

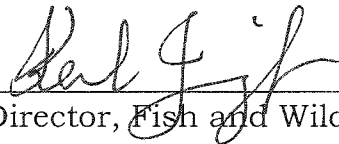
Finlayson Wolf Information Series

Finlayson Wolf Information Series
MR-99-01

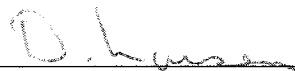
©1999 Department of Renewable Resources, Government of Yukon
You may use the information in this report for education or information purposes.
If you want to use any portion of this report in scientific publications,
you must have permission in writing from the
Department of Renewable Resources, Fish and Wildlife Branch,
Government of Yukon, Box 2703, Whitehorse, Yukon Territory Y1A 2C6

Finlayson Wolf Information Series

Produced by Kelly Hayes
for the
Department of Renewable Resources



Director, Fish and Wildlife Branch



Chief, Wildlife Management Section

Finlayson Wolf Information Series

Table of Contents

- No. 1 Removing Packs to Rebuild Prey Populations
- No. 2 Rebuilding a Wolf Population
- No. 3 Competition Between Wolves and Ravens
- No. 4 Hunting Strategies of Finlayson Wolves
- No. 5 Hunting Healthy Animals
- No. 6 Connection Between Wolves and Prey
- No. 7 The Impact of Wolves on Calf Survival
- No. 8 Life and Death in the Wild

Introduction

The Yukon Government has been involved in wolf research and management in the range of the Finlayson Caribou Herd for 16 years. The first phase of the program began in 1983 with seven years of wolf control. The second phase of the program ended in 1994, when the wolf population had fully recovered. We are currently in a third phase, tracking the populations of wolves, moose and caribou as part of a long-term research program on this important large mammal ecosystem in the Yukon.

The Finlayson Wolf Information series consists of eight plain language essays. Each covers a different aspect of Finlayson wolf ecology. They were written in response to public requests for general information on Yukon wolves, and specifically on the Finlayson program.

There is more information about Finlayson wolves that is not covered in these essays. For a more detailed look at the Finlayson wolf population study, visit any Yukon Fish and Wildlife office. Ask for a copy of the report written by R.D. Hayes. It is called "Numerical and functional response of wolves, and regulation of moose in the Yukon."

Removing Packs to Rebuild Prey Populations

Finlayson Wolf Information Series

No. 1

In the early 1980s, the number of caribou and moose in the southeast Yukon was very low. Biologists killed a large number of wolves in the area to help these populations grow.

Instead of randomly killing wolves, biologists used helicopters to remove entire packs. They believed reducing the number of wolf packs in the area was the key to improving the survival of moose and caribou.



Testing the theory

After the wolf control ended, biologists kept track of how often different packs killed moose. They found that a pair of adult wolves killed an average of 27 moose each

winter. A pack of 10 wolves killed about 46 moose. This information suggested that if the same 10 wolves were organized into five pairs, each pair would kill 27 moose for a total of 135. That means the same number of wolves could kill three times as many moose, depending on how they were organized.

Terms

- **Population:** A group of animals that breed together and produce healthy young.
- **Prey:** Animals that are killed and eaten by others.
- **Kill rate:** Number of animals killed by each wolf.

Kills by small packs

By 1990, nine of the 14 wolf packs in Finlayson were pairs. Biologists calculated that these 18 wolves killed about 200 of the total 400 moose killed by wolves that winter.

Understanding kill rates

Based on the information they gathered, biologists concluded the number of animals killed by wolves each winter, or the kill rate, is not determined by the total number of wolves in an area. It is mainly determined by the number of packs and how many wolves are in each of them.

Using the information

By removing entire wolf packs, moose and caribou populations in the Finlayson area were able to grow. This method was more effective than randomly killing individual wolves while keeping the number of packs the same.

For more information, see *Numerical and Functional Response of Wolves and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Why wolves live in packs

The results of the Finlayson study show wolves get more food if they live in a small pack or pair. So why do wolves usually organize themselves into larger packs of six or more animals?

Wolf packs are families made up of related animals. Wolf pups take about two years to mature, and during that time they remain with their parents for protection. Wolves reproduce every year so there will usually be pups and yearlings living with the parents at one time.

By living with their parents, young wolves learn important social skills necessary for living in a pack and enjoying its benefits. These benefits include help in finding and catching food, defending territories, breaking trails through winter snow, and protecting kills from other wolves and scavengers.

But the most important reason wolves live in packs is simply for reproduction. Packs provide food and protection for young wolves. Adult wolves must share their kills and defend the young, but both adults and pups benefit from the relationship. The pups are provided with food for their growth while the adults see their genes passed on to another generation.

Rebuilding a Wolf Population

Finlayson Wolf Information Series

No. 2

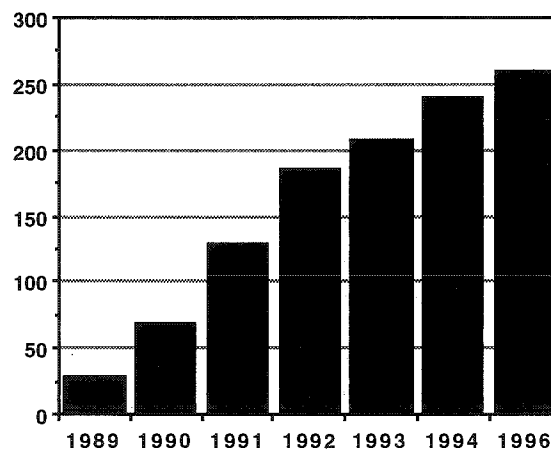
A wolf population is a group of wolves living in the same area that breed together and produce healthy young. These groups are constantly evolving in response to their changing environment. Biologists are now working to understand how a wolf population returns to normal numbers after most wolves have been killed.

Lowering wolf numbers

During the 1980s, many wolves were killed in the southeast Yukon as part of the Finlayson Caribou Recovery Program. Caribou and moose populations in the area were dwindling, so removing one of their major predators allowed them to grow.

In 1983, before wolf control began, 215 wolves in 25 packs were counted in the Finlayson area. Only 29 wolves

Yearly Increase in Wolf Numbers



in seven packs were left when wolf control ended in 1989. Biologists monitored these packs to find out how the new wolves would fill unoccupied land and how long it would take the wolf population to rebuild.

Rebuilding a population

Young adult wolves caused the first change in the recovering population. These wolves left their family packs to move into vacant territories on their own. They eventually met other lone wolves and established pairs, made up of a young male and female. By 1990, over half of the wolves in the area were organized into new breeding pairs.

Terms

- **Population:** A group of animals that breed together and produce healthy young.
- **Pack:** A group or family of wolves.
- **Territory:** An area or space occupied and defended by an individual or a group of animals.

At first there was lots of space available in the area, so these small packs did not have to compete with other wolves for territory or food. As the wolf packs reproduced and their numbers grew, the pack's territories began to overlap and competition increased. Some packs that were already established outside Finlayson also moved into the area and began to compete for territory and food.

Population growth

The year after wolf control ended, the number of wolves in the area doubled to 69 wolves in 14 packs. This quick increase was closely linked to the high number of pups born to new pairs. The pups had a very high survival rate because there was little competition for food and few conflicts with other packs. In the following years, the wolf population continued to grow, but so did competition and conflicts. As a result, the wolf survival rate dropped which slowed down population growth.

Members of a wolf pack

- **Alpha Male:** Father, or male member of breeding pair.
- **Alpha Female:** Mother, or female of breeding pair.
- **Pups:** Young offspring of the breeding pair. (Usually 3-6 per pack)
- **Yearlings:** Older offspring that will leave the pack after about two years. (Usually 2-3 per pack)
- **Beta Wolves:** Other adult wolves, usually offspring from breeding pair, who are waiting to take over an Alpha position.

When some packs grew to more than 14 wolves, some members split off and formed new packs of their own.

Return to a stable population

The number of packs stabilized by 1992, three years after wolf control ended. By then, 27 packs of about five wolves each were living in the Finlayson area. There were few new packs recorded after 1992.

By 1996, seven years after wolf control ended, the wolf population in the area had bounced back to 260 wolves—45 more than before wolf control began. The smaller packs first noted at the beginning of the study had now grown to an average of nine wolves.

Biologists believe that the Finlayson wolf population has now leveled off. By studying the return of wolves to the area, biologists were able to gain an understanding of how a wolf population recovers after losing many of its members.

For more information, see *Numerical and Functional Responses of Wolves*, and *Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Yukon
Renewable Resources

Competition Between Wolves and Ravens

Wolf packs hunt other animals to survive. They usually kill large animals like caribou or moose and feed off the carcass for a few days. The size of the wolf pack, or the number of mouths to feed, usually determines how often wolf packs kill.

During the Finlayson Caribou Recovery Program, biologists discovered that pack size is not the only factor that determines how often a pack kills.

Kill rates and pack size

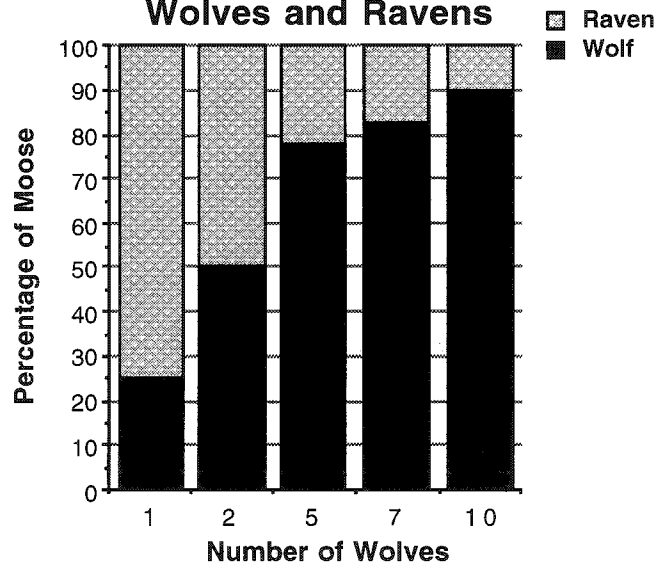
While studying different wolf packs, biologists noticed small packs of two wolves often killed as many moose as a pack of six or seven wolves. Animals killed by small packs were also eaten just as fast as animals killed by larger packs.

Food consumption

A healthy wolf needs an average of 3 kg of food per day to survive. By taking measurements at wolf kills, biologists calculated Finlayson wolves were eating close to 9 kg of food per day.

After a closer examination of the kill sites, biologists discovered why the wolves seemed to be eating so much.

Portion of Moose Eaten by Wolves and Ravens



The raven factor

Flocks of ravens, some with as many as 50 birds, were found at kill sites. These birds were eating the meat from the carcasses. Young ravens are known to band together in flocks during the wintertime to find food more easily.

Terms

- **Pack:** A group or family of wolves.
- **Flock:** A group of birds.
- **Kill Rate:** The number of animals killed by each wolf.
- **Carcass:** The body of a dead animal.

Competition from ravens

In Finlayson it was found that ravens were removing up to 37 kg of food per day from the carcasses. These ravens were able to scavenge more from a kill when there was only a small pack feeding on the carcass.

Ravens provided serious competition for smaller packs that could not eat their kills quickly. This meant smaller packs were forced to kill more often and eat less because the ravens would pick the carcass clean before the wolves had their fill.

Adjusting the numbers

When the consumption rates of Finlayson wolves were adjusted to reflect the amount of food lost to ravens, it was found that the wolves were only eating about 4 kilograms of food per day. This is a normal amount for a wolf to eat.

By studying the kill rates of Finlayson wolf packs and the relationship between wolves and ravens, biologists were able to gain an understanding of why small packs kill as often as a larger pack.

The Common Raven

(*Corvus corax*)

The common raven is a species of bird found throughout the Yukon. With its shiny black feathers and dark beak, the raven is often confused with its smaller relative, the crow.

It is a predator but is mainly a scavenger and are often seen feasting at garbage dumps.

Ravens build large nests made out of sticks and twigs high in trees or on cliffs. Sometimes they will take over an abandoned eagle or owl nest. Each year they lay between four and seven large green eggs.

Ravens are intelligent birds. They are resourceful, quick to learn, and build on knowledge from past experiences.

(From The Audubon Society Encyclopedia of North American Birds, 1987)

For more information, see *Numerical and Functional Responses of Wolves, and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Hunting Strategies of Finlayson Wolves

Finlayson Wolf Information Series

No. 4



Wolves kill other animals to feed themselves. To hunt these animals, wolf packs roam over large areas. However, they don't always attack the first animal they come across.

During the Finlayson Caribou Recovery Program, biologists discovered wolves can be very selective when hunting. They found wolves in the southeast Yukon preferred to kill moose, even if there were more caribou available.

Choosing their prey

Over five winters, biologists located 326 animals killed by wolves. Close to 300 kills were moose, even though there were more caribou wintering in the area. Wolves

preferred to kill moose even though caribou are smaller and safer for them to hunt.

Developing a hunting strategy

By following the wolves hunting habits, biologists found these wolves were more likely to kill moose because they had more experience hunting them. Caribou only lived in a few wolf pack territories during the late winter.

Moose, on the other hand, were in the area year round and wolves could always count on them as a source of food. Because of this, the wolves had developed reliable strategies for hunting and killing them.

Counting the kills

Biologists calculated small wolf packs in the Finlayson area killed an average of 27 moose each winter, medium-sized packs of about six wolves killed an average of 35 moose, while large packs of up to 10 wolves could kill 46 moose in a winter.

Using these numbers, they estimated wolves killed about 450 moose during the winter of 1990. By 1996, the 260 wolves in the area killed about 1,100 moose, which was approximately 10 per cent of Finlayson's winter moose population.

Using the information

By studying the hunting habits of wolves in the Finlayson area, biologists learned that wolves choose their prey depending on the year-round availability of the animal and the experience the wolves have hunting them.

For more information, see *Numerical and Functional Response of Wolves, and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Hunting strategies of North Yukon wolves

During the late 1980s and early 1990s, biologists studied the wolf population in the northern Yukon. These wolves lived on the tundra and in the taiga, or sparsely treed areas of the arctic.

Moose were a source of food for these wolves, but were only found in small numbers in the taiga.

Caribou live in large numbers on the northern tundra and huge migrations occur each year, bringing the caribou through the wolves' territory.

Wolves that only lived on the tundra followed the caribou's migrations as there was no other food source. These wolves depend on caribou for survival.

Biologists located 89 caribou kills compared to 21 moose kills over the course of the North Yukon study.

By looking at wolves' hunting habits in different regions in the Yukon, biologists found wolf packs develop strong hunting skills to kill the most commonly available prey.

Hunting Healthy Animals

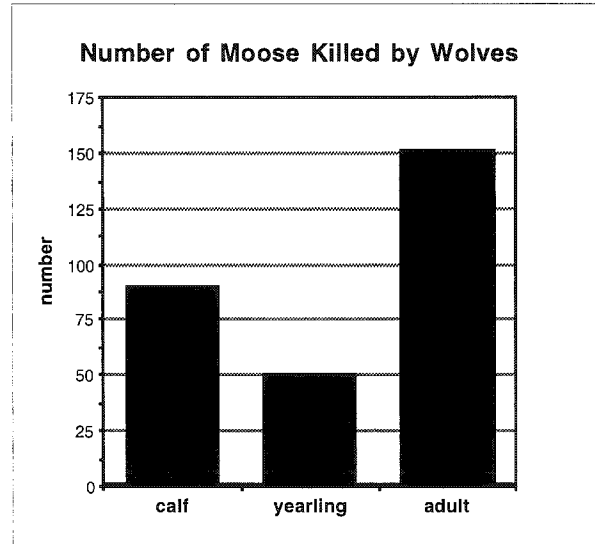
It is commonly believed that predators, like wolves, only kill sick or weak animals to keep their prey populations healthy. But the study of wolves in the southeast Yukon showed that this is not always true.

Unhealthy populations

If an animal population is very large or is living in an area where there is little food, many of these animals will be starving, diseased or sick. If wolves then kill these animals, they are not adding to the number of deaths in their prey population. These are animals that would likely die anyway, whether the wolves killed them or not.

Healthy populations

When an animal population is living in an area where there is plenty of food for them to eat, they are usually healthy. When wolves



kill these animals, they are no longer taking animals that would die anyway. The wolves are killing animals that would likely live for many more years. That means the wolves keep prey population from becoming too large.

Studying wolf kills

During the Finlayson Caribou Recovery Program, biologists kept track of the animals killed by wolf packs. By studying the carcasses of these animals, they were able to tell whether the wolves were killing healthy or sick animals.

Over five winters, biologists located 322 wolf kills. They found 291 moose, 30 caribou, and one sheep.

Terms

- **Population:** A group of animals that breed together and produce healthy young.
- **Prey:** Animals that are killed and eaten by others.
- **Carcass:** The body of a dead animal.
- **Marrow Fat:** Fat found inside bones.

Clues in the carcasses

By cutting open the bones of the dead moose and looking at how much fat was in the bone marrow, biologists were able to see how healthy the moose was when it died. If there is less than 10 per cent of marrow fat in the bones of a calf, it means the animal was starving. Starvation in an adult moose is shown when there is less than 20 per cent marrow fat in their bones.

The moose killed by wolves in the Finlayson area did not show signs of starvation. The bones of calves showed an average of 34 per cent marrow fat. Adult moose were even higher with a 77 per cent marrow fat average. The calves had a lower percentage of fat because they used all their extra energy to grow.

Using the information

By studying these kills, biologists were able to determine that wolves were not killing sick and weak animals. In fact, they were killing healthy ones. By killing these animals, wolves were keeping prey numbers from growing to a level where they became limited by their food.

How a moose defends itself against wolf attacks

On average, a moose will be attacked by wolves at least once during its lifetime.

Although wolves have developed effective strategies for hunting, moose do have ways of defending themselves.

Biologists in the Yukon have seen over 1,000 moose that were killed by wolves. Most of these kills were in open areas where the moose probably made the fatal mistake of trying to out-run its attackers.

When moose run they expose vulnerable areas, such as the throat and hindquarters, which are usually targeted by wolves.

The best defence for a moose is to find a place where it can protect its body. A tree can protect its rear so the moose can use its sharp hooves to fend off frontal attacks. A wolf that is caught between a moose and a tree is in danger of being kicked and seriously injured.

For more information, see *Numerical and Functional Response of Wolves and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Connection Between Wolves and Prey

For years, wildlife researchers have been trying to understand if the number of wolves in an area is closely connected to the amount of prey available.

Population growth

From 1983 to 1989, many wolves were killed in the Finlayson area of the south-east Yukon. This was done as part of a management plan to stop the decline of local caribou and moose. As the the wolf population was reduced, caribou and moose numbers rapidly increased.

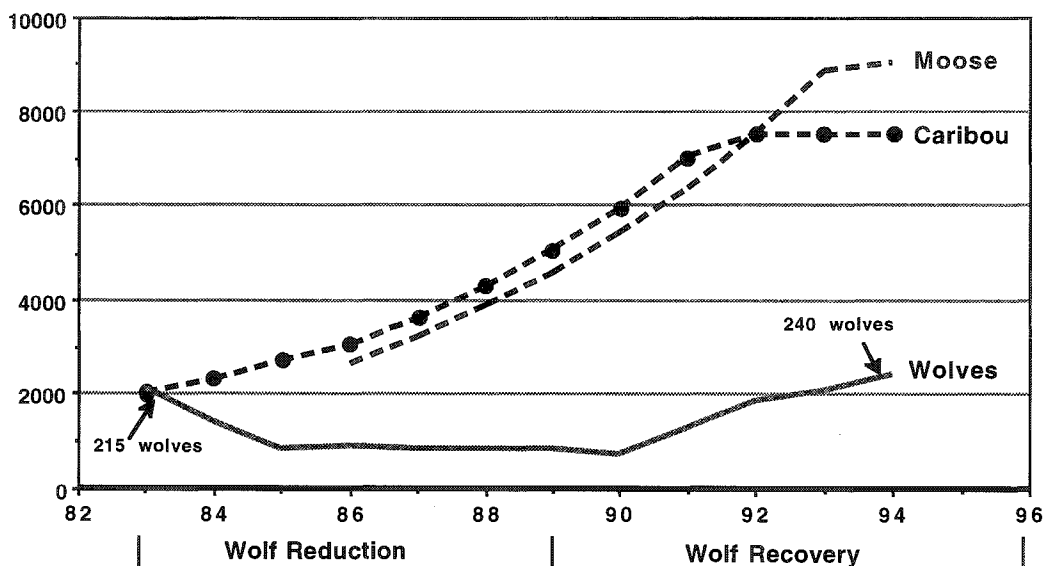
After wolf control ended, biologists studied the rebuilding wolf

population. They were particularly interested to see if wolf numbers would increase wildly, then fall back to a level in balance with the amount of prey in the area.

Establishing a relationship

A tight connection between predator and prey numbers is shown if a predator population quickly adjusts to changes in the number of its prey. A loose connection is shown when prey populations decline, but the number of predators remains the same, or lags behind for a long time. This loose connection could cause prey numbers to fall even faster.

Yearly Changes in Population Numbers



Many studies have shown when prey decline, wolf populations are able to remain high for long periods by finding other food sources.

Limits to growth

By 1992, the vacant territories in the Finlayson area had been filled by the growing number of new wolf packs. At this point, the number of prey in the area became the key factor in determining the growth of the wolf population.

The number of wolves stabilized when they reached a level where they were killing 10 per cent of the winter prey population available to them. Biologists believe that the number of wolves will not increase much beyond this level, but they continue to study the Finlayson population.

Using the information

The Finlayson study showed biologists that a wolf population which is artificially forced to low numbers will not grow wildly when it is allowed to rebuild—even if lots of food is available. The number of wolves did grow quickly at first, but slowed when it reached a level that did not seriously diminish moose and caribou numbers. This shows that the number of wolves is closely connected to the number of prey in an area.

For more information, see *Numerical and Functional Response of Wolves and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Terms

- **Population:** A group of animals that breed together to produce healthy young.
- **Predator:** An animal that kills other animals.
- **Prey:** Animals that are killed by other animals.

The Impact of Wolves on Calf Survival

Finlayson Wolf Information Series

No. 7

Wolves like to hunt caribou and moose calves. They are small and can be killed more safely and easily than adults. These calves are important to the growth of caribou and moose populations. If many calves are killed by wolves, then few new animals are added to the population.

Removing the predators

During the 1980s, people in the south-east Yukon became concerned with the decreasing numbers of moose and caribou in the Finlayson area. To give these animal populations a chance to grow, hunting by people was restricted and a large number of wolves in the area were killed.

Population growth

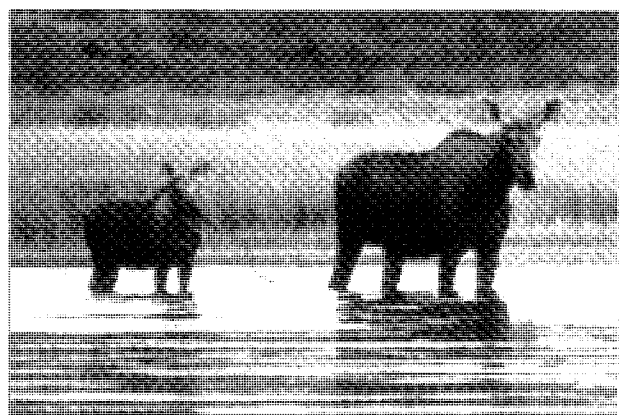
From 1983 to 1989, the years that the wolf reduction took place, the number of

caribou in the area grew from 2,500 to 6,000. The moose population also rose from about 3,000 to 9,000. This growth was related to the small number of adults being killed and the high survival rate of calves.

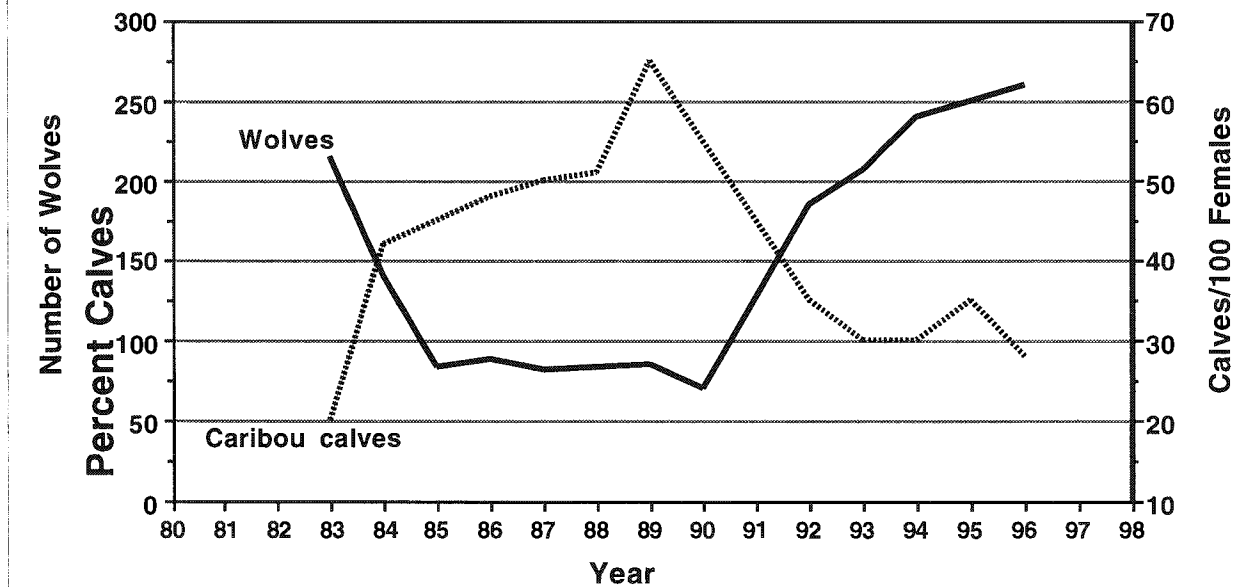
Calf survival

The calf survival rate is the number of calves that survive their first year for every 100 adult females in a population. In a stable system where a natural number of wolves are present, moose and caribou calf survival is typically 30 calves for every 100 females.

When there are few wolves, the survival rate of caribou and moose calves is very high. During the years when wolf numbers were low in the Finlayson area, calf survival was between 40 to 60 calves for every 100 adult females.



Yearly Changes in Caribou Calf Survival and Wolf Numbers



Return of the wolves

Wolf control ended in 1989. By the following year, the Finlayson wolf population had already doubled in size. In 1992, the number of packs found in the area was the same as before wolf control started in 1983. Wolf numbers in the area returned to the levels seen before wolf control by 1994 and continued to grow until 1996. Biologists believe that wolf numbers have now leveled off, but they continue to study the Finlayson population.

Response to rising wolf numbers

As the number of wolves increased, calf survival dropped back to its normal rate. This slowed the population growth of caribou and moose, and caused their numbers to stabilize as well.

Using the information

By studying the response of moose and caribou to reduced wolf numbers,

biologists were able to gain an understanding about what controls population growth of both moose and caribou.

The key to increasing moose and caribou populations is having a high calf survival rate. They discovered calf survival is strongly related to the number of wolves in an area. When wolf numbers are low, calf survival is high and when wolf numbers increase, calf survival drops. This shows that wolves are important in determining the size of moose and caribou numbers in an area.

For more information, see *Numerical and Functional Responses of Wolves, and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.

Yukon
Renewable Resources

Life and Death in the Wild

Finlayson Wolf Information Series

No. 8

A wolf's life in the Yukon is not an easy one. They have to survive in a cold climate and kill other animals, like caribou and moose, for food. These animals will fight back with their sharp hooves and antlers and can injure wolves. Humans are also a threat to Yukon wolves.

Human impact

Studies have tried to find out how long wolves live and what causes them to die in a natural system. In other parts of North America these studies have been difficult because many wolves are killed by humans through hunting or trapping. In the Yukon, people have little affect on wolves, killing only about 100 wolves each year from a total population of 4,000 wolves.

A unique opportunity

One of the first studies of a natural recovering wolf population was in the remote Finlayson area of the south-east Yukon. Because of its isolation, only a few wolves are hunted or trapped in the area each year.

Biologists studied how the wolf population naturally rebuilt itself after most of the wolves were killed during the 1980s. They kept track of the number of wolves in the area that died and the cause of death.



Death in a natural system

On average, adult Yukon wolves only live until they are about three-and-a-half years old. It is the same for both males and females. Over five years, 25 radio collared wolves died in the Finlayson area. Only three were killed by humans. The rest died of natural causes.

Why wolves die

Biologists believe most wolves were probably killed by other wolf packs. Over half of the wolves that died of natural causes were found within five kilometres of their pack's territorial boundary. These wolves likely died when they came into contact with another pack in the boundary area.

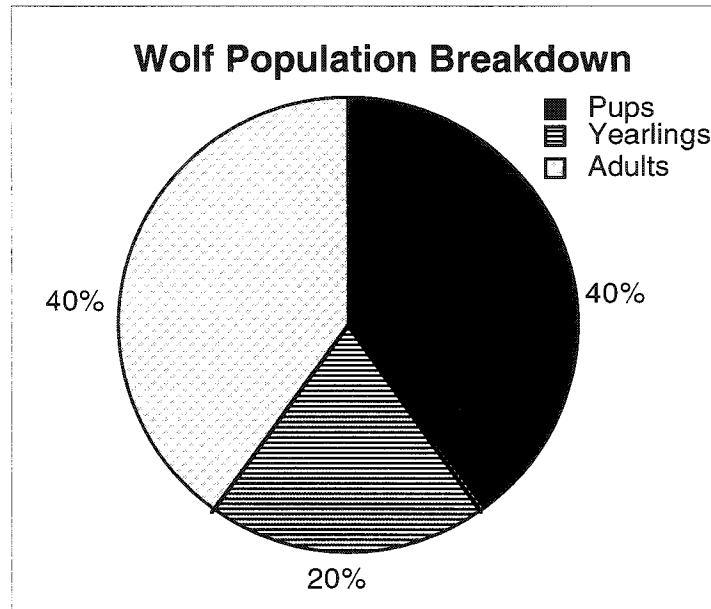
Pack protection

The most dangerous time for wolves is when they leave their family pack. When a young wolf reaches maturity, it often tries to compete for a dominate position within its pack. If it is not successful, it will usually leave the pack and look for a new one. This is called natural dispersal.

During the Finlayson study, biologists found five wolves that had died more than 10 kilometres outside of their pack boundaries. These wolves were less than three years old and had probably been driven out of their family pack after an unsuccessful attempt to become an alpha wolf, or pack leader.

A dangerous season

Biologists also found a relationship between the wolf's age and the time of year they died. All 10 wolves that died between April and November were young adults. This is the time of year when most young adult wolves leave their family packs. Almost all of the older adult wolves



died between November and April when packs strongly protect their territorial boundaries.

Using the information

The study of the rebuilding wolf population in the Finlayson area was a unique opportunity for biologists to study wolves living and dying in a natural system. During their study they learned useful information about the life cycle of Yukon wolves. This information creates a greater understanding of wolf populations.

For more information, see *Numerical and Functional Response of Wolves, and Regulation of Moose in the Yukon*, R.D. Hayes, Simon Fraser University, 1995.