By Warren B. Ballard
Photos by author except as noted

The case of the disappearing moose

Part 1 of 3

Editor's note: *This is a wildlife whodunit of epic proportions. Moose were disappearing from one of Alaska's finest game ranges and no one knew whether it was from overhunting, poor range, wolf predation, or some other cause.*

We won't spoil the story by telling you the answer. Learn for yourself how wildlife scientists unravel puzzling and complex wildlife relationships from this detailed report by the project leader of one of the largest, long-term predator-prey studies ever made anywhere.

Radio-collared animals were frequently located from Super Cub airplanes equipped with special antennas mounted on each strut. This is pilot Al Lee, with author in rear. (Russ Dixon)

The upland basin of the Nelchina and Susitna rivers, roughly 130 by 160 miles surrounded by rugged mountains, dotted with lakes and crossed by rivers and creeks, is one of Alaska's great game ranges. Moose and caribou roam there, and Dall sheep peer down on the huge valley from the upper foothills and surrounding mountains — the rugged Alaska Range, the Talkeetna Mountains, and the coastal Chugach Mountains. Great hump-shouldered grizzlies, glossy black bears, and wide-ranging wolves are the large carnivorous mammals.

The moose, largest of the world's deer, is probably the most important big game animal of the Nelchina Basin, and in recent years nearly one-fifth (18%) of all moose bagged by Alaskan hunters has come from there. Moose is one of the basic meat animals of Alaska, comparable to beef in some other states, and it is valued and managed for its great food value. It is also an important trophy, and the two uses are compatible: by law the meat of every moose shot in Alaska must be utilized.

Moose have lived in Alaska for thousands of years. Evidence suggests that only within the last 200 years have they become relatively abundant. Generally, Alaska's moose were increasing in the 1950s, and in many areas they reached peak numbers about 1960. Good range, mild winters, low hunting pressure, and perhaps predator control by the federal government before state management commenced in 1960, all probably contributed to the increase.

Moose began declining in many areas after 1960, at a time when the demand for moose meat, trophies, and photo opportunities was increasing. The great moose herd of the Nelchina Basin was included in the decline, and no one knew why.

Since 1952 annual moose counts have been made in Game Management Unit 13, commonly referred to as the Nelchina Basin. One indicator of a healthy moose herd is a large number of calves. From 1952 through 1960, for every 100 cow moose in the Nelchina, approximately 40 had calves with them during the November counts. Not all cows are old enough to bear calves, and not all calves survive even under ideal conditions: 40 calves per 100 cows indicated a healthy productive herd.

Favorable conditions for moose continued through most of the 1950s: frequent forest fires that had occurred earlier kept spruce trees from shadowing out young willows, a major moose food. Wolves of the Nelchina were reduced to about a dozen animals by intensive control

by the federal government prior to 1953. The wolves were shot from airplanes, and poison was widely distributed. Black and brown/grizzly bears (biologists consider the Alaska grizzly and brown bear to be the same species) were inadvertently killed by the poison, for their numbers also were low. Human hunters were allowed to kill bull moose only, and plenty of bulls remained for breeding.

Nelchina moose peaked in 1960. During 1961-62, deep snows contributed to the deaths of many moose. Then the number of calves per 100 cows began to decline, and fewer twin calves appeared.

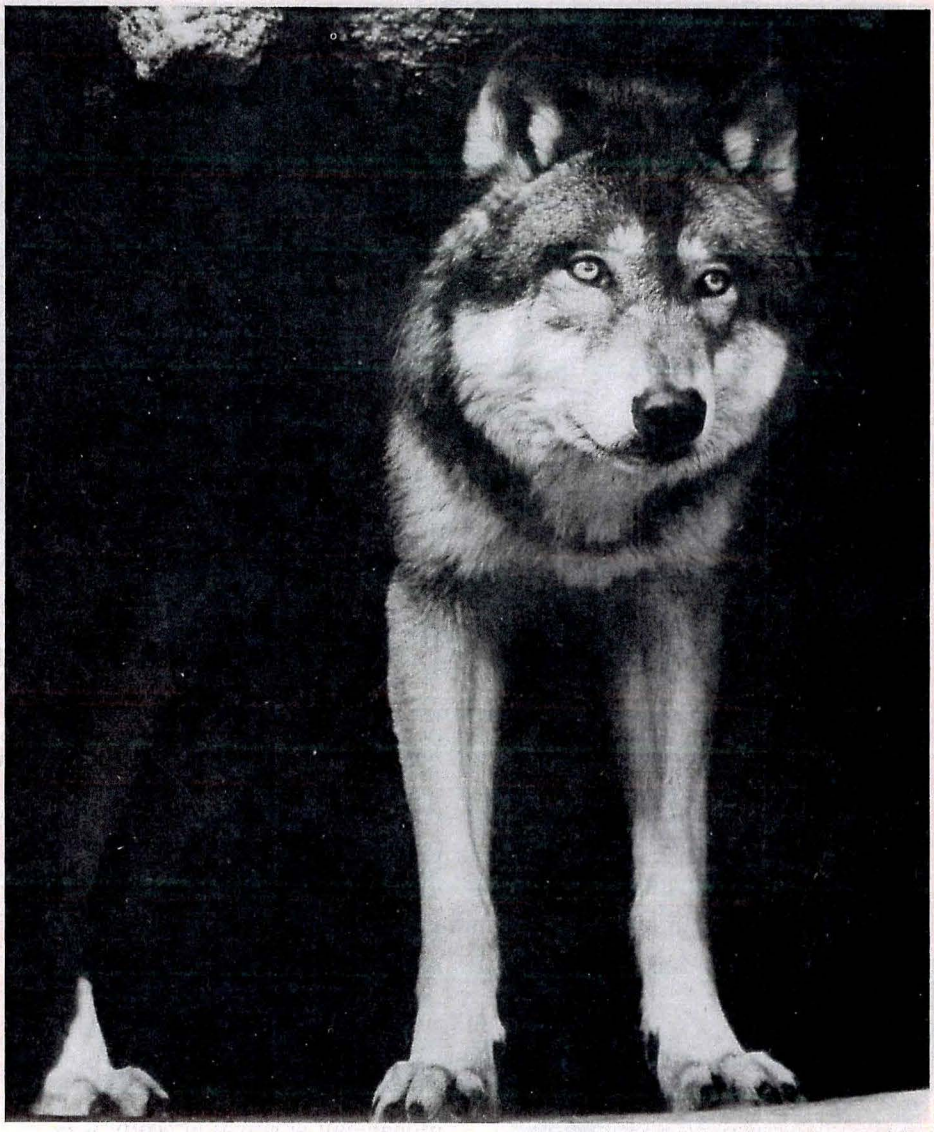
At first state biologists thought severe winters were the sole cause of the moose decline, and they expected them to rebound when milder winters returned. But they didn't: despite mild winters, moose continued to decline, a trend that continued until the 1970s. Something other than tough winters was killing moose. Was it a single factor, or a combination of things?

Poor range condition is a common problem where moose numbers have been high. With poor range come low pregnancy rates and increasing high mortality due to low resistance to predation, starvation, disease, and other stresses. A frequently observed result of poor nutrition is high calf loss during winter. In the Nelchina, although calf losses were sometimes high during severe winters, this did not appear to be the case for most years.

Casual observations of the range showed it to be in fair condition. Biologists concluded the problem wasn't with the range.

Disease and parasites were ruled out, for these problems are rare with Alaska's moose.

Overhunting? Sometimes excessive hunting can harm a moose population. The solution is easy: reduce or stop hunting. In the Nelchina the moose harvest was almost exclusively bulls. Nearly all cows were being bred, for the bull-cow ratio was adequate. Studies elsewhere in Alaska have shown that as few as seven bulls for each 100 cows doesn't appear to hamper reproduction, but it can reduce calf survival, for calves born late because of an extended breeding season may be small and weak when winter arrives. Overall, the bull-cow ratio in the Nelchina has never reached that low a level.



Many thought wolves were responsible for the population decline of the Nelchina moose herd. Others weren't sure. The uncertainty sparked the largest predator-prey study ever undertaken. Part of the study included killing some wolves in one area to determine whether that affected the moose population. (Leonard Lee Rue IV)

Moose calves were being born in good numbers, but they weren't surviving through the summer: they weren't present in November when aerial moose surveys usually are made.

Overhunting wasn't causing the decline.

Predation was another major moose mortality factor that deserved consideration. Prior to statehood the federal government spent hundreds of thousands of dollars to reduce wolf numbers throughout Alaska. With statehood and growing environmental awareness, predator control was halted. Predators began to be viewed as important components of the natural system, for it appeared they culled the sick, the old, and the lame — inferior individuals. With this view came the idea that predators should no longer be hunted or trapped as pests or vermin, since they are beneficial.

To some, the fact that they had long suffered persecution by man was enough reason to stop trying to control wolves. Simplistic and often fictional books and articles, presented as fact, portrayed the wolf as a Disney-like creature that had been unfairly treated by man. Such literature claimed a following which became vociferous whenever the state proposed wolf control.

An adult moose awaits death after being severely injured by wolves in late winter. Wolves sometimes injure a moose or other prey and then wait for it to become weak before finishing it off.

The 12 or so wolves that had survived federal predator control efforts in the Nelchina Basin in the early 1950s had increased to about 450 by the 1960s — a good example of the tremendous reproductive potential of the wolf. Bears also increased during that period. Thus as moose numbers declined, predators increased.

Was this cause and effect? In the whodunit of the Nelchina, was the wolf the guilty one — the butler, so to speak? Or was he an innocent bystander? Only years of careful investigation would tell.

Most moose calves were dying during summer, a time when wolves are raising their young. Adult wolves carry food to their dens in order to feed their pups. Often scraps of food are left, and of course, large numbers of wolf droppings, or scats, are found near the dens; both of these provide information on what wolves eat when at the den.

In 1971, Robert Stephenson and Loyal Johnson, both ADF&G biologists with years of experience with wolves and moose, began visiting wolf dens in the Nelchina to collect food remnants and scats to see if they could determine what wolves were eating. Substantial amounts of calf moose hair were found in the scats, supporting the idea that wolves were responsible for killing many moose calves. The case against the wolf looked pretty strong.

Moose continued to decline, and by November, 1975, the lowest calf survival ever in the Nelchina occurred, with 15 calves observed per 100 cows. Calf survival had been declining for a number of years. This meant that fewer new moose were entering the population, and as each year passed, surviving moose were becoming older, and they were dying without being replaced. If the trend continued, eventually there would have been few if any moose left in the Nelchina Basin.

The time had come to determine the cause of the moose decline. Since available information suggested that predation by wolves was the primary reason for poor moose calf survival, a study was commenced that was aimed at learning something about the Nelchina wolves. A three-part approach was planned: (1) a moose movement and population study, (2) an experimental wolf reduction program in part of the moose study area, and (3) a wolf population dynamics and food habits study.

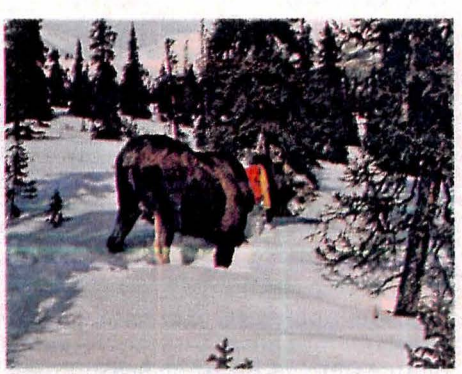
The moose study and wolf removal program took place in the upper Susitna River Basin, an area of about 2,800 square miles. The wolf food habits and population study was made in the remainder of Game Management Unit 13 and focused mostly on the eastern Talkeetna Mountains, Lake Louise flats, and the Alphabet Hills.

The experimental wolf reduction program started in the winter of 1976 in the 2,800-square-mile study area. Wolves were found by pilots and observers flying fixed-wing aircraft who radioed the information to a nearby helicopter. All the wolves were killed from the helicopter with a shotgun. This was the most humane and the most efficient method. During the first year of the program 40 wolves were killed in this manner. After this, biologists killed wolves by shooting them from fixed-wing aircraft. From the winter of 1976 through the summer of 1978 a total of 60 wolves was killed in the experimental removal area.

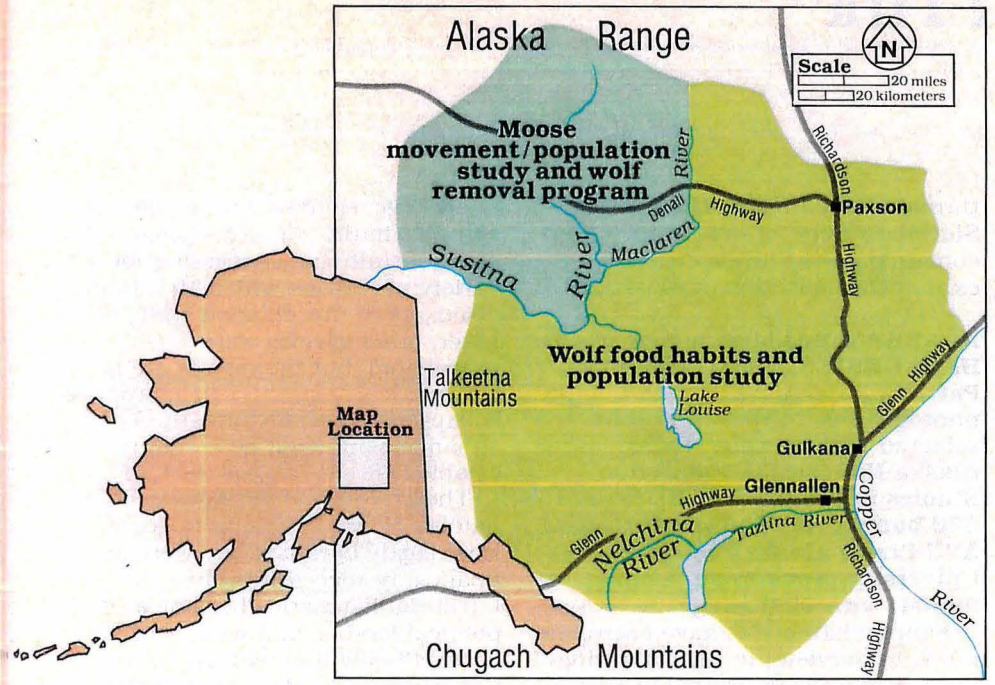
Whenever possible the carcasses of these wolves were retrieved: hides were sold at public auction, and the carcasses were autopsied to gather additional data on wolf food habits and physical condition.

Not all wolves in this study area were killed: as soon as some wolves were removed, others, from outside the study area, began to move in. In less than two years after the removal program had stopped, the wolf population in the area had increased to within at least 89% of the precontrol level.

The author prepares to put an ear tag on an adult moose. Such tags usually remain with the animal for many years, sometimes for life. (Courtesy ADF&G)



After being tranquilized and fitted with a canvas collar containing a radio transmitter, an adult moose quickly resumes its normal daily activities.



This is where the moose collars came in. The moose with radio collars could be easily located; the collars held transmitters which emitted a pulsating signal which could be picked up by special receivers installed in chartered aircraft. With this equipment it is possible to fly to within a few hundred yards of the origin of the signal.

Over a three-year period more than 1,200 relocations were made on the radio-collared moose. Many of these moose spent the year in relatively small areas — about 17 square miles. Others used up to 530 square miles. Some of the moose were migratory and lived part of the year outside the wolf removal area. They were moving from 10 to 58 miles between summer and winter range.

Would the wolf reduction experiment improve the survival of calf moose? No one knew.□

Next month: wolf studies, and moose calf mortality studies.

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Although moose are the most important wolf prey in the Nelchina Basin, caribou comprise 20 to 30 percent of the annual wolf diet. Here ADF&G biologist Ted Spraker examines a partly consumed wolf-killed caribou.

And then there were the moose studies. In October, 1976, and March, 1977, two teams of two biologists captured more than 100 cow moose by darting them from helicopters with an immobilizing drug. Each downed moose received either a radio collar or a numbered canvas collar as well as permanent ear tags. A tooth was extracted from each animal: when cross-sectioned and viewed under a microscope, the tooth's annular rings reveal the age of the moose.

Samples of blood were taken from the jugular vein for analyses which gave clues to the health of the animal. Measurements were taken to compare the size of Nelchina moose with moose from other regions of Alaska: bigger moose are found in healthier environments. Last, a biologist checked a cow moose to feel if a calf was present.

Usually between 20 and 30 moose were captured each day, with workdays lasting up to 12 hours.

Analyses by Dr. Albert Franzmann, a highly trained ADF&G wildlife biologist with a degree in veterinary medicine, indicated that Nelchina Basin moose were in good health. Chemical analyses of the blood compared favorably with other Alaskan moose on good range, indicating that range conditions of the Nelchina were still adequate to support a healthy moose herd.

The pregnancy rate was 88%, which was good. Average age of cows that were examined and marked was seven years. Since one- to two-year-old moose were not tagged, the average age of the population was less than seven years. Moose live beyond 20 years, and cows usually start producing calves at the age of two. Even very old moose have a calf each year, although the number of twins declines with the age of the mother.

Moose reach prime breeding age between 7 and 11 years, so a large percentage of Nelchina moose were just reaching their prime. Clearly, Nelchina moose were in relatively good health and were producing ample numbers of calves.

We still didn't know what was causing the poor calf survival. Wolf predation appeared to be the probable cause.

It was believed that moose found north of the upper Susitna and Maclaren rivers generally lived to the north of these rivers. But what if this weren't true? The wolf removal experiment was based on the idea that moose would give birth in an area with relatively few wolves. The number of calves that survived would be measured by making counts in November, the usual time of moose surveys. If some of the cows were migratory and spent part of the year — especially during calving time — outside of the area, then we would not be getting the true picture of calf survival under low wolf densities.