



Wolf behavior: a history of its study in North America
by Karen Ann Fischer

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF ARTS in
History

Montana State University

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Abstract:

The scientific study of wolf behavior in North America is a recent development. In the early twentieth century published information was based on the observations of government trappers hired between 1915 and 1940 to eliminate the wolf as a threat to livestock. Popular literature of the time portrayed the wolf as dangerous, not only to livestock, but to game animals—and humans as well. Stanley Young of the U.S. Biological Survey wrote two books detailing the war on wolves (The Wolf in North American History) and their behavior (Wolves of North America, pt. 1.). The latter was the standard work, though inaccurate, for thirty years.

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Captive wolf packs studied in zoos led to detailed information of the social dynamics within and between wolf packs. Chief among the researchers in this country are W. Michael Fox and Erich Klinghammer.

Based on the new scientific information, popular literature on the wolf from the 1960's on began to portray it as a much maligned animal worthy of preservation. At the same time the old stereotype persisted in areas where the wolf still exists, creating management problems for the governments involved.

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IN NORTH AMERICA

by

KAREN ANN FISCHER

A thesis submitted in partial fulfillment
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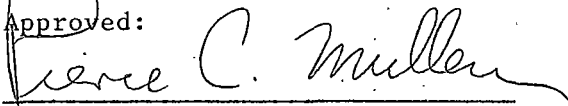
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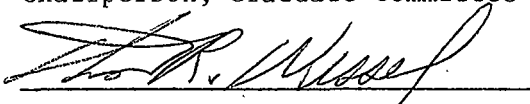
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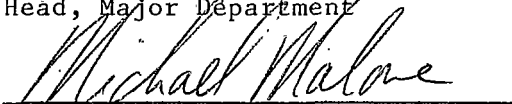
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ABSTRACT

The scientific study of wolf behavior in North America is a recent development. In the early twentieth century published information was based on the observations of government trappers hired between 1915 and 1940 to eliminate the wolf as a threat to livestock. Popular literature of the time portrayed the wolf as dangerous, not only to livestock, but to game animals and humans as well. Stanley Young of the U.S. Biological Survey wrote two books detailing the war on wolves (The Wolf in North American History) and their behavior (Wolves of North America, pt. 1.). The latter was the standard work, though inaccurate, for thirty years. ★

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INTRODUCTION

Wolves figure prominently in folklore and myth. Only in the twentieth century did wolves become the subject of scientific scrutiny. Initially these studies were directed to the problem of exterminating the wolf. Their depredations on livestock in the western grazing districts occasioned these first federal analyses. Government biologists, especially Vernon Bailey and Stanley Young, were interested in discovering wolf ecology and behavior in order to destroy them. In most cases this campaign was successful and wolves disappeared in all but a few places in the country. ★

Eliminated as a threat to domestic stock, the wolf now became a lonely symbol of wilderness. Certainly some of the nostalgia was romantic and idealistic. But in those remote and inaccessible places where wolves could be found, scientific work with a new perspective was undertaken. Adolph Murie's classic study originated because of concern about preserving Dall sheep in Mount McKinley National Park. In good Darwinian fashion, it was thought that a balance in nature might be achieved through careful game and wolf management. ★

Only in the past twenty years has the wolf been deemed worthy of both study and preservation in its own right. Pack structure could be elucidated through a knowledge of captive animals. Scientists elevated the status of the wolf to that of a mammal with a highly developed social organization. Comparative animal behavior, ★

aggression patterns and territoriality became foci for numerous studies, including those focused on wolves.

At present the wolf is an endangered species and only a few can be found in the continental United States. Attempts to relocate the animal to areas where it was exterminated in the past have not been successful. L. David Mech, who is known for his classic study on Isle Royale wolf packs, is considered by most to be the standard authority on the North American wolf. In the habitat of Isle Royale timber and water play an important ecological role. It may well prove with time that the description of wolves he provides for heavily timbered northern Minnesota will not hold true for the treeless tundra wolves of the far North. But he certainly understood the human factor in his studies and has a keen appreciation of the importance of human interaction with the wolf. Wolf survival hinges on this interaction. ★
What follows is a description of the scientific literature leading to this assertion.

I: THE MASTER CRIMINAL OF THE ANIMAL KINGDOM

"Speedily the wolves were close enough for their panting breath to be distinctly heard by the unhappy travelers. Then the carriage was surrounded by them, and the only chance of escape was to cut the traces on one of the horses and let it loose, so that it might stop the hungry animals whilst the other horses were being urged madly on. This was done, and the pursuers seizing on it were for a time occupied in devouring it, the party meanwhile making their escape. But the horse was soon demolished among the hundred or more, and with their appetite quickened by the fresh taste of blood, the chase was renewed. Again the pack came up with the lumbering vehicle, now moving more slowly because of the loss of a horse; another was cut loose, and the wolves fell to their meal, but as before the coach was soon pursued and again surrounded. A third horse was given, but this did not suffice . . . only two horses were now left, and without either of these it would be impossible to proceed.

At this moment the faithful coachman let down the front window, threw the reins through it to his master, and commending to his kind care his poor wife and children, without another word sprang down among the wolves. The Baron protested, but it was too late: the noble-hearted domestic had freely given himself to a horrible death that he might occupy the wolves for the few minutes that would enable his master's family to escape.¹

So went one of the innumerable accounts of wolf-human encounters from the 19th century. Vilhjalmar Stefansson, the early twentieth century explorer, researched many versions of such encounters with mythical wolf packs, usually at least a hundred strong, attacking

¹Bell, M., "Habits and instincts of wolves," Month, a Catholic Magazine, 60. (1887), 489-490.

travelers desperately trying to appease them by throwing objects, including children and brides, out of carriages and sleds, to give time for one last dash to safety. Interestingly among the Eskimos, who did not fear wolves, it was a whale from which a brother and sister tried to row to safety in a boat. Various articles of the sister's clothing were thrown to the whale and the two escaped, but not until the sister was left naked. Stefansson concluded that the similarities of such monster stories from so many parts of the world cast serious doubt on the supposed villany of the wolf.¹ He claimed the largest wolf pack never reached more than eleven members and was made up of a mated pair and their previous offspring.

Almost all groups of people who shared territories with wolves included them in some fashion in their folklore or mythology. How a particular people viewed their local specie of wolf depended more on the nature of the human society than on that of the wolf. The wolf, while highly adaptable, maintained a consistent core of behavior regardless of location, but people fell basically into two groups: the hunters and the agriculturists.

The hunters tended to appreciate the wolf's ability to live as a hunter like themselves. They colored it in their language and legends with qualities they admired: intelligence, strength, cooperation, and courage. Both human and wolf hunters attacked large prey with the possibility of personal injury and found safety

¹Stefansson, Vilhjalmar, "The Mythical Wolf Pack," Colliers 71 (April 21, 1923), 27.

in attacking in cooperative groups.

Agricultural peoples with domesticated prey colored the wolf differently. It wantonly attacked in the dark of night what was not its to take, eluding human senses, and leaving only its footprints and its unnerving howl as evidence of its presence. To these peoples it was an arch villain, a depraved, vicious, blood-thirsty killer, devouring at will anything that lived.

The world-wide spread of agriculture, especially the grazing of domesticated livestock, spelled the doom of the wolf. With both habitat and its natural food supply eliminated, the wolf turned to killing livestock and came into direct conflict with agricultural man. All over the world the range of the wolf relentlessly shrank, until in the twentieth century it was limited to an essentially circumpolar area. Major populations remained in Russia, Canada, a few survived in Finland, Sweden, and the more inaccessible mountainous regions of eastern Europe, the Middle East, and India. The Soviet Union, Finland, and Sweden had policies of declared or undeclared extermination.

In North America the wolf coexisted with native peoples who generally respected and did not fear it. Various Indian tribes experienced wolf predation on their horses, and they retaliated by killing wolves, but they did not view the wolf with hatred. Barry Lopez quoted early accounts of how some tribes even removed pups from

dens and played with them, always returning them to the den unharmed afterward.¹

The advent of white settlers with their domestic livestock signalled the beginning of the war of extermination. The first North American bounty on wolves was established in 1630 in Massachusetts,² and for the next three and one half centuries the spread of white civilization westward included the spread of the bounty system in some form.

Wolves were killed by many methods. Shooting with either bow and arrow or gun, pit and deadfall traps, coiled whale bone embedded in hunks of fat to unwind and pierce the stomach, all have long histories. Young said that early explorers approached and clubbed wolves to death because they did not fear people and stayed so close to humans slaughtering buffalo. Indians killed a buffalo and waited one day for the wolves to gorge themselves. The sleeping wolves were then so lethargic, the Indians found them easy targets.³

In the first half of the nineteenth century wolf numbers were greatly reduced in the area east of the Mississippi, mostly by trapping and the elimination of hiding places, although some poison was used. After the Civil War the western plains were developed for agriculture

¹Lopez, Barry Holstun, Of Wolves and Men (New York: Scribner 1978), p. 124.

²Young, Stanley Paul, The Wolves of North America (Washington: D.C., American Wildlife Institute, 1944) p. 340.

³Ibid., p. 120.

in an incredibly short time. The completion of the Union Pacific Railroad in 1869 provided easy access to the buffalo grazing lands, and at the same time divided the animals into two herds, the northern and the southern. The southern herd was wiped out in just seven years according to Young.¹ The railroad made the marketing of hides, tongues, and tallow profitable. Professional "wolfers" contributed substantially to the slaughter by using buffalo carcasses as bait for poisoning wolves. The Northern Pacific Railroad was completed in 1881 and within another seven years the northern herd too was gone. Cattle followed close on the heels of the vanishing buffalo. Stanley Young quoted an 1884 estimate by the Colorado Livestock Record that close to five million cattle were driven north from Texas to Colorado and farther between 1866 and 1883.²

Now the North American bison was a formidable prey for the wolf. Cattle, on the other hand, even the half wild cattle of the plains, proved much easier to kill and the hatred of cattlemen for wolves escalated into something of a holy war. Seton estimated that before the coming of the whites, there were roughly two million wolves in what is now the United States.³ While the western cattlemen accepted

¹ Young, Stanley Paul, The Wolf in North American History (Caldwell, Ida., Caxton Printers, 1946) p. 101.

² Ibid., p. 103.

³ Seton, Ernest Thompson, Lives of Game Animals 1 (Garden City, N.Y., Doubleday, Doran, 1925), p. 261.

stock losses from other causes (weather, starvation, disease), they did not accept it from wolves. Associations were formed to protect the cattlemen's interests and one thing on which they agreed was the necessity of bounties on wolves. In Wyoming in an eleven year period bounties were paid for over twenty thousand wolves.¹ Montana paid over three hundred thousand dollars for more than eighty thousand wolves between 1883 and 1918.²

How were wolves killed in such tremendous numbers? What about the legends of the canny outlaws impossible to catch? With bounties by both governments and cattlemen's associations and the hide to sell on the fur market, there arose in the 1860's a class of trappers who could live year round from "wolfing". The cattlemen and the professional wolfers fought the war against wolves in three ways: shooting them on sight, trapping with steel traps, and poisoning with strychnine. The first method soon proved ineffective since the wolves learned quickly to stay out of range.

Traps came to the new world with English colonists, based on the rat trap. Made by blacksmiths in several designs and sizes, most were really meant for animals no larger than beaver. It was Sewall Newhouse of Brattleboro, Vermont, who designed a basic trap available in eight sizes which became standard equipment for the Hudson's Bay Company trappers.³ He began the first commercial company

¹ Seton, Op. cit. p. 261.

² Lopez, Barry Holstun, Of Wolves and Men (New York, Scribner : 1978) p. 183.

³ Young, Op. cit. p. 51-52.

in North America to manufacture traps for the taking of wild animals in 1855. His design was a great success and between 1861 and 1869 his company produced three-quarters of a million traps for use on everything from mice to bears.¹ For most of the latter part of the nineteenth century the Sewell trap caught wolves effectively and his basic design remained the trappers' favorite right up into the twentieth century.

Strychnine was even more effective than trapping. Strychnine came from the seeds of an orange-like fruit of a tropical tree originally from India.² The poison was known and used in Europe as early as 1640. The colonists and early citizens of the Republic had to import it. The first American company to manufacture it was the firm of Rosengarten and Denis, which set up shop in Philadelphia in 1834, and was soon distributing it throughout the continent.³ Strychnine use in the West began when a shipment destined for South America landed instead in San Francisco on board a ship that changed direction in mid-voyage after hearing of the gold rush.⁴ Opportunists found easy trapping with strychnine supplemented their income.

¹Young, Op. cit., p. 54.

²Young, Stanley Paul, The Wolves of North America (Washington: D.C., American Wildlife Institute, 1944)p. 323.

³Ibid., p. 324. ⁴Ibid., p. 325.

In the early years on the plains, from about the 1860's to 1880's wolves were easily caught. The sound of a gun attracted them, for they associated the buffalo slaughter with an easy food supply. They were known to sit in a circle surrounding a wolfer while he laced a buffalo carcass with strychnine, waiting for him to leave so they could feast.¹

Eventually survivors became quite wary. If a human hunter killed a large animal far from camp and needed to leave it overnight unprotected in wolf country, he merely left something with his scent on it on or near the carcass, a piece of metal or a handkerchief would do.² The wolves shied away from anything with human scent on it. They learned to recognize the smell of strychnine, and according to Seton, became very hard to poison, except for young pups in the fall of the year when they first ran with the pack. Seton, who himself hunted wolves, firmly believed wolves were intelligent animals who not only learned to avoid traps and poison themselves, but communicated what they knew to their young and other adult comrades. Ironically the very methods used against them helped to make wolves more destructive. They learned not to return to a kill, but to kill fresh for each meal.

The fate of the wolves in the United States was sealed when the federal government became involved in their extermination. By the

¹Young, The Wolves of North America, p. 124-125.

²Seton, Ernest Thompson, Life Histories of Northern Animals, II, (New York: Scribner, 1909), p. 765.

early twentieth century most of those involved agreed that bounties did not bring the desired result: the total elimination of the wolf. With state and local governments and cattlemen's associations all paying bounties, and as little as ears or noses required for proof of an animal as a wolf, fraud became widespread. According to Young by 1914 over one million dollars a year was being paid for bounties in the war against wolves.¹ Eventually local and state governments grew weary of draining their treasuries. Cattlemen demanded protection for their stock grazing on national forest land for which they paid grazing fees. Together they pressured the federal government for help. The agency charged with investigating the problem and coming up with solutions was the U.S. Biological Survey, originally with the Agriculture Department and later under the Department of the Interior. After sending its own naturalists to investigate, the Survey published a pamphlet on how to best eliminate wolves.

A major new tactic described by Vernon Bailey in one of the Survey's Circulars was "denning".² Wolves bred early enough in the spring so that they could be tracked to the den site while snow was still on the ground. Killing pups was easy, since the adults were extremely

¹Young, The Wolves of North America, pt. 1, P. 381.

²Bailey, Vernon, Directions for the Destruction of Wolves and Coyotes, Circular no. 55, (Washington, D.C.: U.S. Bureau of Biological Survey, April 17, 1907), p. 1.

wary and stayed out of range, helplessly howling and barking at the killers.

Beside the free advice to private individuals, a formal government program was established. In 1915 one-hundred-twenty-five-thousand dollars was appropriated by Congress for predator control.¹ Professional trappers were salaried and equipped for elimination of wolves and other predators. After fifteen successful years Congress was convinced in 1931 to spend up to a million dollars a year for a ten year period to control predatory mammals and rodents.² When the program ended in 1941, the Biological Survey in cooperation with the Forest Service had killed over twenty-four thousand gray (*Canis lupus*) and red (*Canis niger*) wolves since 1915.³ As Stanley Young stated in his account of this program: "No other nation has ever paralleled the United States with any similar legislation or operations looking toward wolf and other predator control."⁴

¹Young, The Wolf In North American History, p. 142.

²Ibid., p. 144. ³Ibid., p. 146. ⁴Ibid., p. 145.

II: THE BEGINNINGS

A lot had been written about the wolf by the 1940's, an awful lot. Most of it did not bear close examination. More than one generation grew up on Jack London's Call of the Wild and White Fang; many more saw the movie versions. Endless adventure stories (all true to life, of course) were not complete without at least a hint of danger from wolf or wolves. And there were the outlaw stories, accounts of the last of the plains wolves and how, after many escapes, the cunning killers were reluctantly dispatched by the wily trapper who succeeded where everyone else had failed.

In reality very little was known about wolf behavior. Many of the early explorers reported on encounters with wolves. Trappers added their observations on what helped to trap wolves and on how much wolves deserved their fate. But by the twentieth century the picture was still distorted. Ernest Thompson Seton, the well-known naturalist illustrator, drew on his background of trapping wolves to write both books and magazine articles about them. He concluded that the male and female wolf stayed together as a mated pair throughout the year and perhaps even for life. Supposedly based on his own observations he described their various vocalizations.¹ The "muster" or "rallying cry" was voiced by a single wolf who called his friends to help him dispatch a prey too large to handle by himself. The

¹Seton, Ernest Thompson, Life Histories of Northern Animals, II (New York: Scribner, 1909), p.770.

"hunting song" was the sound of the pack pursuing prey, like a pack of domestic hounds after a fox. Another bark-howl combination was the "closing-in" when the wolves had cornered their prey and were about to finish it off. There were other sounds between wolf mates or between mother and young which Seton did not feel competent to decipher as to meaning.

Perhaps the most comprehensive work to mix fact and fiction about the wolf was The Wolves of North America, part I, subtitled: "Their History, Life Habits, Economic Status, and Control", by Stanley P. Young. Young, a senior biologist with the U.S. Fish and Wildlife Service, was involved in the Biological Survey's efforts at eradication, and for a while made a living from killing wolves. He seemed eminently qualified to write such a book, which was published the same year as Adolph Murie's pioneering study.

Young gave a fairly complete picture of the wolf. It hunted by exhausting its prey after a chase of many miles. Since wolves had been clocked by automobile at a top speed of about twenty-eight miles per hour, they appeared too slow to catch prey like deer or elk. Old trappers claimed wolves hunted in relays and spelled each other. Certainly chases had been witnessed more than once where the prey was exhausted and the wolves still fresh, so the conclusion seemed probable enough. Young was aware of Sigurd Olson's study of wolf predation on deer in northern Minnesota in 1938. Olson concluded that

wolves took the young, the old, and the weak.¹ Young believed that since wolves took livestock in the prime of health, it only seemed natural to conclude that with this hunting technique all wild prey were subject to their hunger also.²

Young based a lot of his information on what trappers told him as well as his own experiences trapping wolves. Trappers agreed the wolf was territorial and "runways", well worn paths much used by particular wolf packs, were found by Young. Based on this and beliefs of trappers before him, Young concluded wolves had basically circular territories about twenty miles in diameter if prey were plentiful, and ranging up to sixty miles if prey were scarce. The circumference of this rough circle could be as much as a hundred miles and the pack patrolled it regularly looking for game.

He detailed five types of wolf vocalizations which agreed with what Seton had said, including this description of the "call of the kill": "It is a deep snarl produced by exhaust of air through the wolf's partially opened mouth as it hangs on with teeth sunken into the flesh of its victim."³

¹Olson, Sigurd F., "Study in Predatory Relationship with Particular Reference to the Wolf," Scientific Monthly 46(April, 1938), 323-336.

²Young, Stanley Paul, The Wolves of North America, Pt. I. (Washington, D.C., American Wildlife Institute, 1944), p. 268.

³Ibid., p. 77-78.

Wolves were so shy of people by the time of Young's writing, it was safe to assume they did not kill while humans stood close enough to hear their sounds. Young did not explain where or if he personally had heard this particular sound.

Because of the practice of denning, trappers knew a lot about where wolves were likely to site a den. Young stated that pups could go as long as the first month without water so that dens were not necessarily found near rivers or streams. Adults cached large amounts of food near the den for the pups even before they were born. After about three months, pups joined the adults on the runway. When a kill was made, they stayed several days in the same area until it was consumed, and then resumed their patrol. Young called these places "loafing spots". Adults taught pups to kill in late summer. Adults liked to attack in pairs; one, usually the female, went for the head, while her mate hamstrung the animal from the rear. The pups were sometimes allowed to stay through to the next breeding season, which explained why wolves of various sizes were seen emerging from denning areas.

Lone wolves were usually old males who had lost their mates. Since wolves mated for life, once the partner was gone, the remaining wolf no longer participated in group hunting. A wolfpack consisted of a single family and perhaps the two year old offspring. Occasionally two or more families joined together, but Young did not believe this association lasted very long.

While Young thought the wolf basically afraid of humans, at least by the twentieth century, and of no danger to them, he also included accounts of wolf attacks. Both in Europe and North America there were so many such stories that, as he put it: "Where there is so much smoke, there must be some fire."¹ He did not speculate on what percentage of attacks could be attributed to rabies or starvation, although he mentioned them as possible motivation for at least some attacks.

This then was the standard version of what wolves were like. It varied little from what St. George Jackson Mivart wrote in 1890, except that he thought the males fought for the privilege of mating with the females each season, and wolves ate anything they could find, including small animals, birds, fruit and buds.² The only recent researcher who agreed with Mivart on wolf feeding habits was Sigurd Olson. In a study published in 1938 he stated that "Anything that crawls, swims, or flies may be included in their diet."³ For the most part, however, Young's version of things prevailed.

¹Young, Wolves of North America, p. 128.

²Mivart, St. George Jackson, Dogs, Jackals, Wolves, and Foxes, (London: R.H. Porter, 1890), p. 5.

³Olson, Sigurd F. Op. cit. p. 329.

III: ADOLPH MURIE AND MOUNT MCKINLEY

"This book is dedicated to Adolph Murie, who in the early 1940's became the first biologist to conduct an intensive and objective ecological study of the wolf."¹

So read the dedication of L. David Mech's book, The Wolf: The Ecology and Behavior of an Endangered Species, published in 1970. Almost every researcher between Murie and Mech declared Murie's work a classic. By the 1930's wolves were eliminated as a threat to livestock in the lower forty eight States. There remained a worry that they took too many big game animals which could otherwise be harvested by hunters in areas like Alaska. Human experiments with domesticated reindeer provided a new source of food for wolves and an extensive control program was underway. The question arose of what policy should be followed in Mt. McKinley National Park which lay in the heart of wolf country and had its share of wolves. Murie was in the employ of the Fish and Wildlife Service at the time and was assigned to study the wolves of Mount McKinley. In his foreword Murie asked some important questions:

...What, for instance, is the total effect of the wolf preying on the big game species in this national park? What is the relationship between the wolves of the park and the general wolf population of Alaska? How do such predators as the golden eagle, fox, grizzly bear, and lynx affect the hoofed animals? In short, what is the ecological picture centering about the wolf of Mount McKinley National Park?²

¹ Mech, L. David, The Wolf (Garden City, N.Y.: Natural History Press, 1970), p.[v.].

² Murie, Adolph, The Wolves of Mount McKinley, (Washington, D.C.: U.S. Government Printing Office, 1944), p. xiii.

His study lasted a little over two years, from April 1934 to August 1941. Although he had some help the first year from two Civilian Conservation Corps members, in 1940 and 1941 he worked alone. Here indeed was a study which might damp the enthusiasm of armchair adventurers attracted to the "romanticism" of wolf research. In 1939 Murie walked approximately 1700 miles! From an automobile road which cut through the heart of the sheep ranges, Murie had himself let out to hike a semicircle of nine or ten miles each day to rendezvous with a car farther down the road. Along his hike he examined sheep skulls and wolf droppings (scats). In all he collected 829 sheep skulls and 1,174 wolf scats, most of them the first year.

Most wolf research to this time was conducted by people who were interested in its extermination. Since they had plenty of carcasses to examine, previous studies analyzed stomach contents to find out what wolves ate. Young cites a study involving 3,346 wolf stomachs taken from wolves caught in steel traps.¹ Murie noted that no disturbance of animal life in a national park was allowed until a scientific study had been made. As he put it:

Killing the wolf to examine the stomach contents, in this case, was too much like killing the goose that laid the golden eggs. A dropping tells almost as much...²

From his analysis of scats Murie found the principal food of wolves was caribou and mountain sheep with some ground squirrels, marmots,

¹Young, Stanley Paul, The Wolves of North America, pp. 212-213.

²Murie, Op. cit., p.1.

and mice also eaten. The sheep skulls he divided into four groups by age: lambs, yearlings, prime, and old. He found few sheep between two and eight years of age represented by skulls, and of those that were, most were diseased. From this and past observations of relative sheep and wolf numbers with the Park, he concluded that in 1941 wolves and sheep were in equilibrium and it appeared that wolves were keeping the sheep population in check.

He also spent a considerable amount of time observing a particular pack of wolves and described both hunting and denning behavior. Of the three packs he observed, the one centering on the East Fork River garnered the most hours of observation. He spent a total of one-hundred-ninety-five hours at this particular den site, including one session of thirty-three hours straight.¹ He observed not only a mated pair but also three other adult wolves, a female and two males, all at the den site. Later when the group left the den permanently, they were joined by two more male wolves. These seven adults stayed together for two years.

The second spring both females had young in two separate dens. Later when the pups were old enough to travel, the second female moved her pups to the rendezvous site of the first and both litters were raised together with all adults bringing food to them. For the first time there was direct evidence that a pack structure of more than an immediate family existed year round.

¹Murie, Op. cit., p. 24.

The hunting behavior Murie observed reinforced the evidence he got from the skulls. Wolves did not take sheep at will. Murie wrote:

Theirs is not a lazy life for the nature of their food demands that they travel long distances and work hard for it, but they seem to enjoy their nightly excursions.¹

They chased many sheep before they found one they could catch. Sometimes the whole group hunted, other times a group of two or three and sometimes a single wolf hunted by itself. They travelled on a park road which gave them the advantage of getting above the sheep on steep slopes. If a wolf could put on a short burst of speed from above, the sheep had less chance of climbing upward past it to safety.

One of the original fears about the wolf was the extent of its predation on Dall sheep. Murie found that it preferred to feed on caribou, especially the calves. Even after the main herd migrated through the park, the wolves managed to live off stragglers. When caribou were lacking, wolves turned to marmots and ground squirrels rather than sheep. The exception was when there were few caribou calves in spring, wolves preyed on Dall sheep lambs. In winter, however, sheep were the major prey of wolves. In years of deep snow sheep became weakened and provided easier prey for the wolves as well as carrion. Murie concluded: "The wolf and the mountain sheep have existed together under conditions largely as at present for a long time, so that an adjustment between them, whereby both can survive, should be expected."² What Sigurd Olson concluded about Minnesota

¹Murie, Op. cit., p. 34

²Murie, Op. cit. p. 124-125.

wolf predation on deer in 1938, Murie felt held true for wolf and sheep in Alaska. While wolves searched for vulnerable animals and might surprise and take a few healthy ones, in the long run it was the weak members of the population which made up their main diet.

Above all, from his extensive observations of particular packs, Murie was impressed most with the wolves' friendliness to each other. He gave several examples. All adults were friendly with the pups. When the pups were old enough to play outside the den they often crawled over all five adults. If the play got too boisterous around an adult, it would move farther away where it could rest in peace. Before leaving for the evening hunt, the wolves had a general greeting ceremony with much tail wagging, nuzzling, and frisking. Then all stopped and howled. The female returned to the den and the others departed for the evening hunt. Several times the grey female, who was the mother of the pups, participated in the hunt, a second black female staying behind at the den.

Murie implied that each female in a pack had her own den and produced a litter, which might later be combined with any other litters in the same pack structure. The pups from 1940 ran with the pack until the spring of 1941 and then were seen with the parent pack no more. Murie noted that one wolf, "a tall, rangy male with long silvery mane and a dark mantle over the back and part way down over the sides"¹

¹Murie, Adolph, Op. cit., p. 28.

was the leader, although he was not mated to either of the females. He was nicknamed "the Dandy" because "his tail waved jauntily and there was a spring and sprightly spirit in his step."¹ The others approached him in a "cowering" fashion.

He also noted that wolves were territorial, although not necessarily following a circular route through it and that territories overlapped. He once watched the East Fork Pack attack a strange wolf who approached them at the den site and cowered on his side before them. At first they all sniffed each other and wagged tails slightly, but led by the Dandy, they suddenly attacked the stranger. He fled and they pursued him, catching and knocking him down several times. When about two hundred yards from the den the others left, but the Dandy continued and harassed the stranger until it left, its hip and tail bleeding.

At one point Murie entered the East Fork den and took a pup to raise as a captive. The adults offered no resistance except to hide nearby and howl and bark at him. He did not carry a gun and did not feel threatened by them at any time during the study.

With Murie's study and those who came after him, the emphasis was changed from those like Young who had gone before. The war was over. The wolf had vanished permanently from most of its former range. For the most part where it still existed, it was no threat to livestock

¹Murie, Adolph. Op. cit., p. 28.

because there was so little livestock in those places. The wolf came to have a different meaning to those who studied it. As Murie explained the time he spent watching the East Fork den: "For three or four hours at a time there might not be a stir. Yet it was an inexhaustible thrill to watch the wolves simply because they typify the wilderness so completely."¹

¹Murie, Adolph. Op. cit. p. 29.

IV: THE DECADE OF THE 1950's

In the decade of the 1950's modern game management became the focus of research. The wolf was studied in relation to how it affected the management of various game animals. Its North American range was now limited to Alaska, Canada, and Minnesota, with a very few in Michigan and Wisconsin.

Canada, with a large area of sparsely populated land, never had quite the all out extermination program of its neighbor to the south. Its wolf population, while bountied from the early 1900's and hunted extensively in the 1940's and 1950's, survived in relatively large numbers.

Wolf studies were conducted in several parts of Canada. I.M. Cowan conducted a study of wolves in Canada's Rocky Mountain national parks.¹ He described hunting behavior from examination of tracks in the snow. He found that while a single wolf could sometimes kill an elk, it was more usual for them to attack in a group. Even then if an elk stood its ground, the wolves sometimes gave up. They usually caught their prey after a short chase. The longest he noted was one and one half miles. Wolves preferred deer to elk, since they were less formidable prey. Big Horn sheep and mountain sheep were also less often the prey of wolves if easier targets were available. He carefully recorded sightings of the various prey species and assumed

¹Cowan, I.M., "The Timber Wolf in the Rocky Mountain National Parks of Canada," Canadian Journal of Research, Section D, 25 (October, 1947), 139-174.

their sightings should reflect their relative abundance in the area.

He also noted the number of times each was represented in wolf kills and concluded: "In comparison with the number of kills recorded, deer apparently contribute to the diet in greater proportion than they are represented in the population."¹

Hard evidence began to accumulate that given a choice of prey species, wolves concentrated on the species easiest to catch. They also seemed to concentrate on species the size of beavers or larger. R.L. Peterson published a study of moose on St. Ignace Island in Lake Michigan in 1955. Again wolves would rather attack deer than moose even though moose were more numerous. He found deer remains in fifty seven per cent of seventy six wolf scats collected and moose in thirty six per cent.² Milton Stenlund also found deer remains in eighty per cent of fifty one wolf stomachs examined in a study of wolves in Northern Minnesota in 1955.³ This was an area where moose also occurred. Alexander Banfield, in a study of barren ground caribou published in 1954, found caribou remains in sixty six per cent of sixty two scats collected.⁴ Sigurd Olson's summer wolf diet of small animals was not to be corroborated by any later researchers.

¹Cowan, I. M., Op. cit., p. 164.

²Peterson, Randolph L., North American Moose (Toronto: University of Toronto Press, 1955) p. 175.

³Stenlund, Milton H., A Field Study of the Timber Wolf (Canis lupus) On the Superior National Forest, Minnesota, Technical Bulletin, No. 4 (Minneapolis, Minnesota Department of Conservation), p. 21.

⁴Mech, L. David, The Wolf (Garden City, N.Y., The Natural History Press, 1970), p.173.

Game management became synonymous with "game animal only" protection. The national parks of Canada followed a policy of protection from hunting for game animals, but wolf control was deemed necessary. Wolves were eliminated from Jasper and Banff National Parks entirely. Banfield published a report on the wolves of Prince Albert National Park in Saskatchewan in 1951.¹ Wolves had entered the area in the 1920's. The game populations had increased since the establishment of the Park in 1927, with the exception of the caribou. Good browse for this specie had been decimated as a result of forest fires. The fires tended to encourage second growth which benefitted elk, bison, and moose. White tailed and mule deer also extended their range and increased during this time. With the increased food supply, the wolf population also increased.

From 1945 to 1950 a vigorous wolf control operation including the use of snares, shooting, denning and cyanide guns reduced the wolf population in the Park from thirty eight to eighteen animals. Banfield was aware of the publication by Paul Errington in 1946 of a study on predation. Errington had suggested that population control of prey species was dependent on the interaction of several factors and that predators were only a part of the picture.² In 1950 Clifford Presnell

¹Banfield, Alexander W.F. Populations and Movements of the Saskatchewan Timber Wolf (Canis lupus knightii) in Prince Albert National Park, Saskatchewan, 1947 to 1951. Wildlife Management Bulletin, Series 1, no. 4. (Ottwa, Canadian Wildlife Service, 1951), pp. 1-24.

²Errington, Paul L., "Predation and Vertebrate Populations," Quarterly Review of Biology, 21 (September, 1946), p. 231.

presented the view that predators could not keep herbivore populations in check.¹ Banfield concluded his report with the suggestion that wolf control operations be suspended to see if the decline in wolf numbers was really due to the control measures, and to see if wolves could serve as a check on the elk and moose which were increasing to the point that some areas were being overbrowsed.² Such an experiment was tried in Canada in Algonquin Provincial Park.

¹Presnell, Clifford C., "The Predator Question -- Facts Versus Fancies." North American Wildlife Conference Proceedings, 15 (1950). 207-208.

²Banfield, Op. cit., p. 21.

V: DOUGLAS PIMLOTT AND ALGONQUIN PARK

In 1954 there was a conference in Calgary that proved very important to the wolf. The Federal-Provincial Conference on Predator Control was instrumental in ending the bounty system in the western provinces in favor of more enlightened management techniques.¹ As in the United States, Canadian provincial and local governments had tired of the money the bounty system cost, and were ready for an alternative. In Ontario, where bounties had the longest history, an agreement was reached in which the Provincial government agreed to pay as much to research wolves as it did for killing them. The purpose was to determine the influence wolves had on wildlife populations in the Province to provide a factual background from which a "judicious and efficient" program of management could be instituted.²

The research program began in 1957 and Algonquin Park was selected as the site of the initial study. J.A. Shannon, a conservation officer, was the first field researcher assigned to the project. Douglas Pimlott was the biologist, and V.H.H. Williamson and A. Fyvie carried out the laboratory work.³

Wolves had been killed in the Park from 1909 to 1958, more than twelve hundred being poisoned or snared in that time. With the advent of the study in 1959, wolf killing within the Park ceased. One of the major problems to be overcome was to find some way to inventory

¹Pimlott, Douglas H., et. al., The Ecology of the Timber Wolf in Algonquin Park. Research Report (Wildlife) no. 87. (Ontario Department of Lands and Forests, 1969) p. 5. ²Ibid. ³Ibid.

the wolf population of the Park. The first year, 1958, a method based on scent posts was devised.¹ It proved unreliable from the beginning. It was well known that wolves investigated and urinated on scent posts along the travel routes. Wolfers made use of this knowledge for years in selecting places to set their traps. The researchers decided to place artificial scent posts marked with wolf urine in places wolves were likely to travel during the winter, and count the tracks to determine how many wolves were in the area.

Some posts were set up within the Park boundaries and others were placed outside the Park in the Gogama Forest. Two different groups placed the posts. The posts in the park looked as natural as sections of a telephone pole can look, but those who placed the posts outside the Park thought it would be a good idea to place bright streamers on the pole sections to attract the wolves' attention. The results were what might be expected from a wary animal that had associated humans with death for over thirty years and was highly suspicious of anything new in its territory. When the posts within the Park were checked, wolf tracks were found on sixteen occasions. Of the thirty-five posts outside the Park not one had wolf tracks within five hundred feet, even though the posts were checked one hundred and twenty four times.

¹Pimlott, Op. cit., p. 14.

There were other problems with this method as well. Fresh snow obliterated tracks before posts could be checked, or the wind caused drifts to erase tracks. Who could tell for sure whether five wolves visited the post consecutively, or one wolf came five times? The scent post method was abandoned after the first winter.

Aerial searches were also employed that first winter with more success. A total of ninety-four hours were logged, and both wolves and wolf kills were found.¹ Algonquin Park included areas of dense cover in winter as well as open areas such as frozen lakes. Aerial surveys tended to report large groupings of wolves and to miss single animals and pairs. There was an attempt to coordinate the aerial picture with the one seen from tracks on the ground, and aerial estimates were increased twenty per cent to compensate for this tendency. It appeared four different packs were present in a density of one wolf per ten square miles.

Summer presented the researchers with its own set of difficulties. Aerial surveys were out of the question due to the dense cover. Without snow tracking animals was very difficult. How could wolves be found and counted in the summer?

The solution to the problem and the method that made this research program different from all others before it, combined technology and human ingenuity. At the Wildlife Research Station in Algonquin Park a group of timber wolves, coyotes, and coyote-dog hybrids were kept

¹Pimlott, Op. cit., p. 12.

captive for research purposes. They often howled in unison and would respond by howling if a human howled to them. In the summer of 1958 Shannon tape recorded their howling and found they would reply to the recording just as they did live human howling. R.Y. Edwards had first suggested using tape recordings in wolf research, but this first one was of poor quality and low volume. So in March of 1959 the researchers had Dr. W. W. H. Gunn make four recordings of a group consisting of three wolves, three coyotes, and one coyote-dog.¹ No one knew what kind of reaction, if any, the recordings would get from wild wolves, so all the equipment for broadcasting and recording responses was rented during the summer of 1959. The recordings were played in May and a little in July without success, although in July the captive animals replied to them. Finally on August 5th a pack of three or four wolves responded around 10 p.m.

Eventually three packs were located in this way. Two packs were designated as test groups. One was checked twenty times between August and October and the other eleven times. When the wolves responded, the researchers took compass bearings and homesites for both packs were found on the first ground search.

This method proved very satisfactory in 1959 and 1960. Of the thirty one times these first two test groups were howled at, they responded a total of twenty-six times. Twenty of the responses were to

¹Pimlott, Op. cit., p. 20.

the first playing of the tape. Unfortunately in 1961 the method was less successful. While the four packs labelled A, B, C, and D were each found by the recording method, they did not respond reliably and their whereabouts at a given time could not be predicted as a result. Over the course of the study, it became apparent that fall was the best time to elicit responses and spring and early summer were the poorest times.¹

Every later researcher who mentioned the technique paid tribute to Pimlott and his research group for developing it as an innovative way to locate wolves in summer. The curious part was that as long ago as 1891 or 92 E.J. Dillon published an article in the English Illustrated Magazine about wolf-hunting in Russia. In this article Dillon related how his host, a Russian nobleman, arranged a wolf hunt on his estate for Dillon's benefit. Dillon explained how wolves were located in this way:

...In wolf-hunting there is seldom such a thing as a sure find; you must first send out your man—usually the head huntsman -- to play the equivocal part of detective or rather agent provocateur. This he does by entering the forest and uttering a most dismally realistic howl, as if he himself had become a were-wolf and were making desperate efforts to regain his human shape and voice. As a rule the unsuspecting animal howls back a blood-curdling acknowledgment, and sometimes honors the call in person.²

¹Pimlott, Op. cit., p. 22.

²Dillon, E.J. "Wolf Hunting in Russia," English Illustrated Magazine. 9 (1891-92), 314.

Stanley Young in The Wolves of North America also mentioned the calling of wolves:

Some wolf hunters and other woodsmen become adept at imitating the various calls of the wolf. Many instances are on record of wolves having been called up to within shooting range of the hunter. Some of the Eskimos in northern Alaska, who are proficient in wolf-calling, are reported as often succeeding in thus enticing near enough to kill wolves depredating on reindeer herds.¹

Yet neither Pimlott in his description of the technique, nor other researchers who used it later ever mentioned the hunting of wolves by calling as an inspiration for the use of tape recordings. The Dillon article was not mentioned in any researcher's bibliography, so perhaps no one was familiar with it. Stanley Young's book was often cited, but since most researchers disagreed with its conclusions concerning wolf behavior, perhaps they did not believe his account of calling wolves either.

At any rate it became an established method in conjunction with ground searches to find wolves at Algonquin Park. Paul Joslin made extensive use of the technique in 1961 to keep track of a single pack throughout the summer.² He followed it from the den site through six "rendezvous sites" all within a six mile radius of the den, both by recording and howling himself. The wolves responded better to his voice than to the tapes.

¹Young, Stanley P., The Wolves of North America, p. 79.

²Pimlott, Op. cit., p. 21.

The Algonquin study was geared to determine the effect wolf predation had on prey species rather than on wolf behavior per se. Like other studies before it, it confirmed that wolves tend to take the most vulnerable prey species. In this study deer remains occurred in eighty per cent of scats examined, moose in eight per cent, and beaver in seven per cent.¹ In the summer seventy one per cent contained fawn hair and of the moose remains eighty eight per cent were calves.² Pimlott concluded that wolves certainly had an effect on their preferred prey species, deer, but he would not commit himself to the theory that they were capable of regulating the deer population and keeping it within the carrying capacity of the browse available.³ The question remained open.

¹Pimlott, Op. cit., p. 87. ²Ibid. ³Ibid.

VI: THE QUESTION OF PREDATION

The question of predator-prey relationships proved complex. Sigurd Olson in his 1938 study of wolves in northern Minnesota found while wolves took deer in the winter, in summer they switched to grouse, mice, fish, marmots, snakes, insects, and even vegetation. Deer taken by wolves were mostly the old, the young, and the weak. Olson concluded that the majority of healthy deer in the prime of life were not affected by wolf predation.¹ Murie in Alaska in 1944 believed wolves kept Dall sheep in balance through predation on yearlings.² But Cowan in western Canada reported in 1947 that ungulates had increased even though there was no predator control program of any significance in operation. Even with an estimated wolf density of one per ten square miles in winter, not even all the animals dying of disease and malnutrition were being eliminated.³

A study by Rasmussen in 1941 seemed to be the one study which "proved" that predators could control a deer population.⁴ The Kaibab Plateau in Arizona was established as a game refuge in 1906. The estimate of deer on the Plateau at that time was around 4,000. An intensive predator control program to eliminate cougars, wolves, and coyotes was instituted, and within two decades the deer population had soared to 100,000. The area was subsequently overbrowsed by deer

¹Olson, Sigurd F., Op. cit. p. 335.

²Murie, Adolph, Op. cit., p. 143.

³Cowan, I. M., Op. cit., p. 174.

⁴Rasmussen, D. I., "Biotic Communities of Kaibab Plateau, Arizona", Ecological Monographs, 3 (July, 1941), 269.

and cattle and by the 1920's the deer herd was reduced to 10,000 by starvation. So for this area a direct causal relationship was assumed between the elimination of predators and the increase in the mule deer population.¹

Douglas Pimlott disagreed with Rasmussen. He found several extenuating circumstances which, he felt, cast doubt on Rasmussen's conclusions.² Around 1870 there were five hundred Indians living on the Plateau who took an estimated 800 deer annually. After 1885 cattle were grazed on the Plateau and Pimlott assumed that cattlemen took deer in considerable numbers. When the Plateau became a refuge in 1906, human hunting also was eliminated, and this could have had as much an effect as the elimination of predators. So the Rasmussen study results were not all that convincing, and subject to differing interpretations. The evidence of the other studies was not even as clear cut as the Rasmussen study purported to be.

Pimlott thought the evidence his study accumulated from Algonquin Park suggested that at least there wolves might have a major effect on the deer population. Still his study could not estimate how often wolves killed deer, or how much food an "average" wolf required on an "average" day. While it was evident that wolves fed heavily on fawns in summer, there was no way to tell which fawns the wolves were killing. If they killed weak or sick animals that would have died anyway, they would not affect the population. If on the other

¹Rasmussen, Op. cit. p. 269. ²Pimlott, Op. cit. p. 54.

hand, they took substantial numbers of healthy fawns that would have survived to maturity, the wolves would have made an important contribution in limiting deer numbers. Pimlott was the first to admit his study did not provide a definitive answer.¹

Several researchers provided a theoretical framework for this question of predation. Aldo Leopold in 1933 outlined five factors of predation: the density of prey population, the density of predator population, the characteristics of the prey (e.g. its reactions to the predator), the density and quality of alternative foods available to the predator, the characteristics of the predator (e.g. its food preferences, how efficiently it could attack, etc.)² Paul Errington had conducted the most extensive studies of vertebrate predation. He defined two types of predation: compensatory and noncompensatory. Compensatory predation did not affect prey population numbers because it involved predators taking animals that would die from other causes anyway. If, on the other hand, predators took healthy animals or large numbers of the young, the herd size could be substantially affected. This he called non-compensatory predation. He concluded that predators only took large numbers of prey when the prey were living in insecure situations in marginal or submarginal habitats. While he had not studied wolves himself, he thought of all

¹Pimlott, Op. cit., p. 56.

²Pimlott, Douglas H., "Wolf Predation and Ungulate Populations" American Zoologist, 7 (May, 1967), 268.

the predators the *Canis* genus could be involved in noncompensating predation on some occasions. He thought there were strong indications of their depressant effect on deer.¹

Errington's conclusions proved almost prophetic. He suggested that most examples of predators having a depressing effect on wild ungulates had one thing in common: the predators had special abilities as killers and were usually *Canis* species. He called *Canis* species "members of a subhuman group inferior as mammals only to man in adaptiveness and potential destructiveness to conspicuous, relatively slow-breeding forms."² Still he suggested that other factors could be more important in limiting populations, and that predation was not the most important factor in most cases. So as Pimlott insisted, predation proved to be such a complex relationship with so many variables, that very few generalizations about the influence wolves had on prey populations was possible. No study had yet shown conclusively that wolves were the primary factor limiting a prey specie. Nature, however, was about to provide a unique opportunity to address that question head on.

¹Errington, Paul L. "Predation and Vertebrate Populations," Quarterly Review of Biology, 21 (June, 1946), 158.

²Ibid.

VII: ISLE ROYALE, PART I

The question of predation was not going to find a definitive answer until an in depth study under controlled conditions could be arranged. Yet the possibility of setting up such an ideal outdoor laboratory seemed almost nil. Nature, however, provided its own, fully equipped and publicly owned, ready and waiting for the invasion of the scientists.

Its name was Isle Royale, a U.S. national park since 1940. Sometime around the turn of the century moose swam the thirteen to twenty miles of Lake Superior between the Minnesota or Canadian shore and the island, which was officially a part of Michigan. By the 1920's they had prospered and increased into one of the best known moose herds in North America. The moose found Isle Royale an ideal habitat. From timber cutting and fires years before the island provided a lot of brush and young trees. In those areas where old mature growth was left, shade tolerant American yew or ground hemlock grew underneath. It was a favorite food of the deer family. By 1926 the moose population on Isle Royale was estimated to be close to two thousand animals living on an area seventy-two kilometers long and fourteen kilometers wide at its widest point.¹ By 1936, the moose had literally eaten themselves out of house and home and there were fewer than two hundred left.² A major forest fire ravaged the

¹ Allen, ²Durward, Wolves of Minong (Boston: Houghton, Mifflin, 1979), p. 30. ²Ibid. p. 40.

island that year, and because of it the stage was set for the cycle to renew itself. In future years there would be more browse of new growth available and the herd could increase again. By 1948 an estimated 800 moose roamed the island.

At this point there were those who suggested that something be done to prevent another wild population explosion. Since hunting was not allowed in a national park and there was bound to be a public outcry if the Park Service selectively culled large numbers of animals, Lee Smits, a newspaperman from Detroit, proposed releasing wolves on the island.¹ The Superintendent of the Park, Charles E. Shevlin, thought there might already be wild wolves on the island, and the plan was also ill advised because of probable adverse public reaction. Nevertheless Smits persevered and when no wild pups could be obtained, he settled for animals from the Detroit zoo. Four young adult wolves, Lady, Queenie, Adolph and Big Jim were brought to a wire pen at Rock Harbor, Isle Royale in 1952. One escaped and the other three were turned loose ahead of schedule because they kept getting tangled in the wire. Since they were not afraid of people, and Big Jim had been hand reared, they got into all sorts of mischief, tearing laundry from the line and terrorizing unsuspecting tourists. When attempts to retrap them failed, they were shot, except for Big Jim who became extremely wary and stayed out of range.²

¹Allen, Op. cit., p. 13. ²Ibid., p. 17-18.

Adolph Murie had studied the moose on the island in 1929 and noted that there soon would not be enough browse for the ever increasing numbers. He had suggested bringing wolves to the island, but that part of his report was not taken seriously at the time.¹ In the end Superintendent Shevlin proved correct. Sometime during the winter of 1949 when Lake Superior froze solid between Isle Royale and Canada, a wild wolf pack came across to stay. Here at last was the controlled outdoor laboratory with one predator and one prey specie protected from human interference.

Durward Allen was a biologist working for the Fish and Wildlife Service at the time and, recognizing the unique opportunity, tried to get funding for a study. Unfortunately it was a time of retrenchment and the Service could not even keep its previous level of funding intact. After three years of disappointment Allen resigned to join the faculty of Purdue University and got funding from the National Science Foundation. L. David Mech was his first graduate student assistant. Between 1959 and 1961 Mech spent four hundred thirty five hours in the winter in aerial observations and a total of sixty five weeks during three springs and summers in the field.²

The picture he painted of wolf hunting behavior and the relationship between the wolf and its prey was perhaps the most detailed

¹Allen, Op. cit., p. 30-31.

²Mech, L. David, The Wolves of Isle Royale. Fauna of the National Parks of the United States. Fauna Series 7. (Washington D.C.; National Park Service, 1966) p. xi.

since Adolph Murie's study in 1944. The aerial survey found about 600 moose on the island and a major wolf pack numbering fifteen to sixteen as well as a pack of three. While there was mating activity for two years, no young were observed to survive to the following winter. For thirty-one days in the spring of 1960 the large pack was intensely observed. On twenty two days the wolves did not travel very far, but in nine days of traveling they averaged thirty-one miles per day; the average distance between kills was 26.5 miles. The large pack killed an average of one moose every three days and the average daily consumption per wolf ranged from 9.7 to 13.9 pounds. They ate as much as twenty pounds per wolf at one time and went as long as five days without eating at all. Here at last was a study that truly quantified its data. In the published version of his Ph.D. thesis, The Wolves of Isle Royale, Mech went so far as to state: "On the basis of consumption figures, it is estimated that approximately 5,823,300 pounds of browse are required annually to support the moose herd that produces the 89,425 pounds of moose consumed by about 1,512 pounds of wolves."¹

Never before had such intensive observation of wolves' hunting techniques been undertaken. Murie had close to ideal conditions for viewing hunts on the treeless tundra, but the hunts he observed were something of a bonus and not a major focus of his study. Lois Crisler,

¹ Mech, The Wolves of Isle Royale, p. xiii.

part of a husband-wife photography team filming the caribou migration in Alaska for Walt Disney, had raised first two and later five wolves and reported on their hunting techniques on caribou in the Arctic.¹

Mech spent sixtyeight hours by air observing sixtysix hunts by the large pack involving 132 moose.² He found mature healthy moose easily drove off wolves or defended themselves until the wolves gave up. Females with young stayed behind protecting the calf's rear and were quite often successful. Of the seventy-seven moose the pack actually tested they managed to kill six for an efficiency rating of only 7.8 per cent.³ This was a far cry from Young's contention that wolves killed at will.⁴

The wolf was not a vegetarian; it lived on death. Part of the image of the wolf was due to the way it killed its prey. Young and others before him painted a gory picture of wolves hamstringing -- severing the Achilles tendon -- in one or both hind legs of the victim and eating off the still living animal.⁵ No researcher from Murie forward ever witnessed a wolf hamstringing its prey. If such

¹Crisler, Lois, "Observations of Wolves Hunting Caribou," Journal of Mammology, 37(August, 1956) 337-46.

²Mech, The Wolves of Isle Royale. p. xii. ³Ibid.

⁴Young, Stanley P., Op. cit. p.268. ⁵Ibid., p. 263-271.

happened, it was incidental rather than deliberate, Mech witnessed a total of nine kills.¹ The wolves attacked the animal's rump, biting and holding on to slow it down. At the same time one wolf grabbed the moose's nose, as effectively occupying its attention as a veterinarian did with a twitch on a horse's nose. Usually, according to Mech, the moose were killed within ten minutes, but some wounded animals held off the pack for several hours.² More than one other researcher of large predators had witnessed a wounded prey animal lying calmly watching with no resistance while the predator or predators began to devour it. This was also witnessed on Isle Royale. The conclusion was that such animals were in a state of shock, and turned to look at their attacker with no fear visible, no sound uttered, and no resistance offered.³

The large pack quickly consumed their kills, so of the fifty one examined on the ground, most contained only bones. From tooth wear rough estimates of age could be determined and from the state of the bone marrow in leg bones, something of the health of the individual could be estimated. No adults between one and six years of age were found. Perhaps most important, of the two adult kills where the carcasses were

¹ Mech, The Wolves of Isle Royale. p. xii.

² Ibid.

³ Allen, Wolves of Minong. p. 129.

mostly intact, one had fifty-seven golf-ball sized hydatid cysts¹ in its lungs and the other thirty-five.² Such an animal could not have the endurance to run very far. Lois Crisler also mentioned the botflies that laid eggs in the nostrils of the caribou. Heavy infestations sometimes killed them from suffocation.³ Deer were also known to harbor parasites. Perhaps here was an alternative explanation of how wolves ran their prey to exhaustion while remaining so fresh themselves.

Of the relationship between this predator and its prey Mech concluded:

The wolves appear to have kept the moose herd within its food supply, culled out undesirable individuals, and stimulated reproduction. Wolves and moose probably will remain in dynamic equilibrium, although the moose herd may decline in the next decade because a large proportion of the browse is growing out of reach of the moose.⁴

Mech's study appeared in print in 1966 and was widely hailed. With the publication of his book, The Wolf: the Ecology and Behavior of an Endangered Species in 1970, his reputation as one of the major wolf experts was established. Nature had graciously provided in Isle Royale the means to study the question, but it was not yet finished in providing the answer.

¹ Moose eat tapeworm eggs as they browse. The larvae hatch, migrate to the lungs where they encyst. Wolves eat them and the minute adults attach themselves to the wolves' intestines. Wolves do not seem to be weakened by the infestation. The eggs are deposited with the wolf droppings to ensure future moose will be infected when they browse.

² Mech, Op. cit. p. xii. ³ Crisler, Op. cit. p. 253. ⁴ Mech, Op. cit., p. xiii.

VIII: ISLE ROYALE, PART II

After Mech's initial study work on Isle Royale continued. Durward Allen described himself as: "Director, fund raiser, field assistant, and chief cook in the winter camp."¹ He hoped originally to get funding for a ten year project from 1958 to 1968. Instead it occupied him until his retirement in 1975. The funding came initially from the National Science Foundation in a series of four grants that lasted ten years. From the mid-1960's funding came from contracts with the National Park Service. These were the two major sources, but there were others along the way. The roster of support included: The National Wildlife Federation, Purdue Research Foundation, National Geographic Society, Wildlife Management Institute, Carnegie Museum, Defenders of Wildlife, National Audubon Society, Boone and Crockett Club, and the National Rifle Association. The American system of research, so dependent on grant funding, made for some strange bedfellows indeed.

With funding secured a total of six researchers completed projects on Isle Royale. The first was Mech. His work covered from 1958 to 1962. Next came Philip G. Shelton, a graduate in wildlife technology from Montana State University. His study concentrated upon the beaver on the Island, and was conducted from 1960 to 1964.² He and his assistant live-trapped 357 beaver in a five year period, recording ages, sex and weight. He found that while the beaver played a minor

¹ Allen, Wolves of Minong, p. xix.

² Ibid., p. xx.

part in the wolf's diet, it was beneficial to moose in that it changed the habitat to one more favorable to moose. The vegetation changes brought about by the ponds created by beaver dams increased the browse of the moose, who also fed off the trees felled by beaver.

From 1963 to 1966 Peter A. Jordan came to the island as a post-doctoral associate. He had studied mule deer for his Ph.D. at Berkeley and came to Isle Royale to study moose.¹ He concentrated on finding a reliable method for taking an accurate moose census that did not require flying patterns over the whole island. The researchers of Isle Royale knew from personal experience that moose were not always easy to spot from the air even in good flying weather and open terrain, when they were known to be in an area from their tracks.

A major problem was the weather around Isle Royale. The north shore of Lake Superior was noted for its fog and unpredictable storms. David Mech did an aerial survey of the whole island in 1960 during what turned out to be a prolonged period of good flying weather. Later researchers were never to have enough good weather to make as complete a survey again.

An alternative to surveying the whole island was developed by Jordan.² It involved sampling the various habitats on the island. The density of moose in various habitats was determined and a moose census was taken in sample plots within these representative

¹ Allen, Wolves of Minong, p. xx

² Ibid., p. 165-166.

habitats. Based on the samples, the population for the whole island was calculated. Surveys of this type were conducted in all later years. Jordan also began compiling a life table of moose statistics based on teeth wear of skulls found at wolf kills since the original project began in 1958.

The next doctoral candidate was Wendel J. Johnson, who gathered information on the red fox population of the island and the creatures on which it preyed.¹ He found that while moose carrion was important to foxes in winter, the principal prey was the varying hare. They also ate squirrels, deermice, birds, reptiles, insects and fruits. Their relationship to their bigger cousin varied. They were observed to be curled up asleep within twenty feet of a kill waiting for the wolves to finish. Yet when wolves were traveling in search of prey, they were observed more than once to chase and kill foxes.

Michael L. Wolfe, with a doctorate on the history of game management from the University of Gottingen, came a few months after Johnson. He continued the work of Jordan on moose.² Jordan established the method of roughly determining the age of a moose from the visible wear on the teeth, much as one determined the age of a horse. Wolfe applied a method first used on Scottish red deer which involved slicing the upper first molar vertically, polishing the root section,

¹Allen, Op. cit., p. xx.

²Ibid., p. xx.

and counting the layers of cementum which were deposited annually while the animal lived. This method was accurate to within one year. Wolfe concluded that moose who survived their first year could expect to live for the next seven years. After that time wolf predation and the effects of parasites and arthritis took a steadily increasing toll, until by age fifteen most moose were dead.¹

The decade of the 1970's brought Rolf Olin Peterson to Isle Royale. From 1970 to 1974 he worked on his Ph.D. His thesis was published as Wolf Ecology and Prey Relationships on Isle Royale.² He remained in 1975 as a post-doctoral associate, and became director of the research program in 1975 with the retirement of Durward Allen.

This was a time of change on Isle Royale. The information so carefully gathered during the previous years seemed to justify certain conclusions about Isle Royale's ability to support moose and wolves and their relationship to each other. Yet the studies by Mech and Shelton had at least one critic. Douglas Pimlott, in summing up the eight years of research he and his associates had conducted in Algonquin Park, was not ready to agree with the Isle Royale conclusion that at least there it was possible that the wolf

¹Allen, Wolves of Minong, p. 368-369.

²Ibid., p. xx.

kept the moose population within the carrying capacity of its environment.¹ He did agree that they had some influence since the area was not overbrowsed. His main criticisms were that only one extensive aerial survey of the moose population had been done (Mech's) and it quite possibly underestimated the population. The estimate of the total adult moose killed by wolves in a year was based on wolf predation in winter, while Pimlott felt the relative presence of calf/adult hair in scats in summer suggested far more calves than adults were killed then. He also suggested that the number of calves that survived to spring remaining stable for several years was not by itself proof that the entire moose population was remaining stable. On the other hand since the vegetation did not appear to be overbrowsed and the moose were not starving, he conceded the wolves must have had some influence on their number.²

Rolf Peterson had all the data of his predecessors on which to build with his own observations. What happened on Isle Royale in the late 1960's and 1970's showed clearly the importance of keeping a research program of this nature going for a long period of time.

The scenario in the first ten years was of a single large pack of wolves numbering from fifteen to twenty two with occasional sightings of a single wolf or two or three traveling separately from the pack and

¹ Pimlott, "Ecology", p. 55-56.

² Ibid., p. 55.

mostly avoiding it. The large pack covered the whole island in their hunts. The same male and female were identified as alphas for several years. While mating activity was noted each spring between the alpha animals and pups were born, pup survival was very low. In 1964 a dead pup was found with probable cause of death malnutrition. Wolf density remained a stable, one per ten square miles. The moose population remained stable at around six hundred animals. Wolves killed between one hundred forty two and one hundred and fifty adults annually, between two hundred twenty seven and two hundred and fifty calves, and around eighty five yearlings. Annual calf production amounted to thirty three per cent of the entire herd.

Starting in 1969 there were a series of winters with a snow depth of over thirty inches. Previously snow depth tended to average around two feet. At the same time the burned over areas of the island which had provided good browse for moose were maturing so that tender buds were out of reach and trunks were too strong to bend under moose "walking over them" to get within reach of young shoots. Moose concentrated in areas of heavy conifers where snow was less deep. Malnutrition in pregnant cows resulted in weak calves. Yearlings suffered malnutrition during their first winter so that their growth was affected and as adults they were constitutionally weaker than previously. Wolves began to take more adult moose, and for the first time, to take adults in the one to six

year old category, which previously had been practically immune to predation. They no longer consumed their entire kill. Since moose were more concentrated, the area the large pack hunted was geographically limited to about one half of the island.

Wolf summer feeding habits changed also. For the first time wolf scats contained fruit from the island's berry crops. All that winter snow provided larger than normal spring run-off. Beaver dammed streams and created new ponds providing places for new colonies to become established. Active colonies went from one-hundred forty-two in 1962 to three hundred in 1973. An adult beaver weighed about forty pounds, certainly a full meal for a wolf and a much less formidable prey than a moose. Caught on land they were easy prey for wolves. During this same time period wolf predation on beaver in summer tripled and beaver went from making up thirteen per cent of the wolves' summer diet to fifty per cent.

Ironically wolf den sites were located near active beaver colonies in several of these years. Yet the beaver observed in these presumably more vulnerable colonies did not seem disturbed by the presence of their neighbors, nor did the beaver numbers in these colonies decline any faster than at other colonies. Peterson concluded that the increased predation on beaver was due to more chance encounters of wolves with beaver on land, simply because there were more beaver around, than because of a deliberate shift in wolf hunting behavior.

About this same time the social structure of the wolf pack was changing. The same male and female had been the dominant "alpha" animals for several years. But in the winter of 1966 the pack structure broke down. Observers found two packs, labeled the "six pack" and the "Lily Lake seven". The dominant male of the original large pack was seen to be following one of the two new packs at a distance with a limp. Two weeks later there were tracks indicating a battle had taken place and the dominant male was seen no more. A ground search of the area turned up a piece of hide and leg bone that could have belonged to the male wolf. The leg showed signs of arthritis which could have caused the limp. The alpha female retained her position although she had a crooked front leg and had walked with a limp for some time. The same winter a new group containing four black wolves crossed from Canada on the ice. Eventually the "Lily Lake seven" and the "black pack" broke up and were not seen intact again. The "six pack" became the new West pack. It appeared that this would be the only pack on Isle Royale.

In 1971 the West Pack had a steady population of nine. There was also a separate duo of two males, and a single female believed to have been rejected by the dominant members of the West Pack when she came in estrus in February. Eventually these three formed a definite trio. The next winter there were two packs, the old West Pack and a new East Pack of ten animals. This included the trio of the winter

before, five pups, and two extra adults. From 1972 to 1976 this pack grew from ten to seventeen animals. The hunting ranges of these two packs overlapped in the middle of the Island and on at least one occasion the East Pack and West Pack met ending in the death of one West Pack member. In 1975 a third pack consisting of a mated pair and their offspring was observed in the area of overlap between the other two pack territories. It was of course named the Middle Pack. Peterson concluded that as the browse of the moose declined, their productivity also declined.¹ Females did not reach sexual maturity as soon and calf production declined to less than twenty five per cent. All three wolf packs were able to make kills on moose about once every three days. Increased predation would help the decline of the moose and the present wolf population could not long be maintained in such large numbers. The average number of wolves on Isle Royale had increased from twenty two in the early sixties to forty four in 1976.

David Mech had noticed the same phenomenon on the Minnesota mainland.² Years of heavy snow tended to favor wolf predation. Deer "yarded" more and wolves reduced the size of their territories because prey was denser. This opened up areas into which excess pack members could expand and new packs form. The sacred wolf

¹Peterson, Rolf O., Wolf Ecology and Prey Relationships on Isle Royale. Scientific Monograph Series No. 11. (Washington, D.C.: U.S. National Park Services, 1977) xvii.

²Mech, L. David, "Productivity, Mortality, and Population Trends of Wolves in Northeastern Minnesota," Journal of Mammalogy, 58 (Nov. 1977), 565.

density of one wolf per ten square miles which had persisted through several studies no longer held true. Northern Minnesota and Isle Royale both showed the increased density of one wolf per five square miles. Moose and deer were both declining from lack of browse and hard winters and wolves were benefitting and hastening the decline of their prey with increased predation.

Durward Allen commented on the contrast between the first ten years of research on the island and the next eight while he was in charge of the program:

"In some respects the two accounts would have been enough alike to attest that we were studying the same area in both periods. But the answers to some vital questions would have been different. And if the two studies had been done by two groups of people, some eyebrows might have been lifted. Understandably, public confusion could have resulted."¹

Even after eighteen years there remained much to be learned, and work continued under the direction of Rolf Peterson.

¹Allen, Durward, Wolves of Minong, p. 371..

IX: THE STUDY OF CAPTIVES

The field studies of wolves in the wild, largely made possible through the technology of the radio collar and the airplane, greatly increased our knowledge of predator-prey relationships. Yet some things were almost impossible to study in the wild. Wolves were wary of humans, and their hunts throughout most of the year wandered through more territory than a human could comfortably follow on foot, especially in dense brushy areas.

An alternative was to study a group of wolves living in captivity in conditions approximating those in the wild. There had been individuals who kept one or two animals as pets before World War II, but they were not trained scientists and they mostly wrote articles to the effect that wolves could be tamed and were not vicious as the standard picture of the day insisted they were.¹ Dr. E.H. McCleery bought young wolves from Biological Survey Trappers on the Great Plains in the early 1920's in an attempt to keep alive the subspecies of gray wolf known as the "buffalo wolf", or "lobo". These he kept and bred on a farm in Pennsylvania until he was over ninety. His purpose was to keep this animal from becoming extinct and his work was taken over by Jack and Marjorie Lynch. They moved the thirty-eight wolves to Washington state nineteen years ago. Jack Lynch, since divorced, recently established the Dr. E.H. McCleery Lobo Wolf Foundation in hopes of raising enough money to feed the animals the

¹Baynes, E.H., "Dauntless, My Big Timberwolf", St. Nicholas, 35 (November, 1907), 20-25.

required ton of food per week. The wolves were kept in several separate pens and were not allowed to live in natural packs and little of a scientific nature was published about them.

The first studies to look into wolf social behavior were by Konrad Lorenz in Austria. He experimented with breeding an "ideal" dog from crossing wolves, chows, and Alsatians (German Shepherd dogs). He also worked with wolves in German zoos. He developed a theory about submission and dominance in wolves and domestic dogs. He felt that there was an instinctive inhibition on the part of the dominant animal not to attack its subordinate if the subordinate displayed the proper submissive behavior. He related an incident in King Solomon's Ring which illustrated his theory:

And now the incredible happens, just the opposite of what you would expect. The furious whirling of the grey bodies has come to a sudden standstill. Shoulder to shoulder they stand, pressed against each other in a stiff and strained attitude, both heads now facing in the same direction. Both wolves are growling angrily, the elder in a deep bass, the younger in higher tones, suggestive of the fear that underlies his threat. But notice carefully the position of the two opponents; the older wolf has his muzzle close, very close against the neck of the younger, and the latter holds away his head, offering unprotected to his enemy the bend of his neck, the most vulnerable part of his whole body!

¹Lorenz, Konrad Z., King Solomon's Ring, (New York: Crowell Apollo Edition, 1961) p. 187-188.

Lorenz concluded that "A dog or a wolf that offers its neck to its adversary in this way will never be bitten seriously."¹ While he himself had never published an article with a drawing of the supposed dominant and subordinate attitudes, a colleague, W. Fischel, included such a drawing in an article he published in 1956, agreeing with Lorenz's conclusions.²

In the 1940's another researcher, Rudolf Schenkel of the University of Basel, was interested in the idea of submissive behavior in wolves. In 1948 he published the classic article on their facial expressions, "Ausdrucken an wolfen" (Expression studies of wolves).³ Lorenz suggested that submission involved appeasing behavior aimed at avoiding antagonistic or aggressive behavior.⁴ Schenkel characterized submission as "the effort of the inferior to attain friendly or harmonic social integration!"⁵ He described two kinds of submissive behavior: active and passive. These actions in adults were based on behavior of young pups in the den. Active submission was the approach of a subordinate to the dominant animal with tail wagging, head low,

¹Lorenz, Konrad Z., Op. cit., p. 188.

²Schenkel, Rudolf, "Submission: Its Features and Function in the the Wolf and Dog," American Zoologist, 7 (May, 1967), 320.

³Schenkel, Rudolf, "Ausdrucks- Studien an Wolfen," Behaviour, 1, no. 2 (1948), 81-129.

⁴Schenkel, "Submission", p. 319. ⁵Ibid.

and ears down, and finally a nuzzling of the dominant animal's mouth.

Pups behaved similarly to get adults to regurgitate food for them.

Passive submission was more likely to be initiated by the dominant animal. If a dominant animal stared directly at a subordinate, because it overstepped the bounds of proper behavior in some fashion, the subordinate responded by turning its head away with ears flattened, tucking its tail between its legs and moving away in a half-crouching position. If the dominant animal, instead of staring, approached the subordinate, the subordinate flopped over on its side with its hind leg raised and genitals exposed. The dominant animal then either stood over the reclining animal or sniffed its genitals. According to Schenkel, in times of tension, subordinate wolves looked to the dominant animals for reassurance, and submissive behavior helped to strengthen the pack structure.

Schenkel's studies showed that Lorenz had misinterpreted what he had observed in wolf and dog behavior. Often the subordinate animal approached the dominant one and appeared to "bite" the neck or mouth area with an open mouth and without closing its teeth -- an action called "an inhibited bite" -- while the dominant animal stood with mouth closed and ears pointed forward. In other words the picture published by Fischel showed the reverse of what the actual roles were.

Schenkel carefully described the various physical attitudes including ear, mouth, and tail positions, illustrating active and passive submissive behavior. He described the pack "pecking order"; the two parallel rank orders, one for males, and a separate one for females. The two dominant animals were referred to as the "alphas" and these were usually a mated pair. The rest of the pack members were offspring of these two. The alpha male was dominant over the entire pack. The alpha female was dominant over all other females as well as the lower ranking males. Only the two alpha animals raised their hind leg to urinate. Subordinate wolves never raised their legs in this manner. The dominant female prevented other females from mating and the dominant male kept other males from mating with the dominant female. All adults took an interest in raising the pups and pups were immune from the dominance structure until their second year. There were also outcasts who were on the periphery of the group and had the lowest status. This became the basic picture of pack behavior.¹ While these were captive wolves, their behavior did not contradict the picture of life at the den described by Murie in 1944.²

The next description of wolf social behavior was by a non-scientist who had almost ideal conditions in which to study the animals. Lois Crisler, a writer, and her photographer husband, Cris, spent a year and a half filming the caribou migration in Alaska for Walt Disney in

¹Mech, The Wolf, p. 81-92. ²Murie, The Wolves of Mt. McKinley.

in the mid 1950's. In the process of telling the life story of the caribou, they needed shots of the caribou's main predator, the arctic wolf. They made arrangements with native Alaskans to get pups and raised first two and later five wolves. Their descriptions of both the hunts of wild wolves and the social interactions of their growing pups in Arctic Wild¹ were widely quoted by later researchers.

They noted that the wild wolves tested many caribou before finding one they could kill. Especially interesting was the manner in which the year old male and female wolves took over the care of the five young pups, although they were not old enough to have mated themselves and having been raised by humans, did not know life in a pack structure. Nevertheless they brought food to the pups and regurgitated it for them, broke up fights among them, generally babysat, took them on excursions across the tundra, and most of all, provided adult leadership.²

The basic picture painted by Schenkel received more detail from later studies in the United States. In 1967 a study based on observing pack structure and social interactions at the Brookfield Zoo in Chicago were published by Jerome Woolpy, George Rabb, and Benson Ginsberg.³ In February during the annual breeding season the social

¹ Grisler, Lois, Arctic Wild (New York: Harper and Row, 1958).

² Ibid. p. 209-241.

³ Rabb, George B., Jerome H. Woolpy, Benson E. Ginsburg. "Social Relationships in a Group of Captive Wolves," American Zoologist 7 (May, 1967), 305-311.

ranking of the animals was most obvious. They found that the dominant male seemed to keep his position by force of personality. Size alone did not determine ranking. Over a period of years the mating behavior of the wolves proved complicated. The same individuals were the alpha pair for several seasons and for the most part they alone successfully bred. The alpha male actually preferred a subordinate female, but the alpha female physically attacked any of the other females that attempted to breed. The dominant male spent a great deal of his time preventing subordinate males from breeding with the dominant female, as well as with other females. Several males of relatively equal rank prevented each other from mating with a female they all wanted, and they all ganged up on a lower ranking "peripheral" male of very low status. By the height of the breeding season peripheral animals, both male and female were so psychologically conditioned to being thwarted in their attempts to breed, that a glance from a dominant animal was enough to send them crouching away from their intended partners with their tails between their legs.

When the dominant female died and the researchers temporarily removed the dominant male from the pack, other animals assumed their roles. In such chaotic times it took more than one season for a new dominance structure to emerge and in the mean time, more than one pair of wolves successfully bred.

Such behavior corroborated the observations of Robert Rausch in Alaska.¹ When Alaska became a state, it retained its bounty on wolves and in a seven year period over 4000 were collected. Rausch checked the leg bones for signs of growth at joint ends, a good measurement of whether the animal was less than twelve months old when killed. After that age, bone growth ended. Rausch found a ratio of forty four per cent pups to fifty six per cent adults.² The wolves had such a high ratio of reproduction and pup survival, that even eliminating half the pups and adults each year would not prevent the wolves from maintaining their numbers.³

The same situation in reverse was found by Pimlott in Algonquin Park in Ontario.⁴ When his study began, wolves had been controlled for years and received full protection for the eight years of the study. Yet he found no increase in their total number in the Park.

From the study of captive animals, the explanation was that in a stable pack situation only the alpha pair bred and the reproduction rate was lower. Intensive control operations tended to disrupt pack social structures. In the formation of a new structure among

¹Rausch, Robert A. "Some Aspects of the Population Ecology of Wolves, Alaska," American Zoologist, 7 (May, 1967), 253-265.

²Ibid., p. 261. ³Mech, L. David, The Wolf, p. 63.

⁴Pimlott, Douglas, "Ecology", p. 87.

adults, the new alpha animals did not have the "authority" the previous pair had to prevent breeding among subordinates. Most of the wolves would have joined the original pack as pups with unquestioned loyalty to the original alpha animals. With these gone the remaining adults did not so easily transfer their loyalty to what was most likely a sibling. Pack structure would not become stable until enough pups had grown up under the leadership of the new alpha pair. Since this took several seasons, and under control operations, more disruptions were likely, tight pack social structure was hard to maintain. When control operations ceased, birth control by social pressures in a tightly knit pack increased and the number of pups produced decreased.

More confirmation that wolves controlled their numbers if left unmolested came from the study of Harry Merriam, again in Alaska.¹ In 1960 he stocked Coronation Island, an area of roughly thirty square miles inhabited by Sitka black-tailed deer, with four young adult timber wolves. In four years if each female had produced an average litter and all had survived and bred, there would have been ninety-one wolves on the Island. In fact there were seven to eleven adults and yearlings and two pups.

The value of captive studies was apparent in other ways as well. The graduate students who produced studies on Isle Royale familiarized

¹Mech, L. David, The Wolf, p. 65.

themselves with dominant and submissive positions through observation of the captive pack at Brookfield Zoo in Chicago. In observing the animals on Isle Royale from the air tell-tale positions of ears and tails often helped to identify alpha animals.

From captive studies the alpha male was known to initiate most aggressive behavior against outsiders. Murie had also observed this in Mount McKinley Park.¹ When Harrington and Mech in northern Minnesota began to howl at wolves to verify pack locations, they were sometimes approached by wolves. Such wolves were almost always alpha animals and their behavior fitted a model based on observation of how captive animals reacted to a strange wolf.² As field studies continued to fill in details of wolf behavior in the wild, the findings of captive studies were substantiated.

¹Murie, Adolph, Op. cit., p. 44.

²Harrington, Fred H. and L. David Mech, "Wolf Howling and its Role in Territory Maintenance," Behaviour, 68, Nos. 3-4, (1978), 232, 235.

X: THE IMPACT OF TECHNOLOGY

One of the main reasons that studies of wolf behavior in the wild were such a recent development was because of the importance played by technology. The airplane and the helicopter became grim reapers when used by bounty hunters in open terrain. They also provided a new means of tracking the far ranging animals, especially in winter, in dense cover, when human travel on the ground could be difficult. Spotting the animals from the air, however, was something of an art. Robert LeResche and Robert Rausch conducted a very illuminating study of aerial surveys in 1974.¹ They fashioned four pens each one square mile in area. Within each pen were from seven to twenty-three moose. The habitat was mostly open forest consisting of birch, aspen, spruce and cut-over areas. Censuses were taken by forty nine different observers. Those with previous experience found sixty eight per cent of the moose present while "green" observers averaged only forty three per cent.² The density of the moose didn't seem to affect the outcome, but weather and snow conditions and time of day did. Midmorning and midafternoon with a high overcast sky provided the best viewing conditions. Because of this study, researchers on Isle Royale added twenty per cent to their aerial counts of moose.

¹LeResche, Robert E. and Robert A. Rausch, "Accuracy and Precision of Aerial Moose Censusing," Journal of Wildlife Management, 38 (April, 1974), 175-182.

²Ibid., p. 175.

If an animal as large and dark as a moose which did not blend in well against a snowy background could be missed so easily, finding the far smaller wolves with their great variation in coat color, proved equally difficult. What revolutionized the study of wolves in the wild was the invention and perfection of the transistor. By 1963 transistorized radio transmitters had been developed by Cochran and Lord that were small enough and light weight enough to fit on a collar worn by a wolf.¹

David Mech made extensive use of this device in his continuing studies of the wolves in northern Minnesota.² Between 1968 and 1976 he and his graduate students placed radio collars on 129 wolves. The animals were tracked by airplane at least once a week, twice being the norm, and every day in the winter. A total of 2400 hours of flight time was logged, tracking eighteen different packs with at least one radioed member. On the average nine different packs in adjoining territories were observed each year. He was able to check on their whereabouts almost at will.

¹Cochran, W.W. and R. D. Lord, "A Radio-tracking System for Wild Animals," Journal of Wildlife Management, 27 (January, 1963), 9-24.

²Mech, L. David, "Productivity, Mortality, and Population Trends of Wolves in Northeastern Minnesota," Journal of Mammalogy 58 (November, 1977), 559-560, 562.

This new technique permanently laid to rest the old trappers' idea of a wolf patrolling its territory in a circle every few weeks. Wolves followed man-made roads when available, game trails, and whatever other opportunities for easy travel the terrain provided. The alpha male, especially, scent marked at frequent intervals. Using radioed animals to find packs each day, their movements could be determined as never before. Based on tracks and scent posts observed in winter, Roger Peters, a psychologist interested in olfactory communication, and L. David Mech provided a diagram of a typical pack territory in an article entitled, "Scent-marking in Wolves," published in 1975.¹ It looked like a grid drawn by a drunk had been superimposed on the outline of an amoeba.

Trappers set their traps based on their knowledge of where wolf scent posts were, and since they got results, the view went unchallenged. It was traditionally held that wolves marked their territory to keep other wolves out. Scott and Fuller perpetuated the idea in their book, Genetics and the Social Behavior of the Dog, published in 1965.² Mech's extensive study from 1968 to 1973 showed that the alpha animals scent-marked about every two or three minutes along their travel routes throughout their territory. At the periphery wherever the scent of other packs overlapped theirs, the resident

¹Peters, Róger P. and L. David Mech, "Scent-marking in Wolves", American Scientist, 63 (November-December, 1975), 629.

²Ibid., p. 634.

alpha wolves did mark more often, but Mech concluded that scent marking served several purposes, and wolves did not need the stimulus of a strange wolf to scent mark. The wolf, like the dog, perceived a lot of information about its environment through its nose. It differentiated between individuals from their scent marks, knew how long ago they last passed this way, whether the females were in estrus, whether an animal was adult or pup. As Mech put it, the territory was like "an olfactory bowl".¹ Since it was marked more heavily around the edges than in the interior, and the pack left sign as they moved about within it, a stray wolf from within the pack always knew where it was in relation to both the territory and the other pack members. An outsider knew when it was on the border between territories and when it was in more danger trespassing through the heart of a strange pack's area.

The use of radio collars also made possible the location of packs for howling studies. Pimlott and Joslin pioneered the technique of howling at wolves, using their response to find rendezvous sites, and to get some idea of how many animals were in a given pack.² Mech had the advantage of using the radioed animals to find the packs before he howled at them, so that he knew in advance approximately how far they were from him.

¹Peters and Mech, p. 634.

²Pimlott, "Ecology," p. 20.

One of Pimlott's graduate students, Paul Joslin, suggested in an article in 1967 that wolves used howling to advertize their presence to other packs so that they could avoid meeting face to face.¹ Mech's radioed wolves allowed the researchers to check their reaction to human howling even when the wolves didn't answer.² Without the radio collar, it could be assumed that no wolves were present. When howled at, wolves sometimes didn't answer and almost always moved away. When they did answer they either stayed where they were or moved a very short distance away. Mech found that wolves deep within their territory or those near a fresh kill did not leave and tended to howl a response, usually led by the alpha male or female. If on the periphery of the territory and/or near a kill that was almost totally consumed and about to be abandoned anyway, they howled and moved away. Lone wolves usually did not answer and almost always moved away from the human unless they too were guarding a fresh kill. Mech's study, then, reinforced Joslin's conclusions.

Howling also helped separate animals from the same pack locate each other. Howling was found to be more likely to get a response in the fall when the pack was reforming after a summer of moving with the

¹Joslin, Paul W.B., "Movements and Home Sites of Timber Wolves in Algonquin Park," American Zoologist, 7(May, 1967), 288.

²Harrington, Fred H. and L. David Mech, "Wolf Howling and Its Role in Territory Maintenance," Behaviour, 68, No's. 3-4, (1978), 225.

pups stashed at rendezvous sites, and again in February when the breeding season started. Mech also found that occasionally a wolf approached him. The wolves did not always make their closer presence known by noises in the bushes or howling and barking. Without the radio collars, Mech might not have known of their approach. He concluded that it was usually alpha animals, especially the males, that approached. He felt strongly that the wolves treated human howls as they did those coming from strange wolves, and the alpha animals took the initiative in investigating contacts with outsiders. As Mech stated in 1968: " 'Because of all the advantages of radio tracking, it probably should be considered the single most important technique ever developed in the study of vertebrate natural history and ecology.'"¹

¹ Mech, L. David, "Radio Tracking," Natural History v.77:5 (May, 1968), p. 24.

XI: PUBLIC OPINION

In 1974 four wolves were killed by humans in Michigan.

In the long association between humans and wolf, that fact was hardly worth noting. Encounters between humans and wolves often ended in the wolves' death. But these were not native Michigan wolves; they had been transplanted from Minnesota.

The Michigan and Minnesota Departments of Natural Resources, the U.S. Fish and Wildlife Service, Northern Michigan University, the Huron Mountain Wildlife Foundation, and the National Audubon Society cooperated to make the translocation project possible. L. David Mech of the U.S. Fish and Wildlife Service had supervised the trapping of wild wolves near International Falls, Minnesota by a professional trapper. They were drugged, weighed, measured, fitted with radio collars, and shot full of vitamins, antibiotics, and inoculated against distemper and rabies. Then they were airlifted to Michigan, where, after a period of observation in a holding pen, they were released in March, in northern Marquette County. Three of the four were from the same pack and travelled together. The fourth, the second female, remained separate from the others.

They were tracked daily from the air by the Michigan contingent of scientists for this project: Thomas Weise, William Robinson and Richard Hook, of the University of Northern Michigan Biology Department.

The local papers carried enthusiastic accounts of their movements. Although wild, they travelled during the day as well as at night and were seen by local residents. In July one male was killed by an

automobile and the other was shot. The female of the pack was caught in a coyote trap and killed by the trapper on September 20th. In November the lone female was killed by a deer hunter. The researchers concluded that the wild wolves could be successfully relocated and would stay in the general area living off the deer population. They had all gained weight since their release. As the authors of the report on this experiment concluded:

The reason for the failure of the experimental wolves to re-establish themselves was direct mortality by human beings.... This mortality probably is related to two factors, negative human attitudes toward wolves and accessibility of humans to wolf range.¹

So ended the latest of four attempts to relocate wolves. In 1952 four zoo raised wolves were released on Isle Royale. Three of the four were shot by Park officials when they became a nuisance hanging around cabins and harassing tourists.² In 1960 four captive raised young adult wolves were released on the uninhabited Coronation Island off the coast of Alaska, where they successfully established themselves.³ Five wolves were relocated from the Naval Arctic Research Laboratory at Point Barrow to near Umiat, Alaska in 1972.

¹Weise, Thomas F.; et. al., An Experimental Translocation of the Eastern Timber Wolf, Audubon Conservation Report No. 5, (St. Paul, Minnesota, U.S. Fish and Wildlife Service, Region 3, 1975), p 26.

²Allen, Durward, Op. cit., p. 17-18.

³Mech, L. David, The Wolf, p. 65.

They all travelled in a direction back toward Barrow, perhaps because they could home in on the airplane traffic there. Three of the five were shot by humans when they approached too close to villages. The fourth made it back to Barrow, and the fifth remained unaccounted for.¹

The researchers involved in the Michigan attempt used wild wolves (which the trapper would have killed for their fur otherwise) hoping they would avoid humans. Indeed the researchers and the wolves in the Michigan experiment were well prepared for the project. Unfortunately the people of northern Michigan where the experiment was to take place, were not. While there was publicity about the experiment and a certain amount of public support, the old stereotypes persisted. There was fear the wolves would wipe out the deep population. The Northern Michigan Sportsmen's Association opposed the idea of the transplant, and a Baraga County Wolf Hunters Association was formed which offered an illegal reward of \$100 to a person killing a wolf.² Michigan maintained a bounty on coyotes and deer hunters as well as trappers took them. Most people could not distinguish between the two. Earlier researchers had suggested the bounty and public ignorance as major reasons the native Michigan wolf population failed to maintain itself.³ There had been no sightings of two or more wolves together there in a number of years, and the total population

¹Henshaw, R.E. and R.O. Stephenson, "Homing in the Grey Wolf (*Canis lupus*)" Journal of Mammalogy, 55 (February, 1974), 234-237.

²Weise, Thomas F., et. al., Op. cit. p. 26. ³Ibid.

was thought to be around a dozen animals.

The question of public relations was to remain an important one for wolf researchers. It was not as though nothing had changed in the time since the Biological Survey had so successfully eliminated the wolf as a threat to livestock. Lois Crisler wrote a book in 1958 about the wolves she and her husband raised in Alaska.¹ Jerome Hellmuth raised a wolf as a house pet with his family, which he chronicled in a book published in 1964.² Crisler published a second book in 1968 about her unsuccessful attempt to keep the five Alaskan wolves in captivity in Colorado.³ In 1976 Marika Lumi detailed the good times as well as the unhappy ending to her husband's attempt to raise an arctic wolf on the outskirts of Toronto.⁴

All of these attempts to change the image of the wolf paled beside the impact of a single book published in 1963, Farley Mowat's Never Cry Wolf.⁵ Mowat and the publisher marketed it as a true account of his research in the wilds of northern Canada in 1948 as a research biologist with the Canadian Wildlife Service. He had been assigned to study the impact of wolf predation on the

¹ Crisler, Lois, Arctic Wild. (New York: Harper & Row, 1958).

² Hellmuth, Jerome, A Wolf in the Family (New York: New American Library, 1965).

³ Crisler, Lois, Captive Wild (New York: Harper & Row, 1968).

⁴ Lumi, Marika, Wolf...Kill! the Wilderness Called Shunka (Toronto: Van Nostrand Reinhold, 1976).

⁵ Mowat, Farley, Never Cry Wolf, (New York: Dell, 1963).

declining barren ground caribou. Mr. Mowat had a knack for presenting material in a humorous way while still getting his point across. Unfortunately in this case the scientific community of Canada did not appreciate his license. He caricatured the Wildlife Service as a bumbling bureaucracy staffed by indifferent incompetents. While they advocated an extensive poisoning program to eliminate wolves, Mowat alone recognized the true problem to be human hunting pressures. At the same time the picture of wolf home life Mowat presented was guaranteed to gain the sympathy of all who read the book. He gave the wolves names like George, Uncle Albert, and Angeline, and had them surviving almost totally on mice in the summer after the caribou migration removed that prey. After painting a rosy picture of their close-knit family life, he ended with a short one page epilogue which read in part:

In early May of 1959, one of these officers landed at Wolf House Bay. He remained in the vicinity for some hours and placed a number of cyanide "wolf getters" in appropriate places near the den, which, so he ascertained, was occupied. He also spread a number of strychnine-treated baits in the vicinity.

He was unable to return at a later date to check on this control situation, because of the early onset of the spring thaws.

It is not known what results were obtained.¹

To have these gentle anthropomorphized wolves they had come to love, so callously and needlessly destroyed by an inept government official, angered many readers to the point of writing the Wildlife

¹Mowat, Farley, Op. cit., p. 176.

Service in protest.

Needless to say, the reviewers in the professional literature were not kind to Mr. Mowat's book. A.W.F. Banfield, who headed the research project on which Mr. Mowat was employed for six months, wrote a detailed refutation of Mowat's attack on the Wildlife Service.¹ He pointed out that George, Angeline, and Uncle Albert could hardly be expected to have survived eleven years from 1948, when Mowat observed them, to when the supposed poisoning took place in 1959. Actually no poison was used in that area at that time and the officer was on a data gathering mission in April of 1959. He concluded his review:

Much of the book consist (sic) of a fascinating embellishment of Mowat's observations on the home life of a wolf pack. It is certain that not since Little Red Riding Hood has a story been written that will influence the attitude of so many towards these animals. I hope that the readers of Never Cry Wolf will realize² that both stories have about the same factual content.

While Never Cry Wolf may have had the most impact on the public image of the wolf of any book, it could not compare to the immediate effect of a single television program. First aired on NBC on November 18, 1969, "The Wolf Men" showed in graphic detail how wolves were killed by bounty hunters from airplanes.³ Caught in the open on

¹Banfield, Alexander W.F. "Never Cry Wolf: Review", Canadian Field Naturalist, 78 (1964), 52-54. ²Ibid.

³Erickson, David L. and G. Norman Van Tubergen, "The Wolf Men", Journal of Environmental Education, 4 (Fall, 1972), 26.

large frozen lakes or treeless tundra the wolves had no place to hide and no chance to outrun the plane. The film left the false impression that all wolves wherever they occurred were in danger of immediate extinction.

"The Wolf Men" was shown by 181 NBC affiliated stations and was viewed in twenty one point one per cent of all U.S. television equipped households.¹ Thousands of letters were written by viewers. The Governor of Alaska, the Bureau of Sport Fisheries and Wildlife, and Metro-Goldwyn-Mayer, producer of the film, each received around 5000. Almost all wanted wolf hunting and the payment of bounties stopped. In a letter to NBC, Congressman John P. Saylor said:

"The Wolf Men" ... created one of the greatest outpourings of spontaneous grassroots, public support for the protection of an endangered species of wildlife that I have had the pleasure of witnessing during my twenty years as a member of the House of Representatives.²

Largely as a result of this program, legislation was introduced into Congress on December 10th to outlaw the hunting of certain birds, fish and animals from airplanes.³

The growing awareness of the public that the wolf was an animal worth preserving, in its own way, presented problems for researchers and government officials responsible for wildlife management. In

¹Erickson, David L. and Van Tubergen, Op. cit., p.26. ²Ibid.

³Ibid.

Minnesota the wolf thrived largely in roadless wilderness areas inaccessible to humans. In Alaska, the human population was sparse. The public came to identify the wolf with wilderness as Murie had in 1944.¹ As David Mech pointed out in Europe wolves lived in close proximity to humans and it was the lack of all-out persecution that permitted this. The wolf did not have to have wilderness areas for survival, but if it was totally protected in the U.S. and spread its range into areas of human livestock grazing, there would be unacceptable economic losses to stockmen.

An interesting survey of public opinion on wolves was conducted at the Minnesota State Fair in 1972.² The permanent fair grounds are located in the "Midway" district bordering St. Paul and Minneapolis. The Fair regularly attracts over one million visitors in its ten day run each August. People visiting a wolf display containing a stuffed wolf were asked to use a computer terminal to answer questions about wolves. A total of over sixteen hundred people used the computer. People from the Twin Cities urban area were heavily represented, but all ages, both sexes, and both rural and urban locations from all parts of the state were included. Children under ten had the most negative attitude, believing wolves were dangerous to people and should be

¹Murie, Adolph, The Wolves of Mount McKinley, p. 29.

²Johnson, Roger T., "On the Spoor of the Big Bad Wolf" Journal of Environmental Education, 6 (Winter, 1974), 37.

eliminated. Children from the northern part of the state, the wolf country, feared wolves the most. People over age thirty-five were the highest group with most unfavorable views about wolves. Again those from the northern part of the state had the highest percentage of unfavorable attitudes about the wolf. But over all, and even in the North, over seventy per cent of the adults between ten and eighteen and eighteen and thirty five felt the wolf was no threat to humans or deer populations and should be protected.¹

The difficulties for those responsible for management of the wolf became apparent in Minnesota in 1977. In June of that year, the U.S. Fish and Wildlife Service asked for public comment on a proposal to change the status of the eastern timber wolf in Minnesota from endangered to threatened.² The state was to be divided into five zones. Wolves were to be totally protected in Zone one. This included the extreme northeastern part of the state, roughly north and east in a line from International Falls through Ely to Taconite Harbor on Lake Superior. No wolves were to be killed within this zone. Zones two and three were also declared critical habitat for the wolf but government officers could kill animals known to have killed livestock. There was little livestock in Zones two and three and no wolves exist in Zone five, the southern two-thirds of the state.

¹Johnson, Roger T., Op. cit., p. 39.

²Llewellyn, Lynn G., "Who Speaks for the Timber Wolf?" North American Wildlife Conference Transactions, 43 (1978), 442.

Most wolf control operations would be limited to Zone four, an area covering roughly from Duluth to Lake of the Woods. This was the area into which an increasing wolf population was drifting from its primary areas further to the northeast, and livestock was present in greater numbers. The proposal was considered acceptable to scientists and both state and federal agencies.

In the two months allowed for public comment over a thousand letters were received by the Office of Endangered Species of the U.S. Fish and Wildlife Service.¹ About 700 came from Minnesota and the rest represented thirty eight states and the District of Columbia. Of the comment from areas outside Minnesota only representatives of state fish and game departments and some conservation organizations were favorable to the plan. All letters from the public were completely against any change in the wolf's status in Minnesota. There seemed to be a lack of understanding of the Endangered Species Act and a belief that once the animal's status changed, there would be no protection for it whatsoever.

The letters from Minnesota showed strong polarization and evidence of several organized letter writing campaigns. Twelve per cent came from urban areas and the rest from rural. Overall twenty-three per cent of the letters favored keeping the wolf on the endangered list, and seventy per cent wanted it removed from federal regulation

¹Llewellyn, Lynn G., Op. cit., p.442.

altogether and returned to total state control. Only seven per cent were in favor of the proposal to change its status. On a geographical basis, the farther people lived from the areas actually inhabited by wolves, the more favorably disposed toward the wolf they were, and the more they wanted the endangered status kept. Of urban letter writers seventy-eight per cent wanted to keep the status quo, while seventy-seven per cent of the rural comment supported complete declassification. The proposal, while it pleased very few of the public who responded, became the best compromise between such highly polarized groups.

The wolf, as always, continued to fire people's imaginations. The images created by Never Cry Wolf and "The Wolf Men" took their places beside "Peter and the Wolf" and "Little Red Riding Hood." Infused with the larger social and political issues of citizen control of public policy, government agency accountability, and the question of state versus federal jurisdiction, any wolf management decisions in the future were guaranteed to remain an area of controversy.

CONCLUSION

*just
behavior?*

This history of the study of wolves in North America has shown that in the twentieth century the wolf was studied first as a "varmit" of no small economic importance that had to be eliminated before it destroyed the livestock industry. And whatever else can be said about the wolf, there is no question it killed livestock. Men such as Vernon Bailey and Stanley Young reported on the observations of government trappers in the field and on their own efforts at killing wolves, and their efforts were entirely successful. If we now look back from a different viewpoint and find we are disgusted by the discussion of killing methods used and the illustrations of dead wolves in Young's books, perhaps we should reflect that we humans have not treated wolves any more callously or inhumanely than we have other humans in the twentieth century's armed conflicts.

When the wolf was eliminated as a threat to livestock, the emphasis changed to its threat to game species. If national parks and preserves were not to be run as herbivore sanctuaries, then some understanding of the relationship of predator and prey was necessary. Sigurd Olson and Daniel Thompson in the U.S., and Ian Cowan, Alexander Banfield, and A. De Vos in Canada provided some of the early studies, but often samples were small, and the real thrust of research was the effect on the game specie involved. *Behavior?*
not a biologist!

It was really in the 1960's that researchers focused on the wolf itself. Since then the number of researchers with their special emphases and

different philosophies have increased. Douglas Pimlott and Paul Joslin preferred to accustom the wolves of Algonquin Park to human presence around den and rendezvous areas so that the wolves could be personally observed. L. David Mech used radio tracking and more recently remote television transmission in northern Minnesota. On Isle Royale with its thousands of tourist-hikers in the summer, Durward Allen's policy was to give wolves as much privacy as possible. Robert Rausch in Alaska had access to carcasses turned in for the bounty, and specialized in population studies contrasting hunted and protected populations.

Developments in the field of psychology also affected studies of the wolf. The 1960's was a time when the place of humans in the natural world was being questioned. As more came to be known about social insects, primates, and wolves, the definition of what set humans apart and made them unique in the animal kingdom became clouded. The study of the evolution of human behavior led to comparisons with other social species, including the carnivores. W. Michael Fox and Erich Klinghammer have been active in such studies, building on the work of Konrad Lorenz, Rudolf Schenkel, and Erik Zimen in Europe.

Enough research was under way in 1967 that the entire May issue of the American Zoologist was devoted to state of the art papers. There were fifteen contributions on the Canid family from twenty-six researchers. In September 1973 the International Union for Conservation and Natural Resources sponsored the First Working Meeting of

Wolf Specialists and the First International Conference on Conservation of the Wolf at Stockholm.¹ Two years later wolves were the subject of a symposium held in May at the Annual Meeting of the Animal Behavior Society.² By this time the field had matured enough to have its own jargon and abbreviations.³

The results of all this research have slowly filtered down to the public. Most of the major researchers have written articles for non-professional, popular wildlife type publications in an effort to help the public get a truer picture of the wolf.⁴ Douglas Pimlott instituted public wolf howls in Algonquin Park in 1968. Since then over six thousand people have thrilled to hear a wolf pack respond to the sound of a human howl. And since wolves have re-established themselves in other Canadian parks, where they had earlier been eliminated, the program has expanded.⁵

¹Pimlott, Douglas H., (ed.) Wolves: Proceedings of the First Working Meeting of Wolf Specialists and of the First International Conference on Conservation of the Wolf, Stockholm, September 5-6, 1973. (Morges, Switz., IUCN, 1975).

²Klinghammer, Erich, (ed.) The Behavior and Ecology of Wolves: Proceedings of the Symposium on the Behavior and Ecology of Wolves held 23-24 May, 1975. (New York, Garland STPM Press, 1979).

³e.g.: RLU is the abbreviation for Raised Leg Urination, a characteristic behavior of dominant animals.

⁴See bibliography for specific citations under Allen, Mech, Pimlott and Theberge.

⁵Carbyn, Ludwig N. "Wolf Howling as a Technique to Ecosystem Interpretation in National Parks", in Klinghammer, Erich, ed., The Behavior and Ecology of Wolves (New York, Garland STMP Press, 1979), p.460.

Partly as a result of Konrad Lorenz's ideas about submission and aggressive behavior and Mowat's Never Cry Wolf, a new mythical image for the wolf has evolved. One can wonder how much the Vietnamese Conflict and the "back to nature" movement of the 1960's influenced the emerging popular image of the wolf as a species that was friendly, cooperative, and nonviolent among its own kind. The wolf became in the popular mind a social animal that managed to control its own numbers and did not make war against its own kind.

At the same time in areas where wolves still exist public relations have become a problem to be reckoned with by government managers and researchers alike. It is difficult for the average person to think in terms of geologic time, to realize that the norm of the natural world is change.

For example, three hundred years ago it was woodland caribou that inhabited northern Minnesota and white tailed deer were rare. Nineteenth century logging radically changed the habitat to the detriment of caribou and moose, and to the benefit of the deer. Residents of this century remember only the huge deer herd and the many years of hunter success. Now the forests are maturing once again. The moose are making a comeback while the deer decline. When wolves were bountied, the deer thrived; now wolves are protected, and the deer decline. How easy it is to blame the wolf alone for the problem. To recommend intensive logging of wilderness areas or the

acceptance of a smaller deer herd raises a flurry of protest.

Yet the scientific study of wolf predation has proved frustrating and demands all kinds of qualifications. Under some circumstances wolves can have a major effect, at other times and places little if any, on prey population levels. The wolf, like the cockroach and the human, survives by being adaptable to prevailing conditions.

All that can be said for certain is that we still know very little about wolves in the wild. Captive wolf packs seem to behave substantially like wild wolf packs, but vary in details. It is hard to know how much captivity affects the captives' behavior, and how much absence of such behavior in wild animals reflects lack of enough time to observe them rather than any real differences.

Researchers realize that knowledge is built up in fits and spurts. It does not form a symmetrical pyramid leading to an ultimate pinnacle. It is more like branches growing from the trunk of a tree. So far there is no ideal wolf tree.

Perhaps David Mech, who has studied wolves in the wild for over twenty years now, said it best in an article on animal behavior in International Wildlife. After howling to the wolves in northern Minnesota and getting a response, he was asked by Jean Craighead George what the wolves had said. "I don't know," he replied.¹

¹George, Jean Craighead. "Consider the Ones Who Lead," International Wildlife 9 (September-October, 1979), 42.

If the researchers will not commit themselves to a definitive picture just yet, they have provided the basic information on which more popular authors have based books in the 1970's. Ewan Clarkson in Wolf Country describes the ecology of Isle Royale in terms of a business ledger.¹ Each animal borrows what it needs to survive and with its death repays the account by providing food for other plants and animals to live. Barry Lopez in Of Wolves and Men examines the myths and the various realities held by researchers, trappers, native Alaskans, and those who have lost animals to wolves.² There have been books to set the record straight for children, but they tend to satisfy adults more than their intended audience. None can beat "Little Red Riding Hood" for drama.

The public with its new found awareness demands more of a say in wolf control policy. Government agencies are hard put to justify their actions, when the public believes all wolves, everywhere, are in immediate danger of extinction. Alaska only recently had its right to eliminate wolves in a given area by aerial hunting vindicated in a federal Court of Appeals.³

¹Clarkson, Ewan, Wolf Country; a Wilderness Pilgrimage (New York: Dutton, 1975).

²Lopez, Barry Holstun, Of Wolves and Men (New York: Scribner, 1978).

³Bozeman Daily Chronicle (February 24, 1980) p. 18:1.

Perhaps, most of all, in an increasingly urbanized society the wolf is a symbol of a previous age, and of a more simple human existence. It stands for the primitive, and is closely associated in the popular mind with wilderness. As much as we would like to believe that management decisions can be based on rational discussion, with a firm foundation on scientific studies, there is subtle evidence of the emotional hold the wolf has over us. At the University of Minnesota the James Ford Bell Museum of Natural History has a series of dioramas depicting the native wildlife of the state.

There is a tape at the Bell Museum of Natural History which softly, below conscious level, plays bird calls and natural sounds as the people move around. Near the middle of the tape, the bird calls stop and just as softly the cry of a pack of wolves sounds. Activity seems to stop and people, adults and children alike, look up from what they are doing and glance over their shoulder.¹

¹Johnson, Paul T. "On the Spoor of the Big Bad Wolf," Journal of Environmental Education 6:2 (Winter, 1974), 39.

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