

The Ecology of the Timber Wolf
(Canis lupus Linn.) in Southern
Manitoba - Wilderness, Recreational
and Agricultural Aspects.

by

Edward Leslie Hill

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE

Department of Zoology
Winnipeg, Manitoba
R3T 2N2

THE ECOLOGY OF THE TIMBER WOLF
(Canis lupus Linn.) IN SOUTHERN
MANITOBA - WILDERNESS, RECREATIONAL
AND AGRICULTURAL ASPECTS.

BY

EDWARD LESLIE HILL

A dissertation submitted to the Faculty of Graduate Studies of
the University of Manitoba in partial fulfillment of the requirements
of the degree of

MASTER OF SCIENCE

© 1979

Permission has been granted to the LIBRARY OF THE UNIVER-
SITY OF MANITOBA to lend or sell copies of this dissertation, of
the NATIONAL LIBRARY OF CANADA to microfilm this
dissertation and to lend or sell copies of the film, and UNIVERSITY
MICROFILMS to publish and abstract of this dissertation.

The author reserves other publication rights, and neither the
dissertation nor extensive extracts from it may be printed or other-
wise reproduced without the author's written permission.

ABSTRACT

The ecology and recreational value of timber wolves (Canis lupus) in the Wallace Lake area and the extent of wolf predation on cattle in agricultural regions of Manitoba were examined during 1973-1975 in an effort to evaluate the ecological, recreational and economic status of wolves in Southern Manitoba.

A population of approximately eleven wolves occupied the 563 km² Wallace Lake study area resulting in a density of one wolf per 51 km². Examination of 203 wolf scats from the study area showed that moose, white-tailed deer and beaver comprised 89.5% of the wolves' diet. Beaver was the primary prey species during summer while moose and deer were utilized heavily during the winter. There was no shift in the wolves' diet to young ungulates during the summer.

Post-mortem examinations of 21 wolf carcasses collected by trappers from scattered locations throughout Southern Manitoba revealed the majority were in good nutritional condition with light parasite loads and few pathologic abnormalities. Sixteen of 20 wolves aged were less than one year old.

A questionnaire survey of 126 summer visitors to the Wallace Lake study area indicated a large majority was interested in hearing and seeing wolves, and 73.6% would have been willing to participate in organized programmes on wolf biology had these been available.

A questionnaire mailed to 1,059 cattle owners yielded a 49.2% return. Of those, 19% had lost livestock to predators of all species during the last five years. Only 1.8% had lost a total of 19 calves and one sheep, attributable to wolf predation during 1973-74. It was concluded that livestock losses to timber wolves in Manitoba were minimal.

ACKNOWLEDGEMENTS

I wish to express my appreciation to Dr. W. O. Pruitt Jr. for his supervision and assistance during the study and preparation of this thesis. The members of my committee, Dr. J. M. Stewart, Dr. R. R. Riewe and Dr. K. W. Stewart provided advice and criticism.

Assistance with statistical and computer problems was provided by Dr. B. D. MacPherson of the Statistics Department and Mr. M. Shooter of the Computer Science Department, University of Manitoba. Dr. L. Lillie of the Veterinary Laboratory, Manitoba Department of Agriculture performed the post-mortem examinations. Mr. D. Schmale of the provincial Department of Agriculture provided a list of cattle owners in Manitoba.

I gratefully acknowledge the financial support provided by the Wildlife Research Section of the Manitoba Department of Mines, Natural Resources and the Environment and the Canadian Wildlife Service. I would also like to thank the Canadian Wildlife Service for awarding me the Terrestrial Biology Scholarship for 1974. Special thanks are due to Dr. M. Shoesmith, Mr. D. I. McKay and Mr. D. Stardom of the Wildlife Research Section for their interest and assistance with this project.

Special appreciation is extended to Mr. Bill Conley, prospector and trapper, of Bissett, Manitoba. Without his

assistance, companionship and expertise the field work would have been very difficult and much less enjoyable.

My family spent an inordinate amount of time on this study. My mother, Mrs. Julia Hill cheerfully spent many hours typing early drafts of the thesis. I am especially grateful to my wife, Bonny, whose assistance in the field and in the preparation of this manuscript, patience and encouragement made the completion of this project possible.

Mrs. Bonnie Lenton prepared the figures for the thesis.

To these people and many others not named above I extend my sincere appreciation.

TABLE OF CONTENTS

	Page
ABSTRACT	i
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	viii
LIST OF FIGURES	ix
INTRODUCTION	1
LITERATURE REVIEW	4
MATERIALS AND METHODS	37
STUDY AREA	37
METHODS	40
Populations	41
Food Habits	43
Post-Mortem Examinations	48
Aging	49
Questionnaires	50
Tourist Questionnaire	50
Farmer-Rancher Questionnaire	51
RESULTS	54
WOLF POPULATIONS	54
UNGULATE POPULATIONS	57
SCAT ANALYSIS	60
General Food Habits	60
Specific Food Habits	62
Staple Food Items	62

	Page
<u>Alces alces</u>	62
<u>Odocoileus virginianus</u>	67
<u>Castor canadensis</u>	68
Incidental Food Items	68
Non-Food Items	68
STOMACH ANALYSIS	68
POST-MORTEM EXAMINATIONS	70
QUESTIONNAIRES	72
Tourist Questionnaire	72
Farmer-Rancher Questionnaire	74
DISCUSSION	83
POPULATIONS	83
GENERAL FOOD HABITS	85
STAPLE FOOD ITEMS	87
INCIDENTAL FOOD ITEMS	91
<u>Rangifer tarandus caribou</u>	92
<u>Ondatra zibethicus</u>	93
<u>Marmota monax</u>	93
<u>Tamiasciurus hudsonicus</u>	94
<u>Microtus pennsylvanicus</u>	94
<u>Lepus americanus</u>	96
<u>Ursus americanus</u>	97
<u>Canis familiaris</u>	97
<u>Canis lupus</u>	97

	Page
AVES	99
OSTEICHTHYES	100
INVERTEBRATA	101
VEGETATION	101
NON-FOOD ITEMS	102
WOLF-HUMAN INTERACTIONS	102
Recreational (Tourist Questionnaire)	102
Economic (Farmer-Rancher Questionnaire)	104
CONCLUSIONS	110
MANAGEMENT RECOMMENDATIONS	112
LITERATURE CITED	119
APPENDICES	127

LIST OF TABLES

	Page
Table 1. Percent frequency of occurrence and percent frequency of occurrence as a major item (M.I.) of specific food items found in 203 scats collected between April, 1973 and June, 1975	63
Table 2. Percent frequency of occurrence and percent frequency of occurrence as a major item (M.I.) of food items found in 13 stomachs	69
Table 3. Reported livestock losses to predators between 1969 and 1973	76
Table 4. Reported livestock losses to predators between 31 March 1973 and 31 March 1974 ...	78

LIST OF FIGURES

	Page
Fig. 1	Map of study area showing its location in Manitoba 38
Fig. 2	Map of study area showing aerial survey lines 42
Fig. 3	Map of southern Manitoba showing area sampled by Farmer-Rancher Questionnaire 52
Fig. 4	Map of study area showing sightings of timber wolves and suspected wolf-kills 55
Fig. 5	Map of study area showing woodland caribou sightings 59
Fig. 6	Percent frequency of occurrence and percent frequency of occurrence (M.I.) of the major food groups in 203 scats collected between April, 1973 and June, 1975 61
Fig. 7	Seasonal and annual percent frequency of occurrence (M.I.) of beaver, moose and white-tailed deer 66

INTRODUCTION

The timber or grey wolf (Canis lupus Linn.) at one time had a circumpolar distribution in the Northern Hemisphere. It was found in all Northern Hemisphere habitat types with the exception of certain desert areas in the western and southwestern regions of the United States and tropical rain forests (Goldman, 1944). In North America the wolf's range extended from the High Arctic Islands to the southern end of the Mexican Plateau (Goldman, ibid.). Wolves now occupy approximately half of their former range in North America (Theberge, 1973). The remnant populations outside Canada and Alaska are very small and geographically limited.

Men and wolves have seldom co-existed peacefully. The wolf is a predator of large mammals and this has led to conflicts, either real or imagined, with man's utilization of game animals and husbandry of domestic livestock. The belief that wolves prey on humans has also contributed to the fear and hatred that man has felt for the wolf. As a result, wolves have been exterminated in much of their former range.

As in other areas of North America, the wolf in Manitoba has been subjected to bounty and poison campaigns in an attempt to lower the population and hence the presumed conflict with man. In Manitoba wolves have been restricted primarily to the boreal forest "wilderness area" of the province with

small outlying populations existing in Riding Mountain National Park and Spruce Woods Provincial Park. Wolves are occasionally seen in agricultural Manitoba. Although there is no longer a provincial bounty on the wolf, it is still classified as a predator and is therefore unprotected throughout the year except in wildlife refuges and Riding Mountain National Park.

In recent years the public attitude toward predators has changed. Increases in both the sport-hunting value and the commercial value of predators have resulted in increased hunting and trapping pressures. At the same time, the aesthetic and intrinsic values of predators have been recognized and the wolf has become a symbol of "wilderness". Because of their increased aesthetic and commercial values, there is now a greater need for "management" of wolves and other predators than for control. Management of predators requires information on the biology of the species, on their effects on agricultural operations and on their effects on other wildlife species.

Few data have been collected on wolves in Manitoba except in Riding Mountain National Park where a detailed study of wolf ecology is presently being conducted as part of a large mammal systems study (Carbyn, pers. comm.). Records of track occurrences, rough population estimates and some reports of predation on livestock have been presented in regional reports by the Manitoba Department of Renewable Resources and Transportation Services (R.R.T.S.). This,

however, is not an adequate basis for making management decisions of potential biological and economic impact on wolf populations.

I undertook this study to provide some basic data on the ecology of timber wolves in Manitoba. The primary objective of my study was to examine the ecology of timber wolves in the Wallace Lake area. The secondary objective was to examine some aspects of the relationship between man and wolves. This involved evaluating: 1) the effects of wolves on cattle-rearing operations in agro-Manitoba and 2) the attitudes of tourists in a wilderness area (Wallace Lake) to wolves. The data collected in this study were used to formulate recommendations for a wolf management policy for Manitoba.

LITERATURE REVIEW

Timber wolves evolved as pack-hunting predators of large animals. They possess physical and behavioral characteristics which have adapted them to this niche. The adaptations which enable them to capture large ungulates render them inefficient as hunters of small animals. Studies in North America have shown that timber wolves depend on large ungulates for their primary food source. Although wolves consume a wide variety of small mammals, birds, fish, invertebrates and vegetation, beaver (Castor canadensis) is the smallest species they prey on regularly. There is a large recent body of literature concerning the interaction of wolves with moose (Alces alces), deer (Odocoileus sp.) and beaver.

Pimlott et al. (1969) observed that wolf food habits studies in North America have shown that there is an "optimum prey species" in every area. That is, one species provides the majority of the wolves' diet. They suggested that a combination of prey characteristics such as density, escape and defence capabilities and habitat physiography determine the "optimum prey species" of an area.

Wolves concentrate on the smallest or easiest prey to catch when two or more species of large prey inhabit the same area (Mech, 1970). Peterson (1955) found that wolves preyed more heavily on white-tailed deer (Odocoileus virginianus) than on moose in the St. Ignace Island area of

Ontario. Despite the fact that moose were much more abundant, he found that their remains occurred in only 36% of the scats collected while deer remains were found in 57%. Cowan (1947) reported that mule deer (Odocoileus hemionus) contributed more to the diet of wolves in Jasper and Banff National Parks than the deer population size would suggest. He found that deer kills were approximately half as numerous as elk (Cervus canadensis) kills although only about one third as many deer as elk were seen. Pimlott et al. (1969) also found that deer were the preferred food of wolves in Algonquin Park, Ontario.

The feeding habits of timber wolves shift with changes in prey populations (Murie, 1944; Voigt et al. 1976) and also with the seasonal availability of prey. When one prey species becomes scarce or unavailable, such as beaver do during the winter, they concentrate on other species. An important seasonal change in the diet of wolves is the shift from adult to infant ungulates during the summer.

FOOD HABITS OF WOLVES

MOOSE

The wide distribution of moose in North America has made them the primary ungulate prey of wolves in many areas. Moose is also an important game species, a situation which has led to real and imagined conflicts between humans and wolves over the utilization of moose.

The importance of moose to the diet of wolves depends upon the availability of alternate food sources. Murie (1944) found that barren-ground caribou (Rangifer tarándus) was the major food source of wolves in Mount McKinley National Park and moose remains were identified in only nine of 1,174 scats. Cowan (1947) noted that while moose were fifth in abundance in the total game population of Jasper and Banff National Parks, they were the third item in importance in the wolves' diet (7% of 420 scats). Pimlott et al. (1969) expected that moose would be the predominant food item following a decline in the deer population in the Marten River area of Ontario. However, the occurrence of moose remains in scats was only 17% while deer was 42%. Burkholder (1959) observed a pack of 10 wolves in Alaska for six weeks and found that, of 22 kills, 14 were caribou and eight were moose. Stephenson and Johnson (1972) and Stephenson (1975a) found that moose were the primary prey of wolves in south-central Alaska.

The wolves in Isle Royale National Park in Michigan rely on moose and beaver for their food supply. Moose are the only ungulates found on the island. Mech (1966) found moose remains in 75.9% of 438 summer scats and Shelton (1966) found that moose comprised 86% of summer food items occurrences. Beaver remains were found in approximately 11% of the summer scats collected during these studies. The summer predation pattern on Isle Royale changed in the early 1970's due to an increased beaver population and a decrease in moose productivity.

Beaver became the principal food source for the wolves during the summer, occurring in 76% of the scats examined in 1973 (Peterson, 1975). Moose have remained the major winter food source for the wolves.

Selection of Moose

Mech (1966) found that the predation efficiency (per cent of moose "tested" that were killed) of wolves on Isle Royale was 7.8%. Shelton (1966) found the total predation efficiency of wolves on Isle Royale over five years (his study and Mech's) was 8.1%. The low predation efficiency of wolves suggests that they must search out moose which are more vulnerable to predation than the majority of the population. A number of factors including age, sex, debilitating conditions, winter severity and range conditions have been found to influence the susceptibility of moose to predation by wolves.

Predation by wolves is usually concentrated on calves and relatively old moose. Studies of the summer food habits of wolves have shown that calves often comprise the majority of moose eaten during that season. Mech (1966) found that 75% of identifiable occurrences of moose remains were calves. Pimlott et al. (1969) found that calves comprised 88% of the occurrences of moose remains. Frenzel (1974) also found a very high proportion of calf remains in summer wolf scats.

Moose, especially calves, were a major item in the summer diet of wolves in south-central Alaska (Stephenson, 1975a).

Because it is impossible to discern whether food items found in scats are obtained through predation or scavenging, it is difficult to determine the significance of this high occurrence of calf remains. If the wolves are feeding on dead calves or calves that would have died of other causes they would not affect the population significantly. However, if they were preying on young animals which would otherwise survive, they could be a significant limiting factor.

LeResche (1968) found that in one area in Alaska the greatest mortality among moose calves occurred during the first five months after birth. During that time, 56% of the calf crop was lost. The greatest mortality, approximately 26%, occurred within two weeks of parturition. Causes of mortality included drowning, entrapment by vegetation, abandonment, injuries inflicted by the mother and predation. Gasaway et al. (1977) estimated calf mortality in another area of Alaska to be 40 - 50% from parturition to six weeks and 60 - 70% by six months of age. They believed wolf predation to be the most probable cause of this high mortality rate.

Moose between the ages of one and seven years are usually not affected by wolf predation (Mech 1966). Winter studies have shown that calves and older animals (eight years and older) bear the brunt of wolf predation. Burkholder (1959)

determined the ages of seven moose killed by wolves and found that six were calves and one was a yearling. He did not notice any selection for age among 14 caribou killed by the same pack during the observation period. Mech (1966) found that calves composed 15% of the moose population on Isle Royale during his three year study. However, calves comprised 36% of 50 observed winter kills and approximately 47% of 36 kills made by the large pack of 15 wolves. No wolf-killed moose between the ages of one and seven years were found. Moose eight years and older comprised 46% of the winter kills. Shelton (1966) in a later study, examined 28 kills made by the large pack and found that 79% were eight years or older. Fourteen per cent of these kills were calves despite the fact that he estimated that calves made up approximately 17% of the late winter population. This low representation of calves may be explained by the fact that in 1962 he missed at least three kills (probably calves) by the big pack. Wolfe and Allen (1973) found that 32% of the 44 wolf-killed moose they examined, also on Isle Royale, were calves.

Mech (op. cit.) and Shelton (op. cit.) found a strong selection for female moose on Isle Royale during February and March (67% and 65% respectively), assuming the sex ratio was even. Shelton (ibid.) reported that the sex ratio of all adult moose killed or eaten by wolves, including those found in spring, summer and fall, was 18 males: 19 females.

Furthermore, the sex ratio of all remains, young and adult, for which sex could be determined, was 23 males: 25 females. On the basis of this information, Mech (1970) suggested that wolf predation on bull moose was concentrated during some period other than February and March. Wolfe and Allen (1973) however, did not find this selection for cows in later studies on Isle Royale. Stephenson and Johnson (1972) found that five of nine wolf-killed moose they examined in Alaska were adult females but that adult females were the most abundant group in their study area.

Debilitating factors such as malnutrition, parasites and pathological conditions may increase the vulnerability of moose. It is difficult to find evidence of physical disabilities in wolf-killed animals because the carcass is usually completely consumed or nearly so by the time it is discovered. As Mech (1970) pointed out, it is also difficult to determine the effect of various debilitating factors on vulnerability when the incidence of these factors in the population is unknown.

Moose are subject to a wide range of diseases and parasites, many of which seem to have been acquired in North America from contact with livestock and native deer of the genus Odocoileus (Anderson and Lankester, 1974). Sylvatic echinococcosis is common in Canada and the northern United States wherever moose and wolves co-exist. Anderson and Lankester (ibid.) briefly reviewed the literature on

Echinococcus granulosus and found general agreement that increasing numbers of pulmonary hydatid cysts increase an animal's vulnerability to predators and other stresses. Mech (1970) found a much higher rate of infection in a small sample of wolf-killed moose than in animals that died of other natural causes.

Mech (ibid.) reported that 21% of 61 wolf-killed moose on Isle Royale had moderate or severe granulomatous lesions in the manibular region which may have been the result of actinomycosis or food impaction. Although the effect of such infection in moose is unknown, Murie (1944) found that it was an important factor in predation in Dall sheep (Ovis dalli) between two and eight years of age.

Peek et al. (1976) found that all mortality appeared to be concentrated on calves, yearlings and the oldest animals in a Minnesota moose population. Cerebrospinal nematodiasis (Parelaphostrongylus tenuis) was found to be the cause of death in 23 of 34 moose which died of natural causes. Moose which died of nematodiasis were under five years of age. Peek et al. (ibid.) suggested that the presence of this parasite in the population might alter the age structure of wolf-kills by predisposing relatively young moose to predation.

Mech (1970) suggested that malnutrition, as evidenced by fat-depleted femur marrow, may increase the vulnerability of moose to wolf predation. The marrow of eight of 54 wolf-killed adult moose on Isle Royale was fat-depleted. Studies