some areas have wolf and ungulate populations which are largely controlled by natural events. Both predator and prey populations are harvested to varying degrees by man in these areas; however, harvest of wild predators by man is usually insufficient to substantially reduce the impact of predation on the ungulate prey. Thus, it is virtually impossible to maintain moderate or high densities of ungulates for extended periods without some form of periodic predator control.

When wolf predation is the primary factor controlling an ungulate population, a wildlife manager is left with 2 choices. He can either wait for a natural recovery of prey while reducing man's harvest or control the numbers of wolves while reducing man's harvest . Given the apparent rarity of natural recoveries, artificial control of wolves is most practical. Wolf control can involve an intensive effort to kill a certain number of wolves during a limited period, less intensive recreational and commercial trapping and hunting, or a combination of these methods. We view the second approach as preferable, if circumstances allow for it.

Improvements in Management of Predator-Prey Relationships

Wildlife biologists are becoming more skilled at accurately estimating the numbers of moose, caribou, and wolves. Knowing the numbers of each species and having estimates of the number killed has improved the ADF&G's ability to predict the status or health of moose and caribou populations.

Knowledge of the numerical relationship between wolves and their prey provides a useful indication of the effects of predation. For example, 3 general types of moose-wolf relationships can be described based on studies where moose were the wolf's primary prey and the wolf was the primary predator. First, at ratios of less than 20 moose:wolf, predation appears to cause a decline in moose numbers. Second, at a level of 20-30 moose:wolf, predation can be a primary force controlling numbers of moose; whether a moose population remains stable or declines is largely dependent on the combined effect of other factors influencing the moose population, including hunting, food supply, and winter severity. Third, at ratios greater than 30 moose:wolf, moose populations may remain stable or increase if food is adequate and if other sources of mortality are minor. These guidelines can assist wildlife managers in making initial assessments of moose-wolf relationships, when the results of long and expensive studies are not available.

Where 2 or more different kinds of predators prey heavily on moose, moose:wolf ratios will still indicate the relative importance of wolf predation on moose. However, the total impact of predation on the moose population will be greater and the expected moose population trend will not conform to the above guidelines. For example, the management of wolves and the desirable ratio of moose:wolf will be altered when 1 or 2 species of bears are major competitors with wolves for moose. If total predation is high enough to maintain a moose population decline, then it is desirable to reduce predation. Because wolves have a higher reproductive rate than bears and also repopulate habitat more rapidly, they are considered to be more manageable. As a result, the effects of predation will usually be adjusted by altering wolf numbers. Where grizzly bears are abundant, the number of moose per wolf will have to be relatively high, perhaps between 50/1 and 100/1 because of the added effects of bear predation. In parts of Alaska where bears are especially abundant, it is possible that wolf control alone might not cause an increase in moose numbers.

Intensive studies of the ecology of wolves, bears, and their ungulate prey are continuing in areas such as the Kenai Peninsula, the Nelchina basin, and in Interior Alaska. The knowledge gained from these studies and others in North America will allow the ADF&G to initiate more timely and effective management actions. The result should be increases in some ungulate populations and a lessening in the occurrence of their drastic declines. Although wildlife populations will always fluctuate to some extent, ADF&G hopes to extend the life of healthy predator and prey populations.

Deep snow can cause drastic declines in moose populations. ADF&G Photo.