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THE CONSERVATION OF THE WILD LIFE OF CANADA

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From a painting by Carl Rungius. Reproduced by courtesy of the New York Zoological Society

THE CONSERVATION OF THE WILD LIFE OF CANADA

BY

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DOMINION ENTOMOLOGIST AND CONSULTING ZOÖLOGIST

WITH NUMEROUS ILLUSTRATIONS

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PREFACE

When Gordon Hewitt came to Ottawa in the fall of 1909 to enter upon his duties as Dominion Entomologist, he fully expected to return to Manchester University in a year or so, there to continue his researches in entomology and his lectures in zoölogy; but the call of Canada was not to be ignored: he found work for a giant to do and he bent himself to his task.

Ten years of life in office were allowed him, and, during that time, he had the satisfaction of developing the Dominion Entomological Service from a small division, attached to the Experimental Farm, to a separate branch of the Department of Agriculture, with four divisions at Ottawa, and twelve laboratories throughout Canada, organized for the purpose of watching, combating and forestalling insect injury to forests and crops. Quarantine stations were also established to prevent the importation of foreign pests. For this work, trained, scientific men were required, and here his enviable talent for selecting the right man for the place, and in using his powers to the full stood him in good stead. Indeed, the relation that existed between my husband and his associates was like that which animates a group of friends, where each one gives the best that is in him and looks for the best in others—a bright record in Civil Service history of loyalty and disinterestedness. Commenting on his remarkable faculty of choosing his associates and attaching them to himself and his schemes, Doctor W. M. Wheeler wrote: "The truly remarkable record of development and public service exhibited by Doctor Hewitt's department during the decade of his administration was clearly due to the unusual abilities of the man. Combin-

ing a thorough training in zoölogy with rare gifts as an investigator, executive talent of a high order, and sympathetic insight into the achievements of other workers, not only in entomology, but in biology generally, he could not fail to secure the affection, as well as the confidence and admiration of all the men, and particularly the young men, whom he had chosen as aids in building up his department."*

In 1916 he was offered and accepted the position of Consulting Zoölogist. His duties were thus enlarged, and his sphere of useful activity appreciably increased. For the new work he was especially fitted, as Doctor Wm. T. Hornaday says: "His broad mind reached out, and grasped the whole invertebrate fauna of the vast region embraced in the Canadian Dominion." † His sphere of influence extended beyond the Dominion, again quoting Doctor Wheeler: "Realizing that very many of the native and introduced animals, and the economic problems to which they give rise, are identical in Canada and the northern United States, he took an actively constructive part in all deliberations, wherever men were assembled in either of the sister commonwealths, to discuss practical matters relating to our insects, birds, and mammals," and by accepting the position of Canadian representative on the International Commission for the Protection of Nature his work became world-wide.

Inspired by Doctor Hornaday, and encouraged by Mr. James White, he commenced to write this book, which occupied much of his spare time during the last four years of his life. As he wrote the book at home in the evenings, I became familiar with it, chapter by chapter, for he liked to read aloud what he had written; also, before writing, he was eager to discuss present needs and future developments. Evening after evening in his library, easy chairs on either

* *Journal of Economic Entomology*, vol. XIII, no. 2.

† The statement of the Permanent Wild Life Protection Fund, vol. III.

side of the fire, a low table beside him, holding paper, reference books, and the indispensable tin of "John Cotton," while snowstorms might rage without, in imagination he was able to roam with the bison or musk-ox on the sunny plains, to climb the peaks with the mountain goat, or to hear the songs of birds in sanctuaries made safe by his effort. The facts and conclusions herein contained were gathered and matured throughout days of action, research, and travel, when he followed the pressing needs of the country, and attacked problems as they presented themselves, never resting until they were solved, and then, unsatisfied, merely using success as a stimulant to greater effort.

Pages could be written of his work in preparing and in drafting what is now known as the Northwest Game Act, and, after the bill was introduced in Parliament, of his watchful support of the measure until all opposition was overcome and it became law. The Migratory Birds Treaty also tested his powers; international and interprovincial arrangements and compromises had to be made, and the successful completion of this important treaty bears witness to his courage and diplomacy. During these and other less important negotiations, he would travel many miles for a single interview; he was thankful when the cause, supported and enforced by his persuasive powers, won the day, and he was willing to try again when they failed. How rarely they failed! The appeal of his winning personality and his earnest desire to help usually carried conviction.

As an example of his sincerity, and of his willingness to carry out whatever he asked others to do, before publicly advocating individual and community effort in wild life conservation, he hung nesting-boxes in the trees, and supplied an original water bath in his own garden. Little homes for bumble-bees were carefully tucked under the

lilac hedges and berry-bearing shrubs were planted. The following spring he had the reward of being able to count fifteen nests and the visits of thirty-four species of birds.

His love of nature was not merely sentimental or theoretical. He was an enthusiastic, practical gardener—he liked to dig in the soil and to spread manure. He planted with the precision and skill of an artist; he sowed seeds with equal zest; and, after a rain, he loved to fork around, and thus to make each bulb, perennial, or vegetable "comfortable." Nor were the poetical accompaniments of the craft ever absent. Morning and evening—before his office hours and after—he walked around the garden, bathing himself in greenness, and in the odour of lilacs, roses, and new-mown grass. Then it was he spoke to every flower and bird, no matter how small or how shy, and held converse with the chipmunks and squirrels, who held a safe tenure within the garden precincts.

After his immediate community was convinced of the need of bird conservation, and Rockliffe Park and the Experimental Farm became sanctuaries, he went farther afield: in every province in the Dominion he addressed meetings on the subject of the conservation of our wild life.

This is but a short record of the ideals which led to the making of this book, and of the character of him who wrote it. A great deal might be said by me in faithful and thankful acknowledgment of that character, but which would, in the end, seem to me cold and inadequate. I can, therefore, only take refuge in the words of another, one who valued him level with his deserts, who truly recognized his wonderful gifts, and who appreciated the way in which they were ever employed for the brightening of this world. I quote from the memoir by his friend, Duncan Campbell Scott, in the proceedings of the Royal Society of Canada:

"His death was tragic in its suddenness. He had at-

tended the meetings of the Commission of Conservation, at Montreal, on February 19 and 20, at which he presented an important paper on 'Fur-bearing Animals, Their Economic Significance and Future.'

"Soon after his return to Ottawa, on the 20th, he was taken seriously ill with influenza; this soon developed into pleural pneumonia, and he died about 11 P. M., on February 29, 1920.

"He seemed to be on the threshold of a long career, in which added years would bring even greater success, and would fulfil all that he was destined to accomplish. His gifts were varied, and his sympathies deep and general. He touched life at so many points that one cannot think that his interest ever flagged. His knowledge and appreciation of the arts and *belles lettres* were finely balanced by a warm love of nature, and this led him into enthusiasms for our wild life. His ideal habitation was always surrounded by a garden, and every foot of soil was made to yield either use or beauty. There was in all his work a rare combination of earnestness, with lightness of touch. Highly characteristic, too, was a fine sense of humour, which kept all things in their proper relation. His personality was of that even bearing that finds the best in all men, and gives duly the best in itself. Even his casual acquaintances had sorrow when he died. To those who knew him well there will remain a deep regret; to those who received fully the intimate charm of his personality in familiar intercourse there cannot be any mitigation of his loss, for he was a peerless friend."

ELIZABETH HEWITT.

ROCKLIFFE PARK, OTTAWA.

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In the preparation of this book I have been encouraged by the assistance, so willingly given, of many of my colleagues and friends who have furnished data or have otherwise helped me in my endeavour to make the volume both accurate and informative. It would be impossible to mention every one to whom I am indebted for assistance, but I should like to express here my grateful appreciation of the assistance of the following: Many of my colleagues in the government service, particularly Mr. James White, Assistant to Chairman, Commission of Conservation; Mr. J. B. Harkin, Commissioner of Dominion Parks, and Doctor R. M. Anderson and other members of the staff of the Geological Survey; the officers in charge of the game-protective service of the various provinces, and Mr. F. Kermode, Director of the Provincial Museum, Victoria, B. C.; Doctor Henry Fairfield Osborn, President of the American Museum of Natural History; Mr. E. W. Nelson, Chief of the United States Biological Survey; Doctor W. T. Hornaday, Director of the New York Zoological Gardens, the staunch defender of the wild life of this continent, who has been a constant source of help and encouragement; Mr. Charles Sheldon; and many others. The courtesy of Rudyard Kipling, in giving permission to use the quotation from his poem, "The Feet of the Young Men," is hereby acknowledged.

C. G. H.

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THE CONSERVATION OF THE WILD LIFE OF CANADA

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CHAPTER I

INTRODUCTION

Canada is the home and refuge of the most important and desirable wild animals of this continent. The southern portion of that wonderfully rich and interesting North American fauna that everywhere greeted the early explorers and settlers in the United States has melted away before the advancing tide of settlement like snow, and only in the inaccessible places and in a few protected spots has the harried remnant found greater security and an irretrievable loss been prevented. The northern part of the continent was less tempting to the earlier settlers and more hospitable to its native wild life. The impenetrable forests, trackless wilderness, and mountains of Canada afforded a sanctuary to the greater part of the wild life of the continent, and retarded settlement has proved its salvation. The people of the United States now mourn the loss of their wild life and are endeavouring to rescue the remnant from complete extermination, realizing how great an asset it is to the country and the significance of its depletion. A young country enjoys the advantage of being able to profit by the mistakes of older countries. It lies within our power to preserve for ourselves, but more particularly for posterity for whom we hold it in trust, the wild life of this country. It rests with us to prove that the advance of civilization into the more remote sections of Canada does

not imply the total destruction of the wild life, but that civilization in its true sense signifies the elimination of the spirit of barbarism and the introduction of an enlightened attitude.

The problems, therefore, confronting us involve a knowledge of the following questions: Of what does our wild life consist; what is its value; what are the factors that are responsible for its reduction and ultimate extermination; what steps are we taking to conserve it, and how can we improve on present methods with a view to conserving a valuable natural resource, the constituent parts of which cannot be replaced once they are lost? In the succeeding chapters these questions will be considered. It is felt that a presentation and discussion of the status of the wild life of Canada will afford the best means of securing that wide sympathy of the people throughout the Dominion that is essential to the success of any measures that have already been taken or may be adopted in the future with the object of conserving this resource. While in this matter of wild-life conservation we have much to regret in the past, we have reason to be proud of the efforts that we are now making to remedy past mistakes, and a more general realization of our opportunities to improve our national life and welfare through these means will undoubtedly lead to further efforts. It is desirable that, before proceeding further, the classes of animals to be considered in the inquiry should be specified. The term "wild life" naturally includes all the members of our native Canadian fauna, but it is obvious that the term must be restricted for our present purposes for the sake of adequate treatment and to avoid digressions into well-recognized groups of our fauna. Strictly speaking, it would include the game, non-game, and fur-bearing mammals, the game and non-game birds, the fishes and other members of our fauna. The conservation of our fishes will not be considered here; it has been the subject of

MAP SHOWING THE EXTENT TO WHICH CANADA IS NOW THE STRONGHOLD OF THE MAJOR PORTION OF THE LARGER MAMMALS OF NORTH AMERICA (After Hornaday)

discussion by the Commission of Conservation in other reports. In its report on "Fur Farming in Canada" the Commission has presented a fairly complete statement regarding the fur-bearing mammals of the country, and there is no necessity to duplicate the facts so presented. For that reason the fur-bearing mammals will not be considered at length, but only in so far as their conservation in the wild state necessarily constitutes an important aspect of the general problem of wild-life conservation. In this account it is proposed to deal in particular with the larger wild mammals, many of which are commonly included under the head of "big game," and the birds of Canada, inasmuch as these animals constitute that portion of our native fauna that is in the greatest need of adequate protection with a view to preventing the extermination that will inevitably follow failure on our part to provide it.

Nature has laid on the shoulders of the Canadian people an obligation, and at the same time an opportunity, of a peculiar character in so far as the preservation of the wild life, not of this hemisphere alone but of the whole world, is concerned. In the gradual evolution of the great land masses of the earth's surface it has come about that by its geographical situation and physical characteristics the greater part of Canadian territory constitutes a distinct faunal region, differing from other regions of the world by reason of the fact that it contains certain species of animals not found elsewhere. In some cases these animals are related to forms in other regions of the world; in other cases they are distinct and unrelated. In the Canadian region, to mention a few of the larger forms of wild life, we find the moose (*Alces machlis*), which is related to the elk* of

* It is unfortunate that the word elk has come to be used in North America as an alternate name for the wapiti. As popular names must naturally be used for these animals, it seems very desirable to confine the name elk to the European *Alces* or moose, and use the Shawnee name, wapiti, for *Cervus canadensis*.

northern Europe and Asia; the wapiti (*Cervus canadensis*), which is closely allied to the red deer of the old world, and the caribou (*Rangifer* species), which very closely resembles the reindeer of northern Europe. The bison or buffalo is related to the European bison, which has suffered a serious reduction in numbers and is now confined to the primæval forests of Lithuania, Moldavia, Wallachia, and the Caucasus, where it is artificially preserved.* The mountain-sheep (*Ovis* species), so characteristic of our Western mountains, are well represented in the old world, the centre of their habitat being the immense mountain ranges of Central Asia. The musk-ox (*Ovibos moschatus*) is an animal allied to the sheep family, that is particularly distinctive of our region of the world, ranging as it does over the barren grounds and arctic regions of the north and eastward to Greenland. The Rocky Mountain goat (*Oreamnos montanus* and its sub-species) is found only in the Rocky Mountains. Finally, the most interesting of all our mammals is the prong-buck or antelope (*Antilocapra americana*), which forms by itself a distinctive family of the ungulate or hoofed animals. It is entirely confined to a region comprising a portion of the Prairie Provinces and the Western States. While it is allied in certain respects to the antelopes of the old world, it is unique among all hollow-horned ruminants by reason of the fact that, like the members of the deer family, it sheds its horns every year.

* According to Dr. Theodor G. Ahrens, "The Present Status of the European Bison or Wisent," *Journal of Mammalogy*, vol. 2, no. 2, May, 1921, pp. 58–62, the Lithuanian herd numbered 170 or 180 in 1918, but after the German revolution it seems that all or nearly all the remaining bison were shot by the inhabitants and the retiring German soldiers, among whom discipline had been undermined by the revolution. Later the war between Poland and Russia passed over the region. Since the Russian revolution the Kuban Cossacks have demanded the return of their old hunting grounds in the Caucasus, so that extermination of the bison in that region is also to be feared. Besides the few introduced specimens still extant in Pless and possibly in Ascania Nova there remain a few specimens in zoological gardens. Summing up, he concludes that the extinction of the species is imminent. —R. M. A.

Certain of the foregoing animals extend their range southward into the United States, but Canada is their natural habitat and in Canada they attain their maximum development, apart from the fact that in the United States they have been seriously reduced in many instances.

Our responsibilities in the matter of the conservation of these animals are therefore unmistakably clear. It is our bounden duty to prevent the extermination of all but the noxious species on the higher grounds of our obligations to the people of other countries, as guardians of our portion of the wild life of the world, and to future Canadians, the heirs of a region so richly endowed.

CHAPTER II

THE VALUE OF WILD LIFE TO THE NATION

In order to secure the interest and active support of the people of Canada in the conservation of our wild life, it is necessary at the outset to indicate as clearly as possible the economic significance of such measures as are now being taken and of those that should be adopted with a view to the preservation of our native animals. A consideration of this aspect is not rendered necessary by any lack of appreciation on the part of Canadians generally as to their moral obligations in this matter or because reasons of sentiment carry no weight. It is rendered necessary largely on account of the rapid opening up and development of the country, and because such development comes into direct conflict with the ability of many important forms of our wild life to survive.

Utilization of Non-Agricultural Lands.—The basic industry of Canada is agriculture, and the extension of this industry involves the bringing under cultivation of new areas of land which were formerly the home of our wild life. Therefore, in order to justify on economic grounds the conservation of our wild life its economic value as compared with agriculture in the first place must be set forth.

Not all lands are suitable for agriculture. Even in the best agricultural sections of the country areas unsuited to agriculture occur. In some cases, as will be shown later, such areas have been set apart as forest reserves; in other cases a struggling population endeavours to eke out a meagre existence on the sparse products of the unfertile soil. The problem of the best method of dealing with such

non-agricultural lands has already received some consideration by our governments. In the future it will demand more attention than we have hitherto thought necessary. And it is here primarily that the practical application of the principles of wild-life conservation should receive serious attention, for it will afford one of the most important methods by which the unproductive or scarcely productive areas can be rendered productive. However, it is of the gravest importance to remember this, that while the question as to the utilization of such lands is under consideration we do not permit the means whereby their productiveness can be secured, namely through the taking advantage of the presence of our wild life, that is, by the utilization of our natural resources, to disappear through our neglect to appreciate at the present time their potential value to the community at large.

Deer as a Meat Supply.—One of the most serious problems of the present day is the gradually increasing cost of food, particularly meat. Every effort is being made to increase mixed farming and to encourage the live-stock industry. And yet a potential source of meat is left to the mercy of sportsmen or gunners and their dogs. I refer to our native deer, and particularly to the white-tailed deer which frequents the Canadian woods and forests east of the Rocky Mountains. Here is an excellent meat animal which is hardy, and with proper protection, by which is meant the prohibition of unwarranted slaughter, will increase rapidly in numbers. There are hundreds of square miles of land unsuited to agriculture, and forest land that might be producing not only timber but meat also, and in every way such production would be profitable.

That such an idea is not theoretical but eminently practical is demonstrated by the experience of the State of Vermont. In common with the adjoining States the people in Vermont some years ago had reduced the numbers of

white-tailed deer, formerly so abundant, to the verge of practical extermination. So far as could be ascertained the species was practically extinct in Vermont by 1870. In 1875 thirteen white-tailed deer, comprising six bucks and seven does, were procured by a number of sportsmen of Rutland, Vt., and liberated in the forests adjoining that city. For twenty-three years none were killed, except a few that were illegally shot. They increased in numbers and were sufficiently abundant by 1897 to permit the establishment of a short open season, when 150 were shot. Their increase during subsequent years is indicated by the figures given by Hornaday.* "In 1901, 211 were killed; in 1902, 561; in 1905, 791; in 1907, 1,600; in 1908, 2,208, and in 1909 the grand total was 5,261. For the year last mentioned, 1909, the average weight of the deer killed was 155 pounds each, which for some reason was far below all preceding years, and suggests an error.† The total weight of venison taken was 716,358 pounds. Computed at the lowest reasonable valuation, twelve cents per pound, the total value for 1909 would be $85,962."

As the deer gradually spread over the State they did some damage to agricultural crops, and it was wisely decided to compensate the farmers for such damages. Such a practice is followed in England in the case of damage inflicted by foxes which are preserved for hunting purposes. During the two years, 1908 and 1909, the total amount paid in damages was $4,865.98, and the value of the total number of deer legally killed during those two years was $107,790, which indicates the soundness of the policy of indemnification.

The example of Vermont is a valuable object-lesson. There is no reason why a similar policy should not be

* "Wild Life Conservation," p. 106.

† In the years 1905 to 1908 the average weights ranged from 196 to 207 pounds.

adopted throughout eastern Canada, where we have large areas that are unproductive so far as the food supply is concerned and where deer will thrive abundantly, as it constitutes their native home. On economic grounds the possibilities of the wild meat supply should receive the serious consideration of the provincial governments and of the people. We cannot afford to neglect so valuable an opportunity. It involves nothing more than a sane and judicious protective policy, adequately extended and applied. It would mean that our non-agricultural areas would be made productive and our forest areas more productive.

Development of Northwestern Territories.—How often has our pride in the possession of so enormous an area as Canada comprises been touched to the quick by the reminder that our vast undeveloped Northwest Territories and barren lands are practically unproductive, if we leave out of consideration the fur trade, which has seriously diminished. But there is no reason for depression. On the contrary there is every ground for confidence in the potentialities of our northern territories and their profitable development, provided we will adopt the correct attitude towards the conservation of the wild life of those territories. The economic development of northern Canada is dependent upon the proper conservation of the wild life of that section of the Dominion. If adequate measures are adopted to conserve upon proper lines the game and fur-bearing animals of those portions of the Northwest Territories unsuited to agriculture, and such portions constitute by far the greater part, there is no reason why the whole of that area should not be productive and contribute to the wealth of the country. The possession of such territories would become a matter of pride rather than of reproach.

How is it possible to regard the countless numbers of caribou that inhabit those regions, and to which fuller reference will be made later, except as an inestimable food sup-

ply? In view of the fact that the fur-bearing animals of the north furnish not only luxuries but also necessities, what greater opportunity could we have of establishing the fur-bearing industry on a sound, practical basis? It was not without reason that furs constituted the first lure that attracted the outside world to Canada. This country contained the greatest variety of valuable fur-bearing animals, for the possession of which men risked everything, including their own lives. Now our agricultural lands constitute that lure, but the remnant of those fur-bearing animals is still with us. Conservation of our natural resources is taking the place of exploitation. We should apply the doctrine to the fur-bearing animals and thus secure their full value to the community. And it cannot be stated too often that conservation means the protection of natural resources from injudicious exploitation and their provident utilization. Our northern territories, under proper administration, could become not only a valuable source of food supply, but also one of the chief fur-producing areas of the world.

The mineral wealth in our northern territories constitutes a valuable natural resource awaiting development, and it should be remembered that such development will be rendered more possible by the presence of an adequate food supply such as I have mentioned, which fact indicates another economic aspect of this problem.

Barren-ground Caribou as Source of Meat and Clothing.— The development of a "wild" food supply, by which I mean the caribou in our northern territories from the Labrador coast to the Yukon, would fulfil three objects: First, it would supplement the meat supply from domesticated animals and add to the area of productive land in the country. Caribou furnishes one of the finest of meats, and under proper protection and adequate supervision there is no reason why we should not in the future develop a caribou meat industry, and export frozen caribou from the north.

Secondly, it would furnish an important means of subsistence to those whose work carried them into those regions where transportation and food supplies constitute a serious problem. If reindeer could be employed for hauling purposes they would prove superior to dogs, owing to their ability to find food available, such as the northern mosses and lichens, whereas the food question in the case of dog transport is always a serious one. Thirdly, the presence of such a food supply would enable us to keep those regions populated to a greater degree than would be otherwise possible, thus facilitating the task of developing those areas to the extent that their valuable natural resources, particularly minerals, render desirable. The musk-ox is also an animal of undoubted potential value in the development of our northern and arctic territories, and its utilization is discussed in later chapters.

Relation of Natives to Wild Life.—The necessity of a native food supply in northern Canada demands serious consideration. Among the important aids at the present time in the utilization and development of the northern territories are their natural inhabitants, the Indians, and, to a lesser degree, the Eskimos. Further, our moral obligations to the Indians render it necessary that means shall be taken to ensure them an adequate food supply and a potential source of revenue. This opens up the large question of the relation of the Indians to wild-life conservation to which further reference will be made later. But it cannot be too often remarked that the Indian, when unspoiled by white men, is traditionally a conserver of wild life, that is, he uses it but does not exterminate it. The Indians and the Eskimos knew what the results would be if they conducted a policy of extermination, and they took common-sense precautions accordingly. The Indians had their traditional hunting-grounds, and under the guidance of the recognized trading companies, particularly the Hudson's Bay Company,

they were careful not to exterminate in any area the fur-bearing or game animals. This policy continued until the advent of the independent fur trader—the "free trader" and hunter—who observed no law and whose whole aim was to secure the greatest quantity of furs by the quickest method regardless of the future. The effect of men of this type on the attitude of the Indian towards wild life was what one might expect, but we cannot hold the latter entirely responsible for his abandonment of his former habits. The Indian will conserve wild life if he believes that it is to his advantage to do so. He is not so "red in tooth and claw" as many of those who are frequently accustomed to speak ill of him. His primitive weapons were playthings compared with the modern sporting rifles. The wild life constituted his natural means of subsistence and, with the advent of the trading companies, of revenue. In his primitive state he was merely a unit in that balance of nature that is so marvellously adjusted that while the abundance of species of animals rises and falls extermination does not follow the preying of one species of animal upon another. For such changes as have been brought about in the Indian's attitude he is not to blame, and the foregoing facts are set forth with a view to removing prejudice in the minds of those who have not seriously considered the rights of the Indians in this matter. Our obligations to them in those areas where tribes still exist who have always lived on the wild life that still constitutes a means of subsistence, cannot be overlooked or neglected in developing those regions.

Recreative Value of Wild Life.—When we come to consider the recreative value of our wild life we touch an aspect of wild-life conservation that is as universal in its appeal to the sentiments of Canadians as it is inestimable in its value to the nation. Few men there are who never feel or respond to the call of the open air, the lure of the wild; and to all those who cast aside the daily task and seek re-

freshment on mountain or prairie, in the bush or by lake or stream our wild life most commonly serves as the object they have in view.

Kipling has expressed the call of the wild in his "The Feet of the Young Men," and all Canadian sportsmen remain young:

So for one the wet sail arching through the rainbow round the bow,
And for one the creak of snow-shoes on the crust;
And for one the lakeside lilies where the bull-moose waits the cow,
And for one the mule train coughing in the dust.
Who hath smelt wood smoke at twilight? Who hath heard the birch-log burning?
Who is quick to read the noises of the night?
Let him follow with the others, for the Young Men's feet are turning
To the camps of proved desire and known delight!

Do you know the blackened timber—do you know that racing stream
With the raw, right-angled log-jam at the end;
And the bar of sun warmed shingle where a man may bask and dream
To the click of shod canoe poles round the bend?
It is there that we are going with our rods and reels and traces,
To a silent, smoky Indian that we know—
To a couch of new-pulled hemlock with the starlight on our faces,
For the Red Gods call us out and we must go!

Do you know the world's white roof-tree—do you know that windy rift
Where the baffling mountain-eddies chop and change?
Do you know the long day's patience, belly-down on frozen drift,
While the head of heads is feeding out of range?
It is there that I am going, where the boulders and the snow lie,
With a trusty, nimble tracker that I know.
I have sworn an oath, to keep it on the Horns of *Ovis poli*,
And the Red Gods call me out and I must go!

Canadian sportsmen are fortunate on account of the comparative ease with which they can satisfy their longings, owing to the proximity of good hunting-grounds to all our large centres of population. In few countries do the same conditions exist.

If we ask ourselves wherein lies the chief value of our wild life from the recreative standpoint, the reply would undoubtedly be in its relation to human efficiency. What man is there who, after months of unremitting toil, takes down his gun, rod, or camera, and, seeking the silence of the open air for a week or two, does not come back physically and mentally refreshed and remade? What can ever equal the reinvigorating effect on body and mind of days spent out in the open,

> When you steal upon a land that man has not sullied with his intrusion,
> When the aboriginal shy dwellers in the broad solitudes
> Are asleep in their innumerable dens and night haunts
> Amid the dry ferns, in the tender nests
> Pressed into shape by the breasts of the Mother birds;
> How shall we simulate the thrill of announcement
> When lake after lake lingering in the starlight
> Turn their faces towards you,
> And are caressed in the salutation of colour?
>
> —*D. C. Scott.*

Nothing can ever equal our wild life as a means of increasing human efficiency where the tendency of modern life is to work under the high pressure of city conditions. As our population increases the need will become greater, and unless every possible step is taken to conserve the wild life for the refreshment of the men of the future we shall gradually lose this unequalled source of national vigour.

So much has been written on this almost inexhaustible theme that little that is new can be said, even if a more lengthy treatment of this aspect of the value of our wild life were desirable; but its value as a means of increasing and maintaining our self-reliance and resourcefulness should not be lost sight of. Nothing calls for resourcefulness so much as the quest of wild life, when the beaten tracks of a more civilized life, where everything is provided for one, are left and one has to return to the primal competitive

habits. Resourcefulness is a characteristic of all those called upon to conquer new lands. And on no occasion has resourcefulness of such men stood them in so good stead as when the Canadians barred the way to Calais in the second battle of Ypres, or when the Australians and New Zealanders held impossible positions in Gallipoli.

CHAPTER III

THE EXTERMINATION OF WILD LIFE

One of the saddest features of the history of the wild life during recent times has been the disappearance, that is, the extermination of a number of animals that were formerly abundant. And this has taken place during a period in our history when our attitude towards such matters has been gradually changing for the better.

The pity of it all lies in the fact that once an animal becomes exterminated it cannot be replaced; it has gone forever. Many of our resources may be lost for a time, but they can be regained. Forests may be cut down or burnt, but reafforestation is possible; towns may be destroyed by fire, but better ones can rise from the ashes. It is not so with our mammals and birds. Creatures that have existed long before the advent of man disappear as a result of his recklessness, and we are the poorer for their loss.

Nowhere is our fauna so rich where man has established himself to any great extent that we can afford to permit the complete disappearance of animals. Even the total destruction of our worst predatory animals would be an unfortunate loss. In order, therefore, to understand thoroughly the principles that are involved in the conservation of our wild life, we must appreciate the causes responsible for its disappearance, and realize the extent to which species have become extinct and are becoming exterminated.

Main Causes of Extermination.—Broadly speaking, the causes of extermination may be divided into two classes: unavoidable and avoidable. To a very large extent the extermination, at least the reduction to a point bordering

on extermination, of the buffalo was unavoidable, although, as will be evident when the matter is more fully discussed later, that reduction proceeded at a pace altogether out of proportion to its necessity. The buffalo formerly ranged over what have proved to be the most valuable grain-growing areas of the North American continent. With the settlement and bringing under cultivation of those areas it was inevitable that the range of the buffalo must become so seriously restricted as to be a menace to the continued existence of this animal. Transcontinental railroads divided the herds and hindered their normal migratory movements. Settlement followed the railroads. From an economic standpoint the case was against the existence of the buffalo in anything approaching large numbers.

To a lesser extent the reduction in the number of the antelope was unavoidable, at least so far as its history in the Northwestern States and Prairie Provinces of Canada is concerned. By the extension of the wheat-lands and the gradual reduction in the areas of range country the area available for antelope was seriously reduced and circumscribed. That fact, of course, was unavoidable, and led to the further reduction by shooting, which was avoidable.

In a few cases animals have become extinct from natural causes which were, of course, unavoidable. The case of the Labrador duck (Plate I) affords an illustration of the extinction of an animal from unknown causes.

On the other hand the extermination of other creatures, particularly birds, was avoidable. The extermination of the passenger pigeon and the great auk was brought about mainly by wanton destruction, as unnecessary as one could imagine. One of the chief objects of wild-life conservation is to prevent the extermination of animals where this is avoidable and to maintain the remnant of those animals whose reduction to the verge of extermination has been brought about by causes which are largely unavoidable as

they are consequent upon the economic development of the country.

The main axiom of wild-life protection is this: A species of animal must not be destroyed at a greater rate than it can increase. Further, the preservation of any part of our native fauna depends upon the maintenance of sufficient of its normal range to permit unmolested feeding and breeding. In other words, killing for recreation or food must be wisely regulated, and the provision of refuges is indispensable.

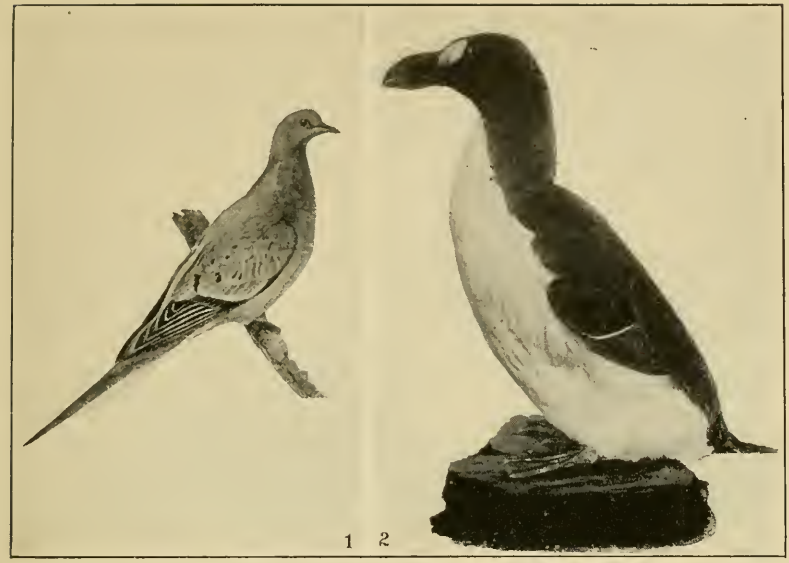
Much of the destruction that has taken place, and is taking place, is thoughtless. The remedy for that is education, supplemented necessarily by legislation. The people of the United States and Canada are energetic in whatever they undertake, whether business or pleasure. But that energy when applied to sport may be disastrous, and it must be wisely restricted by law. Hornaday has aptly described the struggle between the forces tending to destruction on the one hand and protection on the other. He says: "In every township throughout the whole United States the destroyers of wild life either are active in slaughter or are ready to become active the moment they are left free to do so. Every beast, bird, fish, and creeping thing has its human enemy. Americans are notoriously enterprising, restless, and prone to venture. It is that restless activity and indomitable nervous energy that is manfully attempting 'dry-farming' in the west, desert-farming in the southwest, and the drainage of the Florida Everglades. Often the joy of the conquest of nature outruns the love of cash returns. Apply that spirit to forests, and it quickly becomes devastation. Apply it to wild life and it quickly becomes extermination. Our conquering and pulverizing natural spirit is a curse to all our wild life."

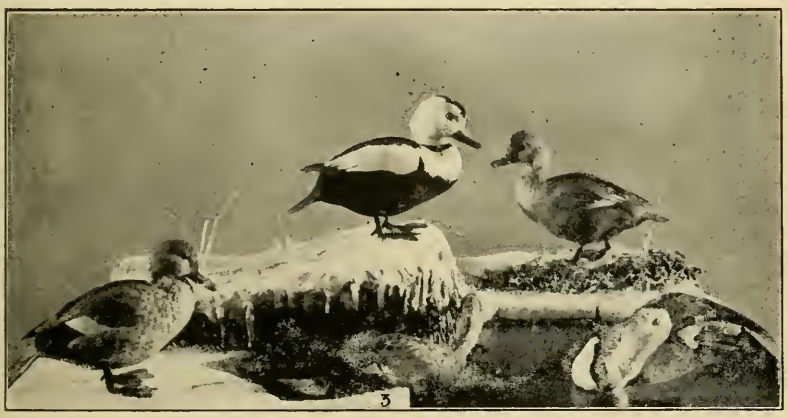
Danger in Numbers.—The very abundance of our wild life has frequently been the cause of its extermination.

Who would have thought of suggesting, less than one hundred years ago, when flocks of millions of passenger pigeons ranged over the whole United States and parts of Canada, their multitudes at times darkening the air, that in the year 1916 not a single living specimen would exist? Yet the only specimens we have are the stuffed ones and the skins in our museums and private collections. This bird was wiped out of existence for the market and for the pot. Mr. W. B. Mershon has recorded the shipment, in 1869, from the town of Hartford, Mich., for the market, of three carloads of pigeons daily for forty days, making a total of 11,880,000 birds. Another town in Michigan marketed 15,840,000 pigeons in two years. These are samples of the destruction that was taking place everywhere. No creature could withstand the effects of such slaughter.

The great auk, one of our most interesting sea-birds, related to the murres, was formerly abundant on the islands and shores of the Gulf of St. Lawrence. Easy of capture and about the size of a goose, it was killed in thousands by the crews of vessels engaged in its destruction for the sake of the oil it contained. To-day it is extinct. Few skins remain in our museums and its eggs are so scarce that they are worth about $1,200 each.

Along our Atlantic coast the Eskimo curlew (*Numenius borealis* Forst.) used to wing its way in countless myriads during its fall migration from the breeding-places in the Barren Grounds to South America. In the spring it travelled north again across the interior and swarmed over the prairies. They landed in enormous numbers on the Atlantic coast, from Newfoundland and Nova Scotia to New England. In Newfoundland their millions darkened the sky and the fishermen salted them down in barrels. Every year they were killed in thousands for the market; they suffered by reason of their excessive abundance. At the close of the





CANADIAN BIRDS WHICH HAVE BEEN EXTERMINATED WITHIN RECENT YEARS AND ARE NOW EXTINCT

1. Passenger Pigeon
2. Great Auk
3. Labrador Duck

last century ornithologists realized that this most useful and highly esteemed of our American game birds was disappearing, until in 1908 Preble stated: "It has become practically exterminated, although formerly enormously abundant and fairly common up to 1890." The market demand and the tastes of the epicures have sealed its fate. Its abundance proved to be its destruction.

As with the birds so with our mammals, and in later chapters the reduction of the buffalo and the antelope from millions to a few thousands will be described. To-day the caribou is undoubtedly in danger of a similar fate. And in fact the same is true of any animal, be it bird or mammal: so long as mere numbers are regarded as a reason for excessive killing, just so surely will the extermination of an animal follow. It should also be pointed out that when a formerly abundant animal becomes reduced in numbers the remnant may tend to herd together and thus give an impression locally of great abundance. This danger exists in the case of such a gregarious animal as the caribou. *Local* abundance, therefore, should never be taken as an indication of *general* abundance and as a reason for permitting killing in large numbers.

It is therefore of the greatest importance to realize that numerical abundance is no guarantee that an animal will not be exterminated, unless its destruction is carefully regulated and permitted to a very limited degree. The examples given are surely sufficient proof of this fact, and should be a serious warning to us in the conservation of the more abundant species of mammals and birds.

The Various Adverse Factors.—The greatest exterminator of all wild life has always been the market hunter, caring only for the largest and most immediate pecuniary returns and utterly regardless of the future and of the rights of posterity to enjoy the wild creatures, both furred and feathered,

that our hospitable land so abundantly provided, and still provides if we will only conserve them in accordance with their needs.

Compared with the rapacity of man, the destruction of our wild life by natural factors is slight, although it must demand our serious consideration. When animals become reduced in numbers through man's improvidence, then their natural enemies which have not suffered a like diminution take an unnatural and abnormal toll. The usual balance of nature is completely upset, and the remnant is exposed to excessive numbers of their enemies. The latter increase in numbers and become emboldened in their attacks. Predatory animals, such as wolves, harry the struggling bands whose former abundance enabled them to withstand the natural onslaughts of their enemies. Therefore, when an animal is reduced in numbers, the necessity of lessening the effects of natural reduction by predatory enemies becomes an important part of any policy of protection.

In Canada forest fires constitute one of the most serious dangers to animal life. Not only do such conflagrations destroy large numbers of mammals and birds, particularly young ones, but they destroy the haunts of such animals, and in consequence any replenishing or restocking of the devastated area is impeded for some time, and in any case the conditions are never as suitable or as attractive.

It has already been pointed out that a species of animal must not be destroyed at a greater rate than it can increase. This axiom involves a number of fundamental requirements. The first of these is the necessity of safeguarding the future of the species by adequate protection of the females. When the females of game animals are killed a reduction in numbers will invariably ensue, and the decrease in the abundance of game animals, owing to the killing of the females, is now generally recognized by those responsible for the protection of game. Where the females are not protected

the chances of serious reduction and ultimate extermination are enormously increased. The second requisite in the conservation of a species of game animal is a realization of the effect that inevitably follows the killing of the most virile males. The sportsman's aim is usually to secure the finest specimen, which usually implies the largest male; in the case of deer this means the best head. If this quest is carried out to excess it may involve the destruction of the most virile animals to an extent that would affect the general virility of the local stock of game with the obvious results. The stock would undergo degeneration, and the destructive effects of natural factors would be correspondingly enhanced. The remedy for this state of affairs is regulation as regards the number of males that may be killed, and the maintenance of a virile nucleus by means of protected refuges. The latter remedy will be considered more fully in a later chapter.

Apart from inadequate protection, which is an avoidable factor in ultimate extermination, great reduction in numbers has been brought about in the case of our wild fowl, such as ducks and geese, by the extension of agriculture in various parts of the country, but particularly in the Prairie Provinces. The drainage of swamps and natural breeding-places has been an important factor in the reduction of our supply of wild fowl. And these birds have been gradually pushed further afield from their former breeding-places. The remedy for this state of affairs, so far as a remedy can be applied, is the reservation of areas unsuitable for profitable agriculture as refuges and breeding-places to secure as abundant a local supply of birds as possible.

Inadequate protection of wild fowl during the spring has been one of the chief causes of an avoidable character of the great reduction in the numbers of ducks, geese, and shorebirds. Spring shooting, had it been permitted to continue —by international action, of which I shall speak later, it

has been wholly prohibited—would not only have reduced the numbers of wild fowl as a whole to seriously small proportions, but would undoubtedly have led to the extermination of certain species. Fall shooting is perfectly legitimate so long as the number that may be killed is limited by law, as it involves only the destruction of a portion of the annual increase; that is, it is using the interest on the capital stock of birds. But spring shooting implies the destruction of the breeding stock, that is, of the capital. The supporters of spring shooting either refused or failed to realize that, even though the birds, during migration, are not actually breeding, they are generally mated. Many species of ducks mate as early as February, and the killing of such birds involved the reduction of the number of birds required to maintain an increase sufficient to provide legitimate shooting in the fall without effecting a reduction in the total number.

But of all factors responsible for the enormous reduction in the numbers of our wild fowl the market gunner was one of the most serious. Absolutely devoid of any desire to conserve birds, and inbred with the sole desire to kill as many birds as possible, and in the shortest time, the market gunner was only limited by the physical impossibility of killing more than a certain number of birds per day. The great slaughtering-grounds on which our Canadian-bred birds were killed in their thousands for the markets of New York, Boston, Philadelphia, New Orleans, St. Louis, Chicago, San Francisco, and other large cities in the United States, were: Cape Cod; Great South Bay, New York; Currituck Sound, North Carolina; Marsh Island, Louisiana; the Sunk Lands of Arkansas; the Lake regions of Minnesota; the prairie regions of the Middle West; the Great Salt Lake; the Klamath Lake region in Oregon; and in southern California. To-day the number of wild fowl to be found in these places is but a small proportion of the former thou-

sands, and certain of these haunts, such as Marsh Island and Klamath Lakes, have been set aside as bird refuges.

In conclusion, let it be remembered that the extermination of any animal cannot be prevented unless such an animal is sufficiently protected to obviate the danger of its destruction at a greater rate than its natural increase.

CHAPTER IV

THE GAME ANIMALS OF CANADA

It has already been pointed out that Canada and Alaska constitute the last strongholds of the chief "big game" animals of the North American continent. Although their numbers have decreased, the larger mammals of our native fauna may still be found in fair numbers in our forests and on our mountains.

In this chapter I propose to deal with the larger members of our wild life, and to describe as briefly as possible their distribution, habits, and abundance. A knowledge of these facts is essential to an understanding of the need for their conservation, and of the steps by which this may be accomplished. This is especially important in the case of the musk-ox and the antelope, which are the two most interesting and scientifically unique of our large native mammals, and which will be exterminated within a few years unless absolute protection is given to them and rigorously enforced. Further, the great possibility of utilizing such larger members of our wild life as the barren-ground caribou and deer as a source of meat has been urged, and the facts that will be set forth in this chapter will serve to emphasize and lead to a greater appreciation of this potential food supply.

THE WAPITI, OR ELK

The wapiti or elk (*Cervus canadensis*) is the handsomest of all our native deer, and next to the moose it is the largest. It is the North American representative of the European red deer, and formerly was the most widely distributed

member of the deer family in North America. But the histories of all the largest and most interesting members of our wild life are depressingly similar, and all have suffered the inevitable result of territorial development and man's improvident greed for slaughter. Thousands of these splen-

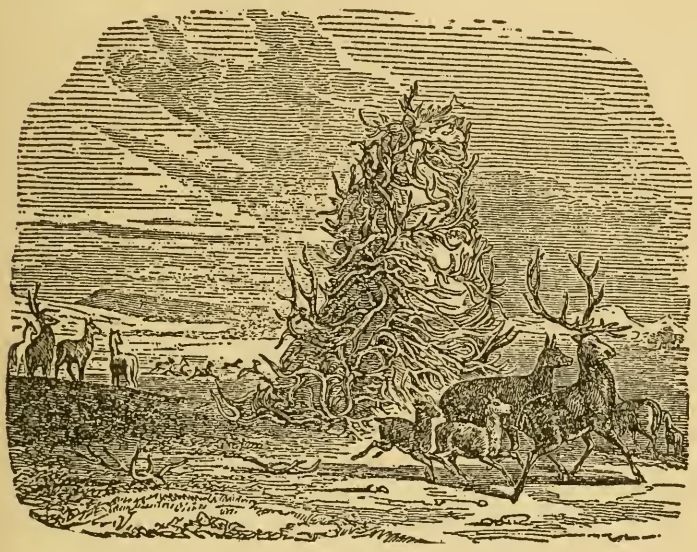


FIG. I.—ELK-HORN PYRAMID
Such pyramids used to be found in the great plains, indicating the former abundance of the Wapiti
(*After Baird*)

did animals have been slain merely for the sake of their teeth. No condemnation of this iniquitous practice can be too strong, and every possible means should be taken to put an end to the practice of dealing in and wearing elk "tusks," in view of the barbarous significance of such useless emblems. The result is that to-day the abundance of the wapiti is but one-twentieth of what it was formerly, according to Hornaday. The latest estimate of their numbers over the whole of their present restricted range in

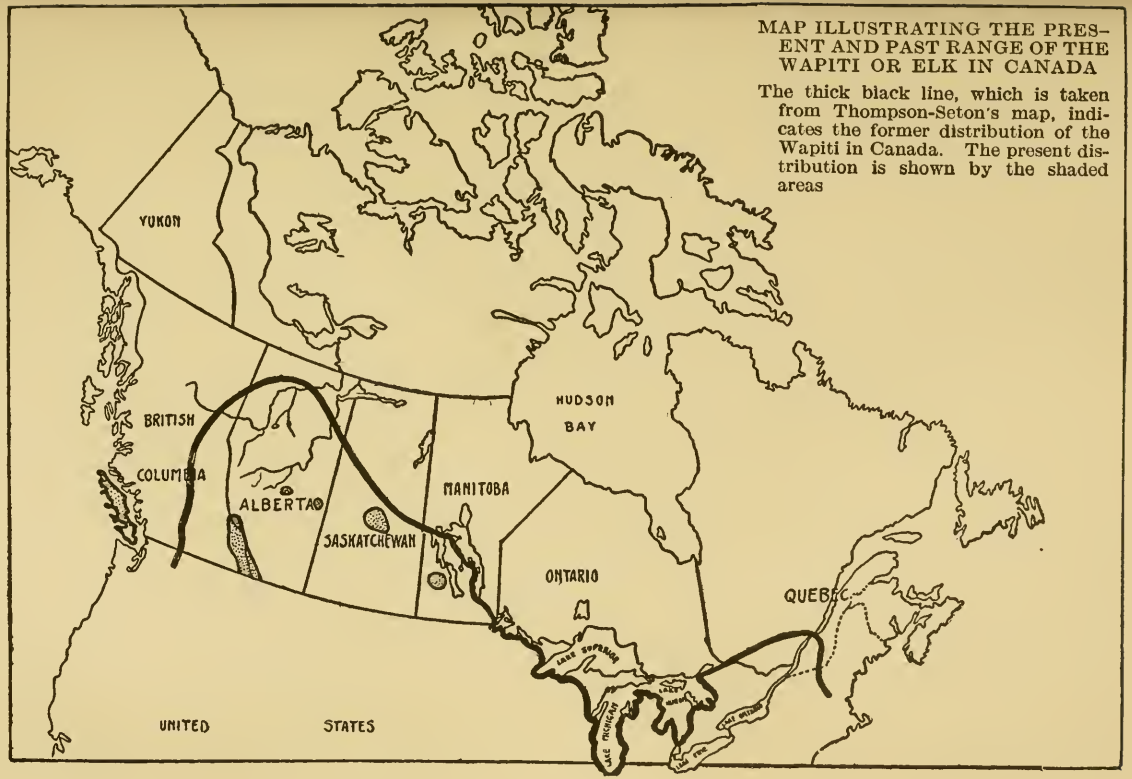
the United States is 70,000,* of which nearly half are to be found in Wyoming, mainly in and about Yellowstone National Park.

Distribution and Abundance in Canada.—Its original range is shown in the accompanying map prepared by Ernest Thompson Seton; this also shows the present range. Formerly the wapiti occupied the greater portion of the central region of the continent. They ranged from Quebec, Massachusetts, and North Carolina in the east, to the Pacific coast of California on the west, and from the Peace River region and northern Manitoba in the north, to Mexico in the south. Now they are restricted to certain regions in the Prairie Provinces of Canada, as will be described later, to British Columbia, and to Montana, Wyoming, Colorado, and the Pacific Coast States.

When Jacques Cartier ascended the St. Lawrence to Hochelaga in 1535, "stags" were found in large numbers. The region of Kingston, Ont., is marked on Champlain's map of 1632 as a region where these animals occurred in abundance. Father Lemoine, sailing on the St. Lawrence in 1653–4, found large numbers of what were undoubtedly wapiti in that region. To-day there are no "wild" wapiti east of Manitoba.

In Manitoba they must have been very abundant in the early days, judging from the large numbers of antlers that are to be found, particularly in the southern portion of the province; but wapiti were exterminated from that region of the province many years ago. To-day they are to be found fairly abundantly in the Riding Mountains, and in the territory lying between Lakes Winnipeg and Manitoba. The increased protection afforded by the Riding Mountains Game Reserve is undoubtedly helping them to increase in numbers, and, in spite of much illegal killing that has taken

* "Our National Elk Herds," by H. S. Graves and E. W. Nelson. *U. S. Dept. Agriculture, Circular No.* 51, 1919.



MAP ILLUSTRATING THE PRESENT AND PAST RANGE OF THE WAPITI OR ELK IN CANADA

The thick black line, which is taken from Thompson-Seton's map, indicates the former distribution of the Wapiti in Canada. The present distribution is shown by the shaded areas

place, Mr. Charles Barber, the chief game warden for Manitoba, informs me that they are increasing in numbers and that the females appear to predominate. He believes that there are approximately six or seven hundred animals at the present time. These are to be found in the following districts: four or five hundred are in the vicinity of the Riding Mountains, and about one or two hundred are supposed to be roaming in the territory between Lakes Winnipeg and Manitoba.

The Province of Manitoba is to be congratulated on the action it took in 1917 in amending its game laws to provide for an absolute close season on wapiti. Such a wise and public-spirited step will undoubtedly assist this most desirable game and meat animal to regain somewhat its former numbers in those portions of the province so admirably suited to its needs, and unsuitable for agricultural development.

In Saskatchewan Mr. F. Bradshaw, chief game guardian, stated in his annual report for the year ending April 30, 1916, that the Game Act has been amended to limit the bag of this animal to one male only. "This step is in the right direction," he states, "but the elk is so desperately near the danger zone that a close season for a number of years would be in the best interests of this animal. The number of elk killed this year is 200, which is a slight increase over last year's figures." In his annual report for the year ending April 30, 1917, Mr. Bradshaw reported on the wapiti as follows:

> In our last report we made reference to the fact that the elk are in danger of being exterminated, and suggested that it would be in the interests of these animals, and of all persons concerned for the future welfare of the elk, to close the season for a period of years. This is the opinion held by all game conservationists who are familiar with conditions as they prevail in Saskatchewan. Naturally if there were any objections against prohibiting the hunting of elk for a number of years

they would come from the sportsmen who hunt these animals. In order that we might have the valuable opinions of these men, the department communicated with each person reported having killed elk last season. . . . The replies received indicate quite plainly that elk-hunting is restricted to certain localities. . . . Over 90 per cent of the 175 elk killed last year were secured in townships 51, 52, 53, and 54, ranges 18 to 27 both inclusive, all west of the 2nd meridian. This appears to be the only elk-hunting ground of any account in our province, and it will take but a few years to deplete the few remaining herds, if action is not taken to save them. . . . The majority of our correspondents are of the opinion that the elk are decreasing in numbers, and unlawful hunting by Indians is given by many as a cause for this decrease.

Mr. Bradshaw informed me verbally, in 1915, that he thought the wapiti were decreasing. The number killed would indicate that Thompson Seton's estimate of 500 in 1907 was too low for the number of wapiti in this province. Mr. Bradshaw has kindly furnished me with a map showing the present distribution of the wapiti in Saskatchewan, and they appear to be confined to the following regions: Southeast of Prince Albert, in the neighbourhood of Basin and Lenore Lakes; northeast of Prince Albert, in the lake country north of the Saskatchewan River; and north of Battleford in the region between Turtle and Pelican Lakes and the Big River. In view of the comparative scarcity of this animal in Saskatchewan and the necessity of providing an absolute close season, the Commission of Conservation made strong representations to the Saskatchewan Government on the subject in 1918, and supported the local efforts to secure such permanent protection. We are pleased to record that the Saskatchewan Game Act was amended in 1919 to provide for an absolute close season in elk in that province. This will enable the wapiti to increase in a region so well adapted to its requirements.

The numbers of wapiti in Alberta have decreased, according to a report furnished me by Mr. B. Lawton, the chief game guardian, and only an absolute close season such as

the provincial government has now declared can prevent their reduction to the point of extermination.

In British Columbia the wisdom of adequate protection has been demonstrated by the increase of the wapiti, both on the mainland and on Vancouver Island. The largest numbers of wapiti on the mainland are to be found in the East Kootenay and Rocky Mountains regions. The following reports by two officers of the Geological Survey of Canada have been furnished to me. Mr. R. C. McDonald, writing on December 12, 1916, states: "Near the summit of the White River and southwest of Mount Fox in British Columbia, I saw several herds of elk. This section is not within the park [Rocky Mountains Park, Alta.] boundaries, and, as it is the only place where I saw elk during the season, I consider that they should be well protected in order that they may multiply and finally find their way into the park." Mr. D. A. Nichols, writing on December 11, 1916, states: "In the section covered during 1915 and 1916 in British Columbia and Alberta, the big game, especially the elk, goat, sheep, deer and bear, were very plentiful. At the headwaters of the Palliser, Spray, Elk, and Kananaskis Rivers, the elk, which at one time were nearly extinct, are increasing rather rapidly, so that bands from ten to twenty-five were seen quite frequently. It has been rumoured that the season for elk was to be thrown open. It seems to me that they should be protected for some time to come in order that they might increase sufficiently so that they could spread out to the foot-hills where at one time they were so prevalent. In early times they roamed over the plains and foot-hills, and have only taken refuge in the mountainous sections on account of excessive hunting. Efficient protection will still have to be granted to them, for the band that I saw were so tame that we could ride up to within 150 yards of them with the saddle-horses and pack-train. If they are hunted in these valleys they

can easily be slaughtered, as the valleys are very narrow, and the elk, unlike sheep or goat, do not find sanctuary in the higher altitudes of rugged peaks. *A sanctuary of several square miles at the head of the White, Palliser, Spray, Kananaskis, and Elk Rivers would assist in preserving these bands of elk.*"

I have also received other reports of a similar encouraging nature from men who have recently visited this region.

In his annual report for 1914, Mr. Bryan Williams, the provincial game warden for British Columbia, reports on the wapiti as follows:

Reports from Vancouver Island are much more encouraging than they were. Several quite big bands and a number of small ones are known of in certain places, and these bands are larger, at any rate, than they were when the last report was written. Also calves have been reported for the first time for several years; so that there is good reason to believe that there is an increase. Now that wolves are getting quite scarce and cougars hunted more and more, the calves will have a much better chance, and the prospects for the future are much better.

Wapiti in southern East Kootenay are still doing well. In the northern part of the district wapiti have been reported in the western side of the Columbia. This is the first time such a report has been received. If it is true, and they have established themselves there, it will be a splendid thing. Years ago wapiti used to winter right along the benches of the valley, and though the lower benches of the valley are much too settled for this to happen again, there is and will be plenty of range for them for years to come along the foot-hills.

In his annual report for 1915, Mr. Williams is able to record a continued encouraging increase. He states:

In East Kootenay wapiti are still increasing, although no further reports of the small band that crossed the Selkirks have been received. On Vancouver Island there is an undoubted increase, particularly in the southern part. It will, however, be most advisable to keep a close season on these animals for a good many years yet; at any rate, on Vancouver Island, though in the Kootenay District in a year or two it may be possible to have a short open season.

In the annual report of the provincial game warden of British Columbia for 1918, a small herd of wapiti is reported pasturing around the south end of the Elk Valley Game Reserve (see p. 239) and a larger herd is known to be in the vicinity of the headwaters of the White River. Efforts to secure a short open season have proved unsuccessful, as the Game Conservation Board considers that the absence of any reports of an increase in the number of wapiti does not warrant such action.* The wapiti liberated at Bridge River, near Lillooet, are reported as doing well, and two claims for damages done by these animals to the crops of Indians in that district have been paid.

In the Dominion Parks of western Canada successful efforts are being made to increase the herds of wapiti that are protected in those areas. The following figures of their numbers in the year 1919 have been furnished me by the Commissioner of Dominion Parks, Mr. J. B. Harkin:

Buffalo Park, Wainwright, Alta	106
Rocky Mountains Park, Alta	27
Elk Island Park, Alta	(estimated) 106

The superintendent of the Waterton Lakes Park reported that in 1915 a herd of wapiti was to be seen almost any time near Turret Mountain. "This herd has increased greatly," he states, "and is now estimated at about 200 head."

In 1916 a herd of about fifty-eight animals was secured from Jackson Hole, Wyoming, by the Commissioner of Dominion Parks, with the intention of placing them in the large wapiti enclosure in Waterton Lakes Park. The wapiti previously enclosed in that park will be liberated, and by this means a beginning will be made in stocking the enormous area of the park over which this animal formerly ranged, and into the western region of which the increase

* It is to be greatly regretted that in 1919 the Game Conservation Board permitted the restricted hunting of wapiti. We feel that these animals are by no means sufficiently abundant as yet to permit hunting.

from British Columbia herds is already beginning to wander, as shown by the reports that I have already quoted.

The foregoing review of the present status of the wapiti in Canada affords ground for optimism with regard to the future of this, the most magnificent of our native deer. If the encouragement and almost complete protection that they are now receiving is continued and with the increase of public sentiment in favour of such protection—we have every reason to believe that it will be maintained—the wapiti will continue to increase in those parts of Canada most adapted to its needs and mode of life, and where it formerly existed in abundance.

Habits of the Wapiti.—The feeding habits of the wapiti vary somewhat according to the season of the year. Formerly, when it enjoyed an extensive range, it usually retreated to the wooded slopes of the mountains and other wooded regions during the summer season, and there it browsed on buds, leaves, and twigs, and grazed on such woodland grasses as it might find. It is an animal with both browsing and grazing habits. In the winter it wandered on the open prairies and grazed where the snow was not too deep. Deep snow usually compels them to seek the wooded regions. The best country for the wapiti is one which combines such summer and winter range as I have described.

During the summer the bulls lead a solitary life and by September their splendid antlers have attained their full size. They are very polygamous animals, and, at this season of the year, fully prepared for struggles with other bulls for the control of as large a band of cows as they can secure, they challenge their rivals to combat. In regions inhabited by the wapiti the wild call of the bull is an inspiring sound. Followed by his band of cows he climbs the crest of any near-by hill, and utters the well-known bugle-notes. The first guttural notes are roared out in an ascending scale

until the shrill call reaches a screaming whistle, which gradually fades away again to a few guttural grunts as the challenge is echoed down the valley. The real bugle-notes are only uttered by the mature bulls.

During the winter the animals frequently congregate in herds, and in Wyoming these number many thousands. In the spring the cows remain banded in small herds until the time for the birth of the calves approaches. They then separate, and in solitude bring forth, about May or June, a single calf, which remains with the mother until it is a year old. The bulls drop their antlers in March or April, and the growth of the new pair is rapid, usually attaining full size in about three months. They are "in velvet" until about August, when the animals hasten the shedding of the velvet by rubbing their antlers against trees or bushes.

The flesh is in the poorest condition at the end of the rutting season, that is, in October; and, as bull wapiti are usually killed soon after this, the venison is often inferior in quality. When killed at the proper season and allowed to hang for a few days, the meat is much superior to most forms of venison.

Economic Value of Wapiti.—Apart from its value from the point of view of the sportsman, to whom it appeals more than any other species of deer, the value of the wapiti as a source of wild-deer meat cannot be overestimated. As already stated, it affords venison of a superior kind. By its habits it is adapted to living in wooded country not well suited to cattle grazing. In Canada we have large areas of such country in the former and present range of the wapiti. With the preservation of those timbered areas should be associated the preservation of the wapiti. Their polygamous habits tend to render less difficult their preservation and use.

There are many wooded areas admirably adapted to wapiti that might be stocked to advantage with these

animals. The successful efforts of the Forest, Fish, and Game Commission of the State of New York serve as an excellent example of what may be accomplished in this direction. From 1901 to 1903 several small herds of wapiti were presented by the owners of private herds, and these were liberated in small bands, chiefly on State lands. Their increase was so satisfactory that by the end of 1907 it was estimated that the total number at large in the Adirondacks was about 350.

The wapiti can be readily bred in private parks, and in his useful bulletin on the raising of deer David E. Lantz* has given many successful examples of such private enterprise. This bulletin gives full information on the management of these animals, and will be found of great assistance to any persons who may desire to undertake this commendable line of game preservation.

DEER

In Canada we have three species of deer, excluding the wapiti or elk: the white-tailed or "red" deer, also called the Virginia deer (*Odocoileus virginianus*); the mule deer, or Rocky Mountain "black-tail" (*Odocoileus hemionus*) of the west, and the Columbian black-tailed deer (*Odocoileus columbianus*) of the Pacific coast. The three species are very distinct and easily separated; they exhibit differences in size, form, antlers, and certain other structural details, and in their habits; all of which characteristics will be described in the following accounts of the three species.

The White-tailed Deer (*Odocoileus virginianus*)

Strange as it may seem, the territory occupied by this timid denizen of our woods and forests has actually increased,

* David E. Lantz, "Raising Deer and Other Large Game Animals in the United States." *U. S. Dept. Agriculture, Biological Survey Bull. No.* 36, 62 pp., 8 plates, 1910.

owing to the settlement of the country, and it is only in regions where there has been insufficient or no protection that its numbers have decreased. In this respect it differs from many of the larger forms of our native wild life, and its tendency to extend its range with the settlement of the country, and to increase in numbers when given adequate protection, are facts of very great economic importance in the development of a "wild" meat supply, to which subject reference has already been made (pp. 8–10).

The chief distinguishing characteristics of this species are the form of the antlers and tail, and the length of the gland on the outer side of the hind shank. The length of this gland is about one inch long in the white-tail, two inches long in the Columbian black-tail, and three inches long in the mule deer.

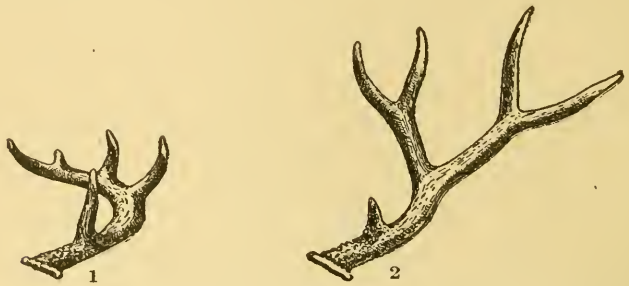


FIG. II.—ANTLERS OF THE WHITE-TAILED DEER (1) AND MULE DEER (2)

The antlers of the white-tailed deer, after rising for a short distance from the forehead, bend suddenly forward so that the beam is almost horizontal and the tines rise perpendicularly. The characteristic tail, from which this species derives its name, is long and bushy. The under side is white, and the edges are fringed with the same colour. When it is startled it runs away, carrying its white tail aloft, and this conspicuous appendage sways stiffly from side to side with every leaping movement of its owner.

It derives its name, the "red" deer, by which it is frequently known in eastern Canada, from the rusty red or yellowish-brown colour of its summer coat; but this name is very undesirable, as it leads to confusion with the red deer of Europe. The red coat is replaced in the fall by a winter coat of brownish gray.

Distribution.—The white-tailed deer is distributed from Nova Scotia to Alberta. Its favourite haunt is brushy river bottoms and deep woods that are interspersed with open spaces. In the plains regions of the west it haunts the tree-lined water-courses. Where its favourite woods have been cut down, as in the long-settled parts of Ontario, it has disappeared. But, on the other hand, it has followed the settlements into the wooded regions where the clearing of the forest has provided it with the environment that it prefers, and it has thus extended its range northward. On the edges of settlements it secures greater protection from the wolves that harass it in the deeper recesses of the forests, and when its natural food is scarce it is able to satisfy its hunger on the settlers' crops.

Habits.—During the winter deer of both sexes herd together, often in fairly large bands; and they feed on evergreens, twigs, moss, and such dried grass as they are able to obtain. With the advent of spring and the melting of the snow the older bucks wander off, leaving the does with the young deer of the previous year. In May the does seek solitude in the thicker cover of the woods, and there bring forth their young. In the first year they usually have one fawn; in the second and subsequent years two fawns are generally born. Sometimes three fawns are produced, but such records are not common. The young fawns lie hidden during the day and are visited periodically by the doe, which never wanders far away from them. The coats of the young fawns are of a rich brown colour, speckled with white spots, thus forming a colouration that is very pro-

tective in character, resembling as it does spots of light falling on a dark object. This form of protective colouration is characteristic of the young of many species of deer during their comparatively helpless state. When they are several weeks old the fawns begin to follow their mothers. During the greater part of the day they rest, and they emerge from their wooded retreats at sunset and in the early hours of the morning to feed and drink. These foraging expeditions are never conducted in black darkness, but on moonlight nights they take advantage of the light. Towards October the fawns are weaned, and they quickly lose their speckled coats and assume the grayish winter coats.

While the does devote themselves during the spring and summer months to their maternal duties, the bucks wander off, frequently in pairs, and lead a bachelor life. They usually lose their antlers in January, and very vigorous animals may lose them a little earlier. The new antlers begin to appear a few weeks after the old ones are dropped, and they complete their growth about August. The velvet with which the new antlers are clothed soon begins to fall off, and its loss is hastened by persistent scraping. By the end of September the buck is in possession of a clean pair of antlers, and is prepared for the masculine contests that are to take place during the next few months. The advent of the fall brings a richer food supply in the shape of nuts, acorns, etc., on which the deer feed and grow fat. In October the bucks, whose necks have begun to swell, commence to seek the does, to whose presence they have been indifferent earlier in the season. By November the rutting season is at its height. The bucks not only fight among themselves but will sometimes attack man at this time, and they have not infrequently proved to be dangerous adversaries. All keepers of park deer should be particularly cautious during the rutting season. The rutting season may last

as long as two months, but by the middle of December the mating fury subsides, and bucks, does, and their fawns of that year wander the woods together until the deepening snows circumscribe their movements and confine them to "yards" of well-trodden snow, from which paths radiate to their chosen feeding-grounds. Deep snow is a calamity to the deer, and their wanderings are limited until the advent of warm days in the spring releases them and permits the resumption of the separate life of the sexes. When the bucks are in their prime they may weigh as much as 300 pounds.

Abundance.—The white-tailed deer is the most abundant larger-game animal throughout its range in Canada, particularly in the east. In the early days it was the chief source of meat, and, in many cases, of clothing, and many a settler has been saved from starvation by the presence of this animal.

Formerly it did not occur in a large part of the region in eastern Canada that it now occupies. From its original home in the south it has followed the settlers into our northern woods.

It has been generally believed that the white-tailed deer did not formerly exist in Nova Scotia. Recently, however, bones of this deer have been found in two widely separated prehistoric Indian shell-heaps by archæologists of the Canadian Geological Survey.* Toe bones were found in a shell-heap near Mahone Bay, by Mr. W. J. Wintemberg, in 1913, and a toe bone was also found in a shell-heap on Merigomish harbour, on the north coast, by Mr. Harlan I. Smith, in 1914. Other bones, supposedly of the same species, have also been found in these heaps. These discoveries indicate the existence of the white-tailed deer in Nova Scotia in prehistoric times. The absence of deer made it necessary to introduce them into Nova Scotia.

**Science*, N. S., Vol. 49, No. 1275, p. 540, June 6, 1919.

Mr. Carmen Odell of Annapolis Royal, N. S., who undertook the work of introduction, has kindly furnished me with the following data: The first introduction took place in March, 1896, when nine deer which had been captured in Charlotte County, N. B., were liberated in Yarmouth and Digby Counties, N. S. Five more were liberated about 1910. So far as is known there has been no immigration of deer into Nova Scotia from New Brunswick by way of Cumberland County, N. S. Following their introduction a permanent close season was maintained on deer in Nova Scotia until 1916. By that time they had so increased in numbers, and in some instances were not only becoming somewhat tame, but were also destroying crops in certain sections that a short open season of ten days was declared, and about 150 deer were reported as having been legally killed that year. All the game wardens report an increase in numbers and none report decrease.

In New Brunswick and Quebec the deer are generally plentiful and increasing in certain sections. While in parts of Ontario the deer have decreased in numbers in recent years owing to the ravages of wolves,—which have been very destructive where they have been reported,—in most districts the deer are plentiful, and in many places they are reported to be rapidly increasing in numbers. In all parts of their range wherever extensive forest fires have occurred the numbers of deer have been reduced.

Too much stress cannot be laid on the importance of maintaining such protection as is necessary to insure a plentiful supply of this excellent food animal, which is specially adapted to life in regions bordering settlement. Further, the value of this animal as a means of rendering productive vast areas that are unsuited for agriculture, such as we find throughout eastern Canada, cannot be too often insisted upon. The white-tailed deer affords an immensely important potential supply of "wild meat" that is

easily accessible to the people; and the need for such a supply was never so pressing as at the present time. The maintenance of adequate protection, *especially the protection of does*, will result in an increase in the number of deer, and thus afford a greater number of people the opportunity of

FIG. III.—TAILS OF THE WHITE-TAILED (1), MULE-DEER (2), AND COLUMBIA BLACK-TAILED DEER (3)

supplementing their food supplies. Any relaxation of protection would result in a decrease in the deer population which it would take years of protection to restore.

THE MULE DEER (*Odocoileus hemionus*)

The mule deer, or "jumping deer," as it is called in Manitoba on account of its peculiar gait, is larger than the white-tailed deer and heavier in build. Its distinguishing characteristics are the large, broad ears, from which it receives its popular name; the rounded, whitish tail with its black tip, and the form of its antlers. The antlers of this species and of the Columbian black-tail differ markedly from those of the white-tailed deer in their size and form. They are larger, and are doubly branching. The main beams, instead

of being single as in the case of the white-tailed deer, are bifurcated, and each branch is double-pronged.

Distribution.—Their range extends from southern Manitoba on the east to northern Alberta in the north, and southern British Columbia in the west. Embracing as they do within their range such varied conditions, their habitat varies somewhat according to the region they occupy. In the eastern part of its range they frequent the low hills, especially where they are wooded and provide cover, and in the wooded valleys of rivers and streams. In the west they occur in the foot-hills and among the open growth of pine in the mountains. On the whole, their favourite haunts are different from those chosen by the white-tail, being more open and exposed.

Habits.—Their habits are, in general, not very different from those of the white-tailed deer. During the winter the mixed bands of all ages and sexes wander around together, sometimes in large bands, several hundred having been recorded occurring in single bands when they have been plentiful. When they run fast going down-hill their gait is a peculiar bounding motion on all four feet; hence the name "jumping deer."

Abundance.—In Manitoba, Seton states that in 1882 to 1885 they were very scarce. Owing to the better protection that they have received since that time they have greatly increased in numbers. Mr. Charles Barber, chief game guardian for Manitoba, states that they are now to be found in more or less abundance in every part of the province, and are increasing in numbers. They are found chiefly in the Pembina Hills and that part of the province lying between Portage la Prairie and Brandon, through which district the Assiniboine River flows. They also occur in fair numbers east of the Red River in that section of the province through which flow the Brokenhead and Whitemouth Rivers. In Saskatchewan they are reported by Mr.

F. Bradshaw, the chief game warden, to be increasing in the closed territory south of township 34. Very few sportsmen are said to hunt deer in Saskatchewan while moose and wapiti are available. Four hundred and seventy-eight deer were killed in 1916.

In Alberta the following figures indicate the extent to which deer have been killed under license since 1907:

1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918
59	125	299	540	619	768	908	1388	692	560	705	828

But these figures do not represent the actual numbers killed, as no returns are available north of the fifty-fifth parallel.

The mule deer is found in the valley of the Peace River. Preble states:

> In the summer of 1895, J. Alden Loring reported seeing a doe of this species at Jasper House; and he observed many tracks in the vicinity of Henry House. In July, 1896, he saw fresh tracks along the stream in the valley 15 miles south of Henry House. He reported the species rare between Jasper House and Smoky River, but saw tracks on the Grand Cache River and the north bank of the Smoky River in the early autumn; and saw tracks of two bands in the mountains west of Henry House about the middle of October. J. T. Edmonton assured me that during the fall of 1897 a few black-tailed deer frequented the vicinity of Stony Rapid, on the Athabaska, about 200 miles (by the river) below Athabaska Landing.

In the Rocky Mountains Park, mule deer are increasing in numbers, and may be seen almost any day in the vicinity of most of the public roads and trails. They are also increasing in abundance in the Waterton Lakes Park.

The provincial game warden for British Columbia, in his report for 1916, states that: "Last winter severe weather caused a great mortality amongst deer of all species, especially in some of the coast inlets; and in parts of the interior the mule deer were also terribly harassed by coyotes.

The regulation prohibiting the sale of venison was a great help, and was almost universally approved of. . . . In the Lillooet district mule deer have greatly decreased, partly due to the bad winter, coyotes, etc., but more to the fact that the Chilcotin Indians are killing far too many, and it is impossible to stop them until the district is declared organized."

Columbian Black-tailed Deer (*Odocoileus columbianus*)

This species bears a marked resemblance to the mule deer, but it is very much smaller. It has only moderately large ears and antlers with double-forked beams; but it is distinguished from the mule deer by its black tail. It undergoes the usual seasonal changes of coat colour common to the other species, and its characteristic home is in the moist forests of cedar, douglas fir, and spruce of the Pacific coast, where it is found as far north as Alaska.

Many of these deer succumb to the deep snows of winter, which render them easy prey both to predatory animals and to the Indians.

MOOSE

(PLATE II)

Throughout the wide breadth of Canada this magnificent game animal roams in our northern forests that constitute its natural home. From the forest-clad mountains of the Yukon and northern British Columbia to the ocean-girt woods of Nova Scotia this strange-looking animal, that first astonished the early French pioneers and evoked the significant name of "l'orignal," may be found wherever the solitude of trees or tree-lined lake or swamp provides the needed retreat. It is too well known to require description, and its enormous size, usually surpassing that of a

MOOSE

WOODLAND CARIBOU

From paintings by Carl Rungius. Reproduced by courtesy of the New York Zoological Society

horse, the immense spread of broad antlers and the peculiarly elongated head are familiar to all Canadians. Moose have been killed in New Brunswick measuring seven feet in height at the shoulders and bearing antlers sixty-eight and one-quarter inches broad. The antlers of the Alaskan race of moose sometimes measure over six feet across.

It is the North American representative of the largest member of the deer family. In northern Europe and Siberia it is known as the elk, *Alces* being the generic name of this animal, of which three species are found in the northern forests of the old and new worlds. It is unfortunate that the name "elk" has been given in North America to the wapiti.

Our North American moose is the most abundant and widely distributed species of its genus. We have no large game animal in the possession of which we have greater reason to be proud. Affording as it does such an excellent trophy, it is eagerly sought by the big-game hunter and sportsman. To the Indians of our northern woods it furnishes at the same time food and clothing. It is an animal which deserves on all grounds the best protection that can be given.

The provincial governments in most cases are wisely devoting their earnest endeavours to its protection, and, in the case of Nova Scotia and New Brunswick, with apparent success. It is essential, however, that greater attention should be paid by all the provincial governments to the habitual disregard of their regulations, particularly in districts where lumbering operations are conducted. We are constantly in receipt of authentic reports that moose are killed in large numbers to supply meat to lumber camps. Such destruction is as inexcusable as it is unnecessary. It could be stopped, and one would think it needless to point out that unless such a reprehensible practice is checked serious decrease in the abundance of this animal will result. Any

government that is determined to conserve its supply of moose has the power and means to effect such conservation. The responsibility in this matter lies with the governments concerned.

Distribution and Abundance.—In Nova Scotia the moose are increasing in number, owing to the prohibition of the killing of cow moose which has been in effect since 1909. The following figures of the number of moose killed each season since that date illustrate the wisdom of the enforcement of such a provision as a means of conserving this or any other member of the deer family:

NUMBER OF MALE MOOSE KILLED

1909	405	1914	1,091
1910	509	1915	1,218
1911	617	1916	1,331
1912	678	1917	1,363
1913	704	1918	1,243

New Brunswick has a well-deserved reputation as a moose country. The greater portion of the province contains the most favoured resorts of this animal, which flourishes under the protection that is given to it by the provincial government, although there is still too much illegal slaughter taking place. The fact that the largest heads of Canadian moose are taken in this province attracts many sportsmen each year from the United States, where in the neighbouring State of Maine improvident slaughter has had the inevitable results.

In Quebec the best moose territories are in the counties of Pontiac and Timiskaming in the west; the St. Maurice and St. John region in the north-central portion; and in the counties of Bonaventure and Gaspe in the east. The superintendent of game and fisheries informs me that the moose in these regions are increasing; fine heads are secured each year.

Throughout the northern region of Ontario moose are plentiful, and appear to be maintaining their numbers. In certain good moose districts, such as the Port Arthur, Rainy River, and Thunder Bay regions, particularly in the Nipigon Forest Reserve, moose are not only very plentiful but are increasing in numbers, and fine heads are annually secured. The opening up of new regions by the National Transcontinental and Timiskaming and Northern Ontario Railways has resulted in a diminution of moose in certain districts, and increased vigilance in their protection is desirable in the regions now more easily accessible. In certain districts adjoining the Transcontinental Railway, where moose are fairly plentiful, many are killed during the winter and are made a source of meat for the settlements all winter. The meat is sold at prices usually varying from five to ten cents per pound, which is cheaper than other forms of meat.

In Manitoba the chief game guardian reports that moose are plentiful in the north and northwestern portion of the province, and also in the east and southeast. Cows are said to be more numerous than bulls. During the last few springs a considerable number of moose have been found dead, their emaciated condition indicating food shortage. In addition, many of these animals were very severely infested with ticks. Specimens of these have been submitted to me and proved to be *Dermacentor albipictus* Packard. This species of tick was first discovered on moose, and there is little doubt that severe infestation of such ticks was responsible for the death of numerous moose whose vitality had been reduced by shortage of food or other causes.

The northern woods of Saskatchewan, west and north of Prince Albert, and stretching westward north of Battleford, are well supplied with moose, which is the chief game animal of the province. The latest reports appear to indicate that they are not so plentiful as formerly. For this reason the recent amendment of the provincial game laws,

which permits the killing of one cow moose each year, is not a wise policy from the standpoint of the protection of this animal, and it is hoped that the increase that has been secured in the Maritime Provinces as a result of the protection of the cow moose will serve to indicate the desirability of prohibiting the slaughter of females. If this is not done, a continued decrease in numbers will undoubtedly follow. In certain districts in Saskatchewan the moose have suffered severely from the same species of ticks found attacking moose in Manitoba. An account of the occurrence of this pest is given in the annual report of the chief game guardian of Saskatchewan for 1916 (pp. 22–25).

In Alberta moose appear to be decreasing in numbers, the decrease being probably due to the extension northward of the agricultural areas and to excessive killing. The following are the returns of moose killed under license since 1907:*

1907	14	1913	865
1908	37	1914	1,335
1909	86	1915	1,116
1910	184	1916	849
1911	305	1917	1,026
1912	425	1918	900

These figures by no means represent the total number of animals killed, as practically no figures are available from districts north of the fifty-fifth parallel.

The number of moose in the Northwest Territories is decreasing annually. Writing in 1905 (*loc. cit.*) MacFarlane states:

> This valuable food animal used to be very common in the Peace River, and, indeed, throughout the forest region of the northern portion of the "Great Mackenzie Basin"; but for the last twenty years it has been

* The apparent increase in numbers indicated by these figures is probably accounted for by the fact that more accurate returns of the number killed have been secured each year.

much less abundant, and, indeed, remarkably scarce in many parts, especially along the Athabaska, Peace, Liard, and other rivers, and the large lakes of the North. As moose have since been found more or less plentiful in the eastern, western, and southern sections of the territory where for many years previously they were rather rare or conspicuous by their absence, it is now supposed by some observing natives and others that considerable numbers of them must have migrated southward, particularly during the remarkably mild winter of 1877–78. Be that as it may, it has been noticed that at intervals, and for several years at a time, this animal has been rather scarce in various sections where it had formerly been fairly abundant.

One of the chief factors that have been responsible for the disappearance or reduction in numbers of moose in many parts of the Northwest Territories has been the destruction of their former haunts by extensive forest fires, which, as I have repeatedly pointed out, constitute one of the chief means of destroying the haunts of big game and fur-bearing animals.

A very complete account of the history and distribution of the moose in the Northwest Territories is given by Preble in his unusually valuable memoir on the mammals of the Athabaska-Mackenzie region.* The following extracts are taken from the account he gives of his own observations and those of other travellers and explorers:

"The moose occurs throughout the Athabaska and Mackenzie region north to the limit of trees." In 1901 it was recorded near Boiler Rapid, Athabaska River. Tracks of moose were seen on Slave River, ten miles below the mouth of the Peace, and on the islands between there and Smith Landing. Tracks were also seen while descending the Athabaska and Slave Rivers to Great Slave Lake. "In the lake country between Fort Rae and Great Bear Lake . . . the moose was found to be rather common and became more

* "A Biological Investigation of the Athabaska-Mackenzie Region," North American Fauna, *No.* 27, *Biological Survey, U. S. Department of Agriculture*, 1908.

abundant as we approached Great Bear Lake, owing to the country being better suited to its needs. . . . Along the southern shore of Great Bear Lake we found it a common and in some places an abundant species." There are immense areas abounding with proper food for this animal in the latter region, and where the native population is sparse and poor moose hunters, the moose flourish. In the winter of 1903–4 they were abundant near Fort Simpson, and while descending the Mackenzie in June their tracks were frequently seen and some animals were observed. Tracks were common along the lower Nahanni, and two animals were seen in this vicinity early in June. On the lower Mackenzie moose were seen a few miles below the site of old Fort Good Hope. They are fairly common in the vicinity of Fort McPherson. "In the mountains west of the Mackenzie, where the snow becomes very deep during some seasons, moose are said to form yards, but they do not seem to have this habit in other parts of the region."

"While exploring in the country between Athabaska Lake and Churchill River in the summer of 1892, J. B. Tyrrell found that moose occurred throughout the more thickly wooded parts of this country as far north as Stone River, near the eastern end of Athabaska Lake." A. J. Stone gives evidence of the large size and abundance of the moose at the headwaters of the Nahanni River. Between Smoky River and Jasper House moose were abundant in 1896. J. W. Tyrrell found evidences of moose on the upper Thelon River in 1900. Hanbury found tracks of moose in August, 1902, while descending Dease River, northwest of Great Bear Lake.

Mr. H. T. Bury, of the Department of Indian Affairs, reported to me in 1915 as follows:

> The moose is found, generally speaking, over the whole of the southern section of this country (Northwest Territories and northern Alberta) south of the Great Slave Lake, and also inhabits that section enclosed by

the valleys of the larger tributaries of the Mackenzie River. There does not seem to have been any great diminution in their numbers during past years, although they represent to the Indians during the summer months a very convenient means of food, and, in consequence, are killed in an indiscriminate manner.

They are accustomed to roam the swamps and inaccessible parts of the country, either singly or in pairs, and it required a considerable amount of skill, energy, and perseverance to encompass the death of one of these members of the deer family. They are accustomed to roam the spruce forests during the winter, occasionally seeking the sheltered side of a coulée to feed upon the shoots of alder and willow. . . . During the summer months they are more nomadic in character, rarely remaining in one locality for a very long time, except for the purpose of haunting the vicinity of a small lake or stream. . . . It is only by the exercise of a good deal of stealth and ingenuity that the local Indians can arrive sufficiently close to them in summer months to achieve their destruction. Probably the district which is the natural habitat of these animals is that comprised within the limits of the Athabaska River. There does not appear to be as yet any considerable reason for fearing a serious diminution in the numbers of the moose, although it would seem advisable in the course of time to have more specific regulations regarding the killing of these animals during the close season.

In the discussion following my address on "The Conservation of Northern Mammals," at the seventh annual meeting of the Commission of Conservation in 1916, Doctor C. W. Wilson, Assistant Surgeon R. N. W. M. Police, stated: "Where moose were quite plentiful, in the region included within the delta of the Mackenzie, the greater destruction has been due to the trading companies, for instance the Hudson's Bay Company. Two Indians told me that they supplied the Company's post with two hundred carcasses a year, of moose alone. The result is that very seldom is a moose seen in that whole district at the present time."

The condition of moose in British Columbia is encouraging from the reports of Mr. Bryan Williams, the former provincial game warden. In his annual report for 1914 he states: "In the north the moose seem to be on the increase, and spreading down farther to the south. This year a

few of these animals made their appearance close down to the Chilcotin River, which is the farthest south in this direction they have ever been reported. In East Kootenay some of the finest moose ever known in that district have been killed this season, three of them with antlers measuring 53½, 58, and 60 inches, respectively. Until this year it has been the general opinion that the East Kootenay moose never had horns of large dimensions, and a 45-inch head was considered a good one for that district. There is no doubt that in former years the bulls never got a chance to grow big horns, as they were all shot too soon; but with the better protection they have had during the past few years there is an improvement, and the value of the game in East Kootenay has been greatly increased."

In 1915 Mr. Williams reports on the moose as follows: "These magnificent animals continue to work their way south, and are increasing rapidly almost everywhere. There is one exception to this, and that is on the Nelson River, where they are reported to be very scarce, and the Indians are suffering in consequence. Reports from Cassiar varied somewhat, but the men who are in the best positions to know say they were extra numerous, but that there is an extraordinary percentage of young bulls. That there are plenty of moose in that country can be easily believed from the fact that one tourist counted 280 odd during the short time he was there. A bull moose was lately seen as far south as the 108-mile House, on the Cariboo Road. Signs of others were seen a little farther south."

From the foregoing account of the distribution and abundance of moose in different regions of Canada it will be seen that, with the exception of the Prairie Provinces, this noble animal not only appears to be holding its own but owing to adequate protection it is possible to record an increase in certain of those regions of Canada that comprise its finest natural haunts and hunting-grounds.

Habits.—The moose is essentially a forest-dwelling animal, frequenting the densest of our coniferous forests, and the woods of birch and poplar. In the summer it resorts more especially to the neighbourhood of swamps and secluded lakes and pools, and here it wades deep into the water to feed on the juicy leaves and stems of aquatic plants. It is distinctly a browsing animal, as the structure of its head and lips shows; and properly speaking it does not graze like other members of the deer family. Its normal food consists of the leaves, twigs, and bark of various trees, such as spruce, hemlock, birch, alder, willow, maple, etc., and also lichens. When deep snow covers the ground its movements are more restricted, and the well-trodden paths and areas that it forms in the snow constitute the well-known moose "yards."

In the fall the "rutting" season begins when the bulls, which during the summer have roamed about in solitary state, set forth to seek their mates. The deep guttural call or bellow that he utters as a call may be answered by the higher-toned reply of the cow, or a challenging grunt of a rival. In the latter case a fierce combat may not infrequently follow, or the bull may be lured into an open spot and to his death by the closely simulated call produced by the birch horn of the hunter. At this time the bulls are bold; they lose their shyness of the summer and, bold in behaviour, they will sometimes fiercely attack an intruder, as many a hunter has reason to know. The bull mates with but a single cow, and is strictly monogamous. About the end of May the young are born. The cow produces one calf the first time, and usually two in subsequent years; and, rarely, three are born. The young accompany the mother during the first year, and during the winter the moose family live together, the parents leaving the young during the early spring.

The young bull moose grows his first pair of spike-like

horns during the second summer, and these are shed in the following spring, when a longer pair take their place. The palmation of the horns commences with the third pair, which are shed in the spring of the following year. As the horns become larger and more widely palmated with each succeeding year, they are dropped earlier, in January or February. The horns are fully developed about the seventh year; and old vigorous bulls may drop their horns as early as December.

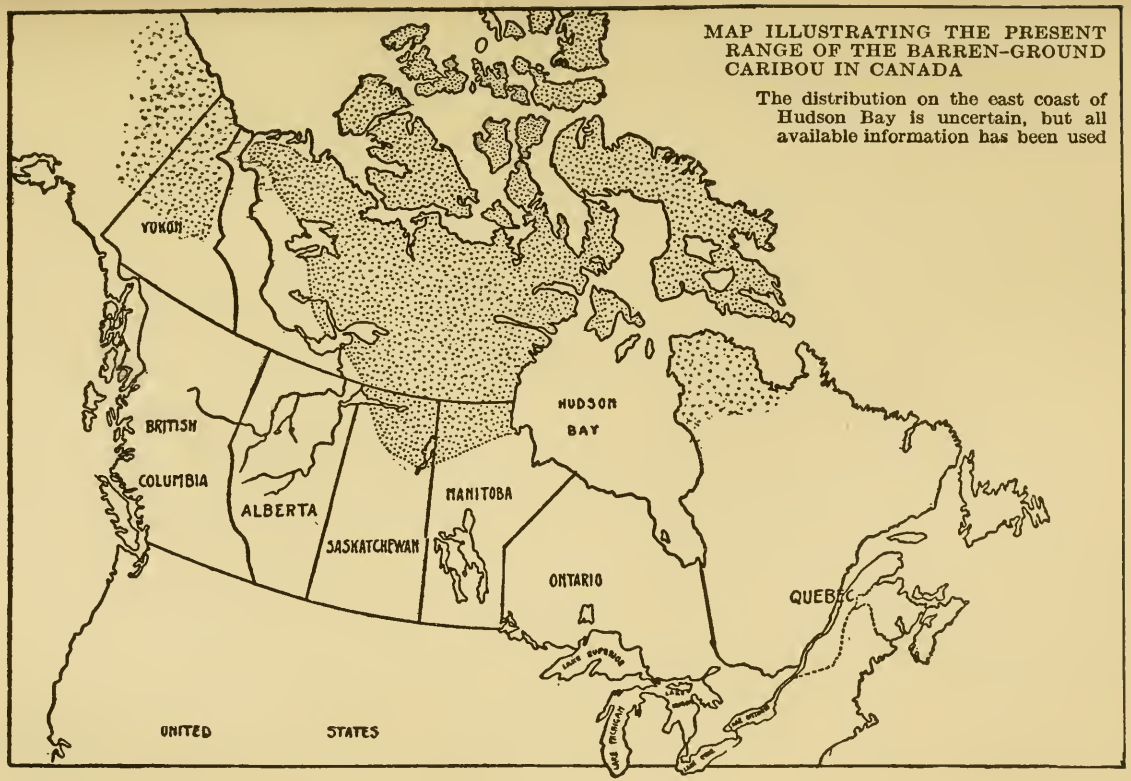
Value.—As a game animal the value of the moose is, perhaps, unexcelled by any of our larger mammals, and its wide distribution in regions that are comparatively accessible to the residents of most of our larger cities and towns, particularly in eastern Canada, enhances its recreative value.

Its value as a source of meat needs no emphasis. Without the moose the Indians in many parts of Canada would face a serious shortage of food, for in many places it is the chief wild-meat supply. In civilized communities, too, it forms not an unimportant part of the meat supply during the open season, and the wise system of protection that is being followed in many provinces will undoubtedly result in an increase of this important adjunct to our meat supply. At the same time this fine animal will afford thousands of Canadians a great incentive to seek recreation in the forest solitudes that form its haunts.

THE BARREN-GROUND CARIBOU

(PLATES III, IV, AND V)

Now that the buffalo has disappeared from our prairies the barren-ground caribou constitutes, I believe, the most abundant of the larger land mammals in the world. In its extraordinary habit of migrating hundreds of miles twice a year it affords a unique phenomenon. As the buffalo formerly ranged the western prairies in millions, so in like



MAP ILLUSTRATING THE PRESENT RANGE OF THE BARREN-GROUND CARIBOU IN CANADA

The distribution on the east coast of Hudson Bay is uncertain, but all available information has been used

abundance the barren-ground caribou now ranges the vast, uninhabited northlands of Canada, which we have wrongly called the Barren Grounds.

Like the buffalo they furnish the native inhabitants of the territories that they occupy with meat and clothing, and, finally, like the buffalo soon after the middle of the last century, their numbers are decreasing with the advent of the white man and his rifle, and their range is becoming restricted by excessive slaughter. Again, the fallacy of believing that excessive numbers of an animal is a reason against its extermination is being demonstrated. But in the case of the barren-ground caribou we can yet save it from extermination by a wise course of conservation, and increase its value as one of the most important natural resources of the north.

The caribou and the fur-bearing animals are the only superterranean natural resources of the north that can be utilized at the present time. As will be shown later, the natives of that enormous area, both Indians and Eskimos, depend upon the caribou for food and clothing. Any exploration of the country is dependent upon this source of meat. Without the caribou, travel in that region would be almost impossible, and the natives would either starve or become a public charge on the government.

In the case of an animal extending over such an enormous area it is natural that distinct races should have developed, and, although we are not concerned here with the different forms, and shall include them all under the one name, it may be pointed out in passing that at least four distinct forms have been recognized and given specific rank. These are the true barren-ground caribou (*Rangifer arcticus*), which is the caribou of our Canadian Barren Grounds; Grant's caribou (*Rangifer granti*), found in the Alaskan peninsula; and the more northerly forms, Peary's caribou (*Rangifer pearyi*), inhabiting Ellesmere Island, and the

BARREN-GROUND CARIBOU

MUSK-OX

From photographs of groups in the American Museum of Natural History. Reproduced by courtesy of the Museum

Greenland caribou (*Rangifer groenlandicus*). The North American caribou are closely related to the reindeer of northern Asia and Europe, from the common ancestral stock of which they are probably derived.

Distribution.—The barren-ground caribou was formerly far more abundant and its distribution was more extensive than at the present time, as the records of the earlier explorers and navigators prove. It extended from the Arctic shores of Alaska on the west to the Hudson Bay and Labrador on the east, and from the islands of the Arctic in the north it ranged as far south as the northern fringe of the timbered areas of northern Alberta and Saskatchewan. In this vast area enormous herds of hundreds of thousands moved back and forth like the tides of an enormous sea of animal life, at the bidding of some strange wandering impulse; and this ceaseless semi-annual movement continues year after year.

From the Arctic coasts of Alaska the caribou have virtually disappeared. When the American traders and whalers, visiting those regions, armed the Eskimos for the purpose of hunting meat for the whaling-fleets, the fate of the caribou was sealed. The coastal herds of caribou were exterminated about twelve years ago, and now the caribou herds are very scarce west of the Mackenzie River, and as far east as Langton Bay. With the disappearance of the caribou in that area the native inhabitants have been compelled to leave, and many migrated eastward to the Mackenzie delta. And now, I am informed by Doctor R. M. Anderson, who has spent seven years in that region (1908–12 and 1913–16), that, owing to the scarcity of caribou east and west of the Mackenzie delta, the Eskimos of that region have for some time been unable to supply themselves with more than a small portion of the skins needed for their clothing, *the deficit being made up by the purchase of domestic reindeer skins imported from western Alaska and northeastern*

Siberia by trading-vessels. The significance of these facts is surely too plain to require comment.

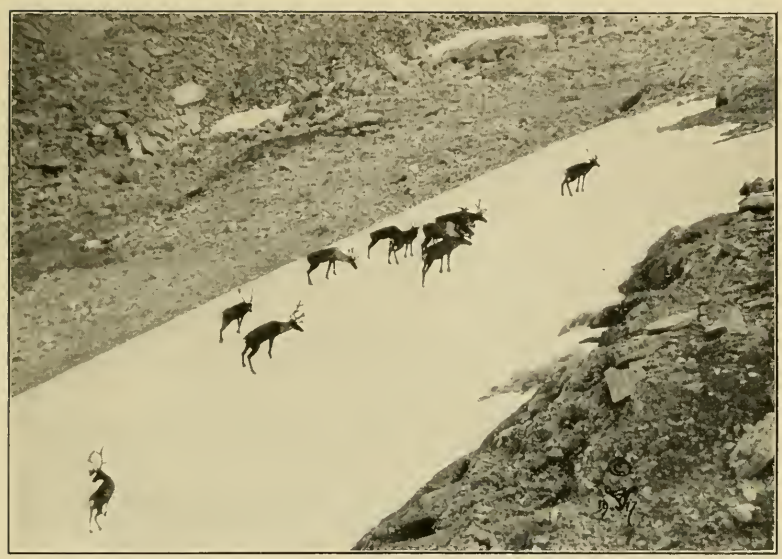
Doctor Anderson reports that from Franklin Bay to Dolphin and Union Strait there is an uninhabited stretch with little game. In the Victoria Island and Coronation Gulf region caribou are found to be fairly common in the summer, supplying food and winter clothing for a considerable native population. The caribou largely migrate to the mainland in November, returning to the north again in April and May, although Mr. Stefansson informs me that caribou may be found in the western part of Victoria Island during the winter, and along the shores of Prince Albert Sound. The centre of the crossing place of the caribou from western Victoria Island is in the region of Bernard Harbour, and here the Hudson's Bay Company established a trading-post in 1916.*

In their migrations south the caribou reach Fond-du-lac, at the east end of Athabaska Lake. They travel as far south as Reindeer Lake in northern Saskatchewan. Nearly every year they come down to Fort Smith, which would appear to be the southwestern limit to their migration.

In the Yukon Territory fairly large herds of caribou are still to be found. Mr. George Black, commissioner of the Yukon, has informed me that a large herd of several thousand annually visits the region adjoining Dawson, Yukon. Osgood† states that these Alaska-Yukon caribou "scatter widely in the summer and in the fall collect in herds, often

* Later advices from the Coronation Gulf region give the information that, from 1917 to 1919, trading-posts were established at the mouth of the Coppermine River, Tree River, and on Kent Peninsula, and that practically all the natives have been supplied with rifles. A considerable portion of the Copper Eskimos have also been induced by the traders to give up winter sealing and to live on the land in winter, trapping foxes and shooting caribou. This unprecedented change of habits was particularly noted around Dease Strait and the Kent Peninsula, which is the main crossing-place for the caribou from the eastern portion of Victoria Island.—R. M. A.

† "The Game Resources of Alaska," by W. H. Osgood. *Yearbook, U. S. Department of Agriculture*, 1907, pp. 469–482.



From a photograph by F. K. Vreeland

OSBORN'S MOUNTAIN CARIBOU IN THE ROCKY MOUNTAINS, ABOUT FIFTEEN MILES NORTHWEST OF MOUNT SIR ALEXANDER

From a photograph by E. R. Sanborn. Courtesy of New York Zoological Park

HERD OF CAPTIVE MUSK-OXEN IN NEW YORK ZOOLOGICAL PARK

nalling apparatus to other members of the herd, and all observers have testified as to the value of this natural heliograph.

Habits.—In the days of antelope abundance they formed herds varying in numbers from a few individuals to several hundred during the fall, and these herds consisted of adults of both sexes and young. In September or October the bucks vigorously contest for the possession of the does, and soon the most vigorous bucks have rounded up their small bands of chosen does. With the advent of winter the herds migrate, sometimes for a hundred miles or more, to seek the more sheltered regions of their range in the low hills and foot-hills, and here among the coulees they pass the winter. To-day these herds do not often number more than about fifty animals.

With the return of spring the herds split up. The does seek such solitude as they may be able to find, and in May or June they give birth, usually to two fawns, which remain with their mother all summer. In the fall the males drift in again, and the seasonal life history is repeated.

It is a singular fact that it is practically impossible to keep the antelope in captivity. Hornaday, who has had great experience in this respect, states: "Owing to the extreme difficulty in maintaining this species in captivity, its total extinction at an early date seems absolutely certain, unless it is fully and permanently protected in a wild state, on its native range, for a long period."

Distribution and Abundance in Canada.—In Canada it formerly ranged, probably in an abundance almost equal to that of the buffalo, from southern Manitoba westward to the Rocky Mountains and northward as far as Edmonton. Seton* gives what would appear to be the last record of the occurrence of the antelope in Manitoba, where it is

* "Life Histories of Northern Animals," vol. I, pp. 215–216.

now extinct. He says: "J. T. Brondgeest, of Whitewater, Man., tells me that he first came to Whitewater in 1879, and settled down in the fall of 1880, and that in those days there were plenty of antelope about, but the last he saw was killed by his father in 1881."

To-day the antelope in Canada are confined to those areas in the southern portion of Saskatchewan and Alberta that have not been devoted to wheat-growing. From the inquiries that I have made, I do not think that there are more than about 3,000 animals now remaining in those provinces, and of this number the greater portion exists in Saskatchewan. In the latter province Mr. F. Bradshaw, the chief game guardian, informs me that the existing antelope are to be found mainly in the following districts: the Great Sand Hills north of Maple Creek and Crane Lake; the Vermilion Hills between Ernfold, on the main line of the Canadian Pacific Railway, and the South Saskatchewan River; on the east of Lake Chaplin, south of Secretan on the main line of the C. P. R.; southeast of Cypress Hills and adjoining the Whitemud River; and northwest and south of Wood Mountain. The last three localities are in a region that is chiefly devoted to cattle-ranching, and it is encouraging to know that, according to Mr. Bradshaw, the owners of the cattle ranges in which the antelope are to be found, particularly in the Pinto Creek section of southern Saskatchewan, are doing what they can to protect the antelope found on their ranges, where they mingle with the cattle. It is of interest to record that Mr. Reuben Lloyd, of Davidson, Sask., has in a small fifteen-acre private game reserve, three male and one female antelope, and in 1916 the latter gave birth to the two fawns which are shown on Plate XIII.

In southern Alberta a few small herds may be found in the rolling hills, and the foot-hills of the Rocky Mountains that are remote from settled areas. In both provinces the

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very large, but at all times they roam widely. The great herds in the fall of the year perform a more or less regular movement in the nature of migrations, and within certain limits their course of travel and times of arrival at given points are well known." This coincides with the information that I have received from Mr. Black, Doctor Alfred Thompson, M.P., and other local observers. It is probable that the greater certainty with which the migratory movements of these herds in the Yukon can be predicted, as compared with the caribou of the Barren Grounds of the Northwest Territories, is due to the difference in the topography of the country, and the greater restriction in possible routes of travel in the Yukon. In connection with these smaller herds in the Alaska-Yukon region it is important to remember that too much confidence should not be placed in the presence of such herds as indications of a wide spread, as there is a tendency among such gregarious animals to band together more readily when their numbers become more decreased, and thus a false impression of abundance may be given.

Migratory and Other Habits.—The most remarkable habit displayed by the barren-ground caribou is its periodical migrations southward in autumn and northward in the spring. During the summer time they keep to the open barren ground and the sea-coast. Here they find abundance of food, such as tender grasses, the shoots and buds of dwarf birch and willow, and they are able to escape to some extent their insect tormentors. In the autumn they turn southward towards the woods, and the winter is spent in these regions that provide shelter and food, such as moss, lichens, and tree-buds. The males are in very poor condition towards the end of October, after the rutting season, their horns being at their best towards the end of September. About a month later the males and females separate, and, according to Warburton Pike, who made valu-

able observations on the habits of these animals, the latter begin to travel northward as early as the end of February. They reach the edge of the woods in April. Tyrrell, who also added much to our knowledge of the barren-ground caribou, states that the young, to the number of one to three, are born before the winter quarters are vacated. Pike informs us that the young are born in June, after the northward migration has taken place. The males remain in the woods till May, but meet the females on their way inland from the coast at the end of July, from which time they stay together till the rutting season is over, and the southern journey is again begun.

Unlike other deer, both sexes bear antlers, but the antlers of the female are rather smaller and more slender than those of the male, which may bear, according to Tyrrell's observations, as many as twenty-two prongs on one beam.

One of the best descriptions of the migration of the caribou is given by Warburton Pike, who witnessed the southward migration at Camsell Lake, near the east end of Great Slave Lake, in 1889. After describing the excitement caused by the approach of "la foule," as the mass of migrating animals are commonly called in the north, he says:*

> From the ridge we had a splendid view of the migration. All the south side of Mackay Lake was alive with moving beasts, while the ice seemed to be dotted all over with black islands, and still away on the north shore, with the aid of glasses, we could see them coming like regiments on the march. In every direction we could hear the grunting noise that the caribou always makes when travelling.
>
> The snow was broken into broad roads and I found it useless to try to estimate the number that passed within a few miles of the encampment. We were just on the western edge of their passage and afterwards we heard that a band of Dog-Ribs hunting some forty miles to the west were at this time in the last straits of starvation, only saving their lives by a hasty retreat to the woods.

* "The Barren Ground of Northern Canada," by Warburton Pike, p. 89.

Pike concludes his account by expressing the belief that the herds of buffalo could not have surpassed in size "la foule" of the caribou.

J. B. Tyrrell has described an enormous herd of caribou, consisting of several thousand animals—males, females, and fawns—which he saw on July 30, 1893, at Carey Lake, where he obtained what are undoubtedly the best photographs hitherto taken of this caribou, two of which are reproduced herewith. He describes "many great bands literally covering the country over wide areas. The valleys and hillsides for miles appeared to be moving masses of caribou. To estimate their numbers would be impossible. They could only be reckoned in acres or square miles." He found, as Pike also found, that when they occur in such enormous numbers they are quite tame.

The magnitude of the migration, both as regards numbers involved and extent of area, has led many to assume that all the caribou migrate. But apparently this is not so, as the observations of Hanbury* and others conclusively prove. Large numbers remain in the north throughout the year. Hanbury shot caribou along the west coast of Hudson Bay and the coasts of Chesterfield Inlet during the winter, and caribou were found on the Arctic coast during the winter months. These non-migrating animals merely wander about.

Another point of interest is that, while their migratory movements are very regular in point of time, the routes they take are not always the same, and they travel generally in a northerly or southerly direction. Their course cannot be predicted with any degree of certainty. They seldom follow the same course in two consecutive years. The Indians, such as the Yellow-knives and Dog-ribs, who are dependent upon the caribou to so great an extent for

* See "Sport and Travel in the Northland of Canada," by David T. Hanbury, pp. 120 *et seq.*

food, with all their experience of the caribou are sometimes unable to find them where they might be expected, with the result that distress and starvation follow.

Economic Value of Caribou.—In an earlier chapter the value of the caribou as a source of meat was discussed. Perhaps no native wild animal is economically so important and generally useful as the barren-ground caribou. Without it enormous areas of our northern territory would become practically uninhabitable. It supplies the Indians and Eskimos with almost all the necessaries of life: food, clothing, shelter, and means to trade at the trading-post. An excellent description of the utilization of the caribou by the Indians is given by Warburton Pike. Describing the Indians' departure to the hunting-ground, he says:*

He leaves the trading-post, after one of his yearly visits, with a supply of ammunition, tea, and tobacco, a blanket or two, and, if he has made a good season's hunt, is perhaps lucky enough to have taken one of the Company's duffel *capotes* (about the best form of greatcoat I have ever seen). He has a wife and family waiting for him somewhere on the shore of the big lake where fish are plentiful, expecting a gaudy dress, a shawl, or a string of beads from the fort, but relying entirely on the caribou for maintenance during the awful cold of the coming winter. The journey up till they fall in with the caribou is usually full of hardships, but once they have reached the hunting-ground and found game a great improvement in affairs takes place; the hunter is busy killing,† while the women dry meat and make grease, dress the skins for moccasins, mittens, and gun-covers, and cut *babiche*, which takes the place of string for lacing snow-shoes and many other purposes. For the hair coats, which every-

* *Loc. cit.*, pp. 49–50.

† The following extract indicates one of the methods of hunting and killing without rifles:

Sergeant A. H. Joy, writing on 18 Feb., 1918, states:

"I had a conversation with a Caribou-eater Indian during the former part of this winter and he told me that the band with whom he lived very seldom used guns to kill the caribou between the end of July and the middle of September, as the caribou came through the country so thick that they could crowd them into the lakes and rivers and on the lake shores and kill them with sticks and axes, and on these occasions the animals are slaughtered in hundreds."

body—men, women, and children—wears during the cold season, the best skins are those of the young animals killed in July or August, as the hair is short and does not fall off so readily as in coats made from the skin of a full-grown caribou; while the strong sinews lying along the backbone of an old bull make the very best thread for sewing. Anything that is left over after supplying the whole family finds a ready sale at the fort, where there is always a demand for dried meat, tongues, grease, dressed skins, and *babiche*, so that the Dog-ribs and Yellow-knives, whose country produces little fur, with the exception of musk-ox robes, are thus enabled to afford some few of the white man's luxuries, tea and tobacco being especially dear to the Indian's heart.

The skins of the caribou are in the best condition in September, and the meat is best in September and October, when, in the words of J. W. Tyrrell, "the males are rolling fat, and as food their flesh is equal to the finest beef." In the spring the flesh is poor, as it also is in the summer. In the spring the skins are of little value, on account of the shedding of the hair, and the frequent abundance of warbled hides, to which reference will be made later.

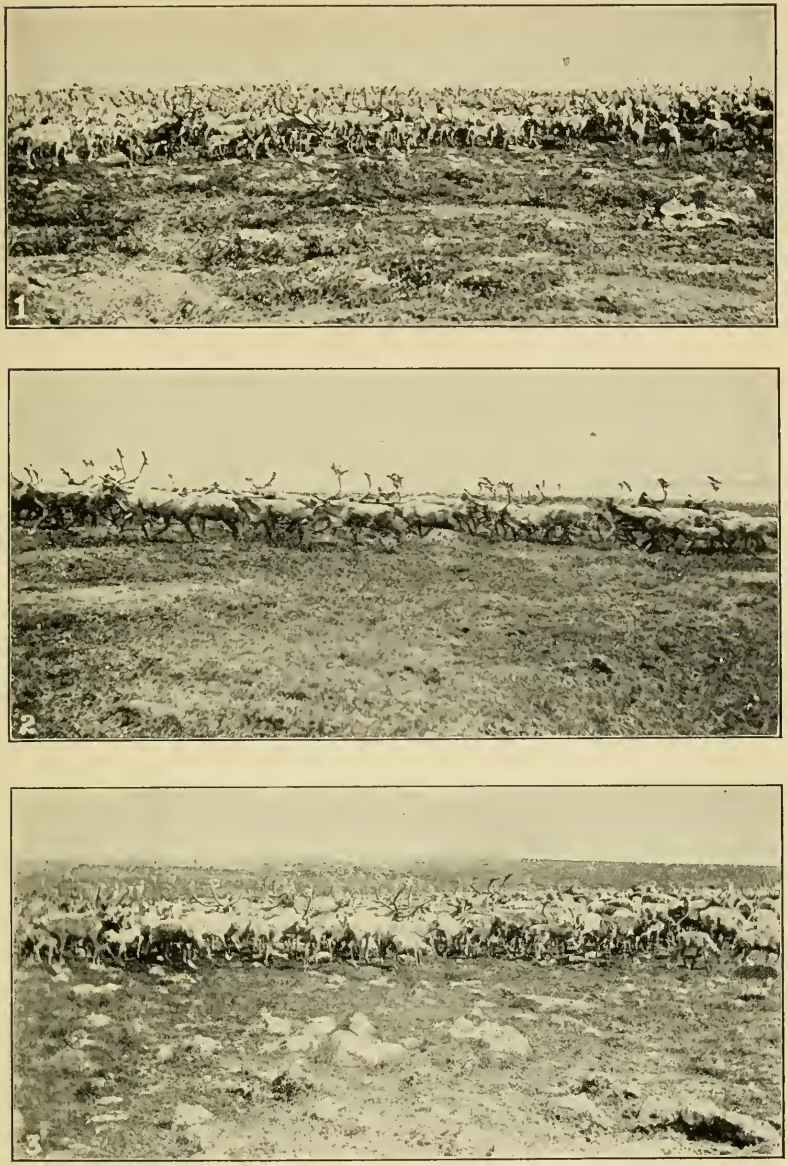
The increase in the number of rifles supplied to the Eskimos on the Arctic coast has resulted in a great increase in the number of caribou killed. At the same time, the ability to obtain this form of food so easily has led to a change in the habits of the Eskimos. Formerly they usually hunted seal during the winter, and continued until late in May. Now, Doctor R. M. Anderson informs me, they are coming ashore one or two months earlier than was their former custom, and living on the caribou which are migrating steadily northward in April and May. While they are migrating they are most easily killed. But the worst feature of this spring killing, which of course is illegal, is that most of the caribou killed are females which are crossing to Victoria Island to give birth to fawns in June. It is of the greatest importance to the conservation of the caribou that this practice should be stopped, and recommendations to

that effect have already been made in my memoranda and addresses to the Commission of Conservation.*

The wholesale trading in caribou skins must be checked. The extermination of the caribou in northern and north-western Alaska was brought about by the trade in summer skins, and the sale of meat to whalers. In this region some of the Eskimo hunters used to kill as many as 500 caribou in a single summer for their skins; and the carcasses were usually left to rot. This practice is becoming common in Canadian territory, where skins are taken for the purpose of barter, and the result is that many more skins are taken than are required by the Eskimos for their personal use. Unless this wasteful practice is discontinued—and we hope it will be—any other effort to conserve the caribou will have little effect. It is interesting to note that some of the Eskimo tribes entertain the belief that the caribou are sent to them by the spirit world to kill, and that unless they kill every caribou they meet, whether they require it or not for food or clothing, the spirit world will not send them any more. Such a belief naturally leads to wasteful slaughter on the part of the Eskimos, and it is to be hoped that missionaries and others will endeavour to dispel such a pernicious idea.

To recapitulate, the economic reasons for the conservation of the barren-ground caribou are as follows: first, the necessity of preserving so essential a source of food and clothing for the Indians, Eskimos, and other present and future inhabitants of the north; and second, the desirability of developing so important a natural resource for the benefit of the Dominion as a whole, inasmuch as it would provide a source of meat of incalculable value, and skins that could be utilized in the manufacture of many articles of clothing and commerce.

* "Conservation of Fish, Birds, and Game." Comm. Conservation, 1916, pp. 146–147; and Seventh Annual Report, Comm. Conservation, pp. 32–38, 1916.



From photographs by J. B. Tyrrell. Courtesy of the Geological Survey

A HERD OF BARREN-GROUND CARIBOU ON SHORE OF CAREY LAKE, DUBAWNT RIVER, MACKENZIE DISTRICT, N. W. T.

Caribou Warble-Fly.—Before leaving this animal, reference should be made to the occurrence of warbles in the hides of the caribou. During the spring and summer a species of warble-fly (*Œdamagena tarandi* L.) deposits its eggs on the coat of the caribou, and the small maggots bore into the skin and ultimately find a resting-place beneath the skin, particularly on the back of the animal. By October the presence of these maggots can be noticed on account of the lumps or "warbles" on the hide. The maggots continue to grow, and pierce the hide for the purpose of breathing. Early in the spring they emerge through the holes that they have made in the hide and fall to the ground, where they change into brownish-black pupæ, from which the flies emerge. Owing to the numerous holes made in the skin of the caribou by these maggots the skins are rendered useless for dressing, and the total destruction of hides is very great. As is well known, our domestic cattle are attacked by a closely related species of warble-fly. The Eskimos are very fond of the large, juicy maggots, and whenever a caribou affected with maggots is killed and skinned they pick the living grubs off the under sides of the skins and eat them raw with great relish. To a taste accustomed to consuming all kinds of raw meat they are no doubt delicacies of a high order.

The caribou are tormented by myriads of black flies and mosquitoes, and it is no doubt largely on account of these pests that they travel northward in the spring, although they are by no means able to escape the hordes of these blood-sucking insects that occur in the north in the spring and early summer.

THE WOODLAND CARIBOU AND RELATED SPECIES

While zoologists are still undecided as to the number of species of caribou that occur in Canada, it is possible to separate four distinct species, namely: (1) the barren-ground

caribou (*Rangifer arcticus*), with its allied races to which I have already referred, which is the smallest species; (2) the woodland caribou (*R. caribou*) (Plate II), which is larger in size, and comes next in extent of distribution and abundance; (3) the large mountain caribou (*R. montanus* and *R. osborni*), which is dark in colour and exceeds all others in size (Plate IV); and the light-coloured or white Newfoundland caribou (*R. terrænovæ*).

Throughout its range the woodland caribou is but thinly scattered, and it is nowhere numerous at the present time. It may be found in the thickly wooded coniferous forest regions from Nova Scotia in the east to British Columbia in the west. In Nova Scotia it has become very scarce, but may still be found in small numbers in the western part of the province, particularly in Victoria and Inverness Counties, Cape Breton Island. A few remain in New Brunswick, but unfortunately they appear to be decreasing in numbers annually.* Perhaps the greatest number now occur in the province of Quebec, especially in the remote forest regions which extend from the Gulf of St. Lawrence to the Hudson Bay, although their numbers are decreasing every year. In 1911 I found that they were still fairly common in the Lake St. John region, but they are in need of greater protection in that province.

Throughout the coniferous forests in the northern portions of the provinces of Ontario, Manitoba, Saskatchewan, and Alberta, and the adjacent similarly forested regions of

* Henry Braithwaite, the veteran guide and trapper, of Fredericton, is quoted as saying, in *The Weekly Mail*, Fredericton, N. B., February 9, 1921: "I may be wrong, but it is my honest opinion that the New Brunswick caribou have been exterminated. . . . Some of our guides and sportsmen appear to be under the impression that caribou will some day return to the province. It is my belief that they will not come back. They left New Brunswick just as they left Maine some thirty years ago, and Maine is without caribou today. . . . They have gone out in precisely the same way as the wild pigeons. I can remember in my boyhood days seeing flocks of wild pigeons which almost darkened the sky. They vanished almost in a night, and the prediction was freely made that they would return, but they have not done so."

the Northwest Territories, the woodland caribou is widely distributed, but it is nowhere abundant. MacFarlane states that this caribou is known to the Cree Indians as the *muskeg-atik* or "swamp deer," on account of the character of its usual habitat, and that it is not found in the region of poplar growth or in the open plains. From the statements of MacFarlane and reports that have been furnished me by Mr. Charles Barber, chief game guardian of Manitoba, Mr. F. Bradshaw, chief game guardian of Saskatchewan, and Mr. H. T. Bury of the Department of Indian Affairs, the range of the woodland caribou is, throughout this western territory, generally speaking about as follows: From Lake Winnipeg westward to Lake Athabaska; in northern Saskatchewan they occur chiefly northeast of Prince Albert and northwest of Battleford; over the whole section of the country within the basins of the Slave and Athabaska Rivers; and between Athabaska Lake and Great Slave Lake they occur chiefly on the west side of the Slave River, and through the country lying between Peace River and Great Slave Lake. Farther west small herds have been encountered along the lower Liard River, and in northern Alberta they have been met as far south as the North Saskatchewan River near Edmonton.

Seldom are large numbers found together. They usually occur in small bands made up of five to thirty or forty individuals. Sometimes larger bands may be found congregating in the autumn. When they are dressed the skins of the woodland caribou are superior to those of the barren-ground caribou.

Mountain Caribou.—The mountain caribou are to be found in British Columbia. In the southeastern part of the province the species described by Seton, in 1899, as the black-faced or mountain caribou (*R. montanus*) occurs in the forested valleys of the Selkirk and Monashee (Gold) Mountains. Mr. Robert Chapman informed me that he

saw a few caribou, no doubt this species, in the great bend of the Columbia River, north of Revelstoke, in 1915. In September the new coat of this species is almost black, and the antlers bear a large number of long tines. Further north the large mountain caribou, first described in 1902 by Allen as Osborn's caribou (*R. osborni*), is found in the Stikine Mountains. This is a larger species than the southern mountain caribou, and its splendid head is prized by all big-game hunters. Its coat is browner than the *R. montanus*.

In referring to the caribou in his annual report for 1915, Mr. Bryan Williams, then provincial game warden for British Columbia, states that the "reports of caribou in the north are much better than for several years, one hunting party in Cassiar having seen some 1,200 head in a few days' hunting. Information has also been received of magnificent caribou ranges in a part of the north country hitherto almost uninhabited, even by Indians. The report states that one day, while travelling some twelve miles, small bands of caribou were constantly in view, and that one large band of close on to five hundred head was seen." In his annual report for 1915 Mr. Williams states: "When the last report was written the mountain caribou in the Selkirks were supposed to be very scarce, but subsequent reports were quite the contrary. In fact, there were more caribou about than for some years, though, owing to the bad crust on the snow, they were hard to get. The Chilcotin caribou have almost disappeared. Even the Indians are now agitating for an absolutely close season in certain areas, and I promise to see that if such regulations are made they will be observed. There are many more caribou on the ranges towards the head of the Fraser River than there were thought to be. This country was hunted a good deal during the past season, and one party reported having seen 128 head, which is a very large number for this district."

1

2

3

Photographs by W. E. Ekblaw of the Crocker Land Expedition of the American Museum of Natural History. Reproduced by permission

MUSK-OXEN ON ELLESMERE ISLAND

1. Eskimos rounding up by means of dogs and shooting down a herd of Musk-oxen
2. Herd of Musk-oxen in characteristic defensive formation
3. Herd of Musk-oxen rounded up by Eskimo dogs

In 1911 what has been described as a new species of mountain caribou, the Rocky Mountain caribou (*R. fortidens*), was described by Hollister.*

This is a very large species, exceeding in size the other species of mountain caribou. The teeth are conspicuously large; the colour is very dark, ranging from dark brown to black, and the antlers are stout and heavily palmated, more like *R. montanus* but very different from *R. osborni.* The species was found at the head of the Moose Pass branch of the Smoky River, northeast of Mount Robson.

As all these species of caribou, which are the reindeer of the New World, occur almost entirely in Canadian territory, with the exception of a few woodland caribou in Maine, northern Minnesota, and northern Idaho and the caribou in Alaska, a special responsibility lies upon us to take every possible step to prevent their reduction to the extent that their existence would be menaced. It is important, therefore, that all the provinces concerned in their protection should take especial care that their game laws provide for such protection as the local abundance of these caribou demands; for otherwise we may lose in some regions a very unique member of our big-game fauna.

ANTELOPE

The history of the antelope, or "pronghorn," in North America, its only home, constitutes another of those tragedies in the story of our wild life. The most graceful and the fleetest of our four-footed animals, it has suffered a fate not unlike that of its companion of the wide prairies, the buffalo, with the herds of which it formerly shared a wide range, extending from the provinces of Alberta, Saskatchewan, and Manitoba in the north to Mexico in the south.

* "New Mammals from Canada, Alaska and Kamchatka," by N. Hollister. Smithsonian Misc. Collections, vol. 56, no. 35, pp. 1–8, 1912. See also *Canadian Alpine Journal*, special no., pp. 37–39, 1912.

Over many portions of this range they roamed in uncountable herds. To-day over the same territory a few thousand are able to exist, solely on account of the absolute protection that they are given in our western provinces and all of the States. It is the same story of extermination following the advent of man armed with rifles and the extension of agriculture. The settlement of the country and the construction of railroads have also introduced a new factor, namely the wire-fence, that has had a very marked effect in confining the remaining herds to restricted areas and thus preventing their normal migration.

One visitor to the West in the early "seventies" has described to me how the prairie seemed to vibrate with the galloping of these swift little creatures, and how they were slaughtered to such an extent that their outstretched carcasses were piled in heaps like cord-wood.

Not only is it the most graceful of the hoofed animals of America, but it is so unique in its characters that it constitutes the sole member of a special family found nowhere else in the world. On that account alone its extinction would be a calamity. Its chief title to scientific distinction consists in the fact that like the cattle tribe it has hollow horns, but unlike them it sheds the outside sheath each year, just as the members of the deer tribe shed their antlers. In the latter case it is the whole horn or antler that is shed; but in the case of the antelope only the outer sheath of the horn is shed. The inner core remains and gives rise to the new horn, which is pronged; and hence the name, "pronghorn," by which the species is more correctly known, as the animal is not a true antelope.

Scarcely more than three feet at the shoulder in height, these little animals are well adapted to the life of the great plains. One of their striking peculiarities is the possession of a white chrysanthemum-like patch of hair on the rump. This hair is erectile at will and serves as an excellent sig-

nalling apparatus to other members of the herd, and all observers have testified as to the value of this natural heliograph.

Habits.—In the days of antelope abundance they formed herds varying in numbers from a few individuals to several hundred during the fall, and these herds consisted of adults of both sexes and young. In September or October the bucks vigorously contest for the possession of the does, and soon the most vigorous bucks have rounded up their small bands of chosen does. With the advent of winter the herds migrate, sometimes for a hundred miles or more, to seek the more sheltered regions of their range in the low hills and foot-hills, and here among the coulees they pass the winter. To-day these herds do not often number more than about fifty animals.

With the return of spring the herds split up. The does seek such solitude as they may be able to find, and in May or June they give birth, usually to two fawns, which remain with their mother all summer. In the fall the males drift in again, and the seasonal life history is repeated.

It is a singular fact that it is practically impossible to keep the antelope in captivity. Hornaday, who has had great experience in this respect, states: "Owing to the extreme difficulty in maintaining this species in captivity, its total extinction at an early date seems absolutely certain, unless it is fully and permanently protected in a wild state, on its native range, for a long period."

Distribution and Abundance in Canada.—In Canada it formerly ranged, probably in an abundance almost equal to that of the buffalo, from southern Manitoba westward to the Rocky Mountains and northward as far as Edmonton. Seton* gives what would appear to be the last record of the occurrence of the antelope in Manitoba, where it is

* "Life Histories of Northern Animals," vol. I, pp. 215–216.

now extinct. He says: "J. T. Brondgeest, of Whitewater, Man., tells me that he first came to Whitewater in 1879, and settled down in the fall of 1880, and that in those days there were plenty of antelope about, but the last he saw was killed by his father in 1881."

To-day the antelope in Canada are confined to those areas in the southern portion of Saskatchewan and Alberta that have not been devoted to wheat-growing. From the inquiries that I have made, I do not think that there are more than about 3,000 animals now remaining in those provinces, and of this number the greater portion exists in Saskatchewan. In the latter province Mr. F. Bradshaw, the chief game guardian, informs me that the existing antelope are to be found mainly in the following districts: the Great Sand Hills north of Maple Creek and Crane Lake; the Vermilion Hills between Ernfold, on the main line of the Canadian Pacific Railway, and the South Saskatchewan River; on the east of Lake Chaplin, south of Secretan on the main line of the C. P. R.; southeast of Cypress Hills and adjoining the Whitemud River; and northwest and south of Wood Mountain. The last three localities are in a region that is chiefly devoted to cattle-ranching, and it is encouraging to know that, according to Mr. Bradshaw, the owners of the cattle ranges in which the antelope are to be found, particularly in the Pinto Creek section of southern Saskatchewan, are doing what they can to protect the antelope found on their ranges, where they mingle with the cattle. It is of interest to record that Mr. Reuben Lloyd, of Davidson, Sask., has in a small fifteen-acre private game reserve, three male and one female antelope, and in 1916 the latter gave birth to the two fawns which are shown on Plate XIII.

In southern Alberta a few small herds may be found in the rolling hills, and the foot-hills of the Rocky Mountains that are remote from settled areas. In both provinces the

antelope is absolutely protected by law for a period of years, and, although a certain amount of illegal killing undoubtedly takes place, nevertheless the watchfulness of the provincial game wardens and of the members of the Canadian Mounted Police appears to be checking any further decrease in numbers due to hunting.

The Dominion Parks Branch of the Department of Interior has been active in its earnest endeavour to save the antelope from extermination. Several attempts have been made to breed the antelope in the national parks in the west, particularly in the Buffalo Park at Wainwright, Alta., but without success. With the assistance of Mr. Thompson Seton, three areas have been set aside as reserves for antelope, one in Alberta and two in Saskatchewan. In the spring of 1914 the Branch was advised of the presence of a small herd of antelope near Foremost, Alta. Mr. Maxwell Graham, in charge of the Animal Division of the Branch, immediately proceeded to the locality and was successful in enclosing, with a suitable fence about twelve miles in length, an area of about 5,160 acres, a herd discovered near the junction of two deep coulées. The land is mostly unsettled, and as yet is unfitted for agriculture. Broken by numerous ravines, it contains excellent summer and winter range, and such vegetation as sage-brush, cactus, and antelope grass, as well as water. At the time of capture the herd consisted of forty-two animals, and this number has now increased to about one hundred.

All animal-lovers are unanimous in their hope that the earnest efforts that are now being made by the Dominion and the provinces of Alberta and Saskatchewan, not merely to prevent the extermination but to secure an increase in numbers of this incomparably beautiful and unique member of our wild life, will be attended with success. The creation in the minds of the farmers and ranchers living within the antelope range of a sympathetic attitude towards the pres-

ervation of so valuable a possession will accomplish more than anything else towards the attainment of the desired object.

THE ROCKY MOUNTAIN SHEEP

Of all our big-game animals none is more characteristic of our western mountains, and none offers such a magnificent trophy to the sportsmen whose endurance its winning demands, as the mountain sheep, or "big-horn." It is the best-known type of the New World representatives of the numerous forms of wild sheep, all characterized by their circular horns, that are to be found in the Old World, where the finest of all the wild sheep, *Ovis poli*, occurs in the lofty Pamir ranges of Central Asia.

Our several species of American mountain sheep are found from northern Mexico on the south to the mountains fringing the northern coast of Alaska and western side of the Mackenzie delta. They reach their greatest abundance in the central parts of their range.

In the United States they have suffered the fate of the rest of the big game, and have been exterminated in very many of their former haunts through the greed of hunters and others whose rapacity has been permitted to run riot owing to the lack of adequate protection; and also by disease contracted from domestic sheep. The history of this animal in the southern portion of its range serves as a solemn warning to us, and should be an incentive to the enforcement of every possible means that will secure the preservation of an animal which in its native haunts evokes thrills of admiration in every mountaineer.

In Canada we have three distinct species of mountain sheep: the Rocky Mountain sheep (*Ovis canadensis*) and its varieties; Stone's or the black mountain sheep (*Ovis stonei*), described by J. A. Allen in 1897; and the pure-white Dall's mountain sheep (*Ovis dalli*), of the far north and Alaska,

ROCKY MOUNTAIN SHEEP (*Ovis canadensis*)

WHITE MOUNTAIN SHEEP (*Ovis dalli*)

From paintings by Carl Rungius. Reproduced by courtesy of the New York Zoological Society

described by E. W. Nelson in 1884. A fourth species, known as Fannin's mountain sheep, or the "saddle-backed" or "piebald" sheep (*Ovis fannini*), was described by W. T. Hornaday in 1901.* This species is now considered by some to be due to interbreeding between *Ovis stonei* and *Ovis dalli*. Its type specimen is in the Provincial Museum at Victoria, B. C., and the latter view appears to me to be correct in view of the observations of Charles Sheldon† and others.

An examination of many skins and the reports of hunters indicate a strong tendency among the northern mountain sheep to vary in colour and thus render specific designations somewhat difficult. In northern British Columbia and the adjoining part of the Yukon Territory where Fannin's saddle-backed sheep occurs, in the mountains between the home of the typical Stone's black mountain sheep (*O. stonei*) and Dall's white mountain sheep (*O. dalli*), sheep are found having white heads and necks and with bodies of varying shades of grey, produced by mixtures of dark and white hairs. One may find white sheep mingling with the dark-grey or grey and white sheep. There can be little doubt that interbreeding occurs. But, while such intergrading of characters may be found in regions adjoining or common to different species, especially as mountain sheep will occasionally extend their range, in the mountain ranges where intermingling does not occur the animals keep true to type, the topographical and climatic conditions being sufficient to prevent extensive intermingling. The distribution of the colour variations intermediate between the black *O. stonei* and the white *O. dalli*, including the "saddle-back" sheep, *O. fannini*, is shown in the accompanying map pre-

*Hornaday, W. T., "Notes on Mountain Sheep in North America, with a Description of a New Species," *Fifth Ann. Report New York Zool. Society*, pp. 77–122, 1901.

†"The Wilderness of the Upper Yukon." By Charles Sheldon. Second edition, New York, 1909.

pared by Charles Sheldon on the basis of the available information regarding the distribution of these sheep* (p. 82).

The mountain sheep are partners with the eagles of the tops of the high mountain ranges. Here on the treeless mountain divides and plateaus, and in the verdant alpine meadows, the sheep find all their needs supplied, and thrive in the altitudes above the limit of tree growth. In these rugged pastures usually one and sometimes two young are born in the spring, and even in the winter, when deep snow drives many of them to the lower altitudes, where protected pastures may be found, or to the foot-hills; others will remain to eke out an existence by pawing through the snows of the mountain meadows. Always alert and difficult to approach, it offers a great contrast to its phlegmatic and at times unsuspicious mountain neighbour, the mountain goat.

The Rocky Mountain Sheep (*Ovis canadensis*)

(PLATE VII)

Distribution.—The justly famous "Big Horn" has as its principal habitat the main range of the Rocky Mountains. From the international boundary on the south it ranges through British Columbia and Alberta to a northern limit, which is found in the region of the Smoky River, on the eastern slope of the Rocky Mountains. It occurs in the mountains of British Columbia, except in the Coast Mountains, from the Kootenays to latitude 55° 30′. Dawson gives its westward range "to the line drawn a certain distance back from the seacoast, approximately along the middle of the Coast Mountains. . . . Within the above area are many ranges and groups in which sheep do not occur." It is found in the Similkameen, Okanagan, Cariboo, and

* We should be pleased if hunters, surveyors, and others visiting the regions inhabited by sheep would send us information regarding the varieties occurring in those regions, in order that our knowledge of their distribution may be increased.—C. G. H.

Chilcotin regions. In spite of long persecution—the slaughter by sportsmen for a trophy that is prized above all others, and by white men and particularly Indians for meat, for its flesh is of the most savoury kind—it has managed to hold its own.

Habits.—The Rocky Mountain sheep prefers the high mountain meadows at timber-line, where small bands will graze on the rich vegetation usually found there. Particularly do they prefer a grassy meadow or slope, one side of which falls away in precipitous crags, with talus below, by which route their marvellous agility in climbing rocks will enable them to make their escape should danger arise. The rams and ewes form separate flocks in the spring, and feed in separate pastures until late in the fall, when they intermingle again. The young are born between May 15 and June 15, sometimes on the high snow-fields, or in sheltered places among the rocks near the timber-line. The chief enemies of the lambs in the spring are the golden and bald eagles. When stress of weather drives the small flocks to lower altitudes they are subject to the attacks of such predatory animals as wolves, coyotes, and cougars or mountain lions.

The horns of the Rocky Mountain sheep are massive and thick, and not so widely spread as in other species. The largest horns ever taken of which I can find a record are claimed to have measured eighteen and one-half inches in circumference at the base and fifty-two and one-half inches in length round the curve. This ram was taken in the Selkirk Mountains. Fine horns are often spoiled by being "stubbed" at the end by fighting, and by wearing away owing to striking the horns against rocks and rubbing them. There is a large amount of variation to be found in the weight and thickness of the horns of races of this species from different localities; for example, the horns of sheep found in the Lillooet region of British Columbia are usually

more slender and less massive than those carried by sheep in the Rocky Mountain region of the same province. The female sheep have short, goat-like horns, which are erect and flattened, and they measure from five to eight inches.

In Alberta the Rocky Mountain sheep are found throughout the eastern slopes of the Rocky Mountains, from the international boundary to the region of the Smoky River, and at the head of the Grand Cache River. In the southerly part of their range they have suffered severely through the excessive hunting of the Stoney Indians, but a number of circumstances are now tending not only to prevent their further reduction, but to insure an increase in abundance. The Indians are now compelled to observe the provincial game laws, which require a bag limit of two sheep and fix the open season from September 1 to October 15. The most important factor, however, in protecting the sheep and insuring an increase is the protection they secure in the Dominion Parks. In the Waterton Lakes Park, in the south, they are reported to be more plentiful. Their increase in number in the Rocky Mountains Park is very noticeable. In fact, the presence of a flock of ewes and lambs in the neighbourhood of the Vermilion Lakes automobile road is one of the attractions of Banff during the summer. Jasper Park contains a large area of sheep country, in which the present stock of sheep will undoubtedly increase through the absolute protection accorded to them by the game-protection policy of the Dominion Parks. These three extensive areas, that are described in greater detail elsewhere, will insure the preservation of this species, and will act as a source of natural supply for the adjacent mountains outside the confines of the parks.

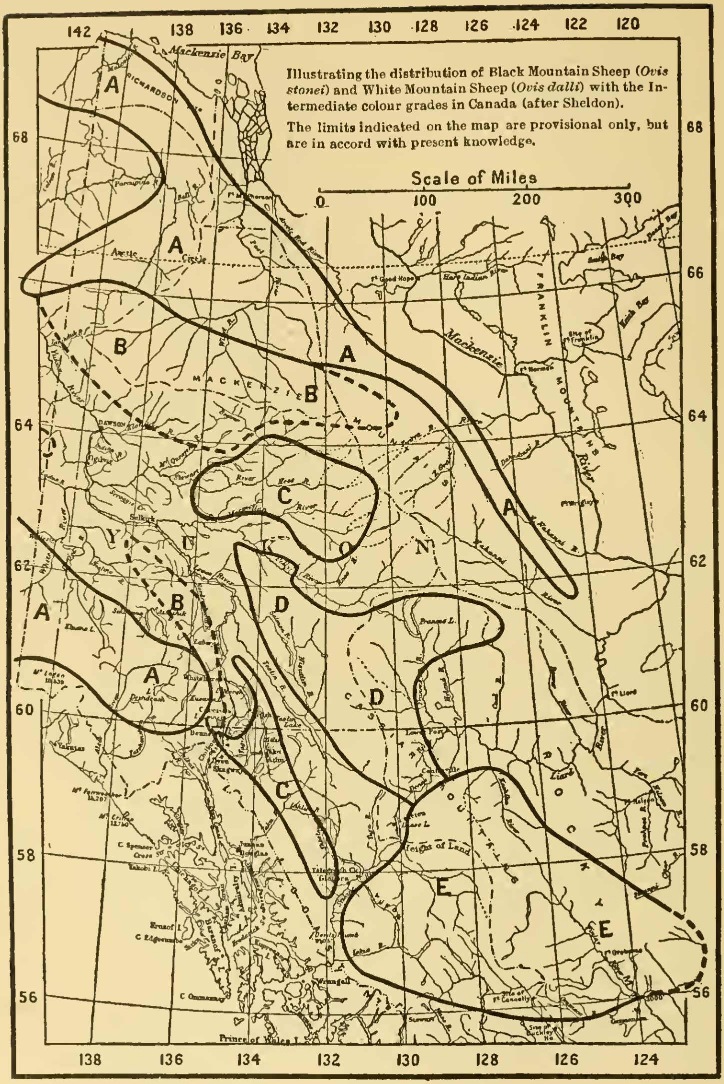
The Rocky Mountain sheep in British Columbia may be killed between September 1 and November 15, in all districts except the electoral districts of Yale, Similkameen, and North and South Okanagan, in which they are given

an absolute close season at the present time with a view to increasing their numbers. The reports received from other districts are very satisfactory and indicate the wisdom of limiting the killing to males only. In the Lillooet region they have unfortunately so decreased in numbers as to necessitate a close season for several years. This decrease is said to be due to the excessive hunting by the Chilcotin Indians and to the abundance of cougars.

The Black Mountain Sheep (*Ovis stonei*)

This species was first described by J. A. Allen from specimens killed by A. J. Stone in the Cheonee Mountains of northern British Columbia, at the headwaters of the Stikine and Nass Rivers, in 1896. The black mountain sheep and the next species, the white sheep (*Ovis dalli*), with the intermediate colour grades shown in the accompanying plate (VII), all of which are generally referred to as the *dalli-stonei* group, have more slender and less massive horns than the Rocky Mountain sheep (*Ovis canadensis*). There is, however, among the sheep of the *dalli-stonei* group, considerable variation in the character of the horns. Charles Sheldon* describes the following types: "The narrow type, sometimes with very close spiral; the diverging type, often with a very wide angle from the perpendicular—both these types occur with massive or slender horns; a type with horns very much curled, the tips extending up well beyond the eyes; a type with very small, compact, curled horns, often well wrinkled in age, but very slight in weight; a type large at the base, and abruptly tapering outward to thinness; a type with horns curving without elevation from the skull, having the appearance of low horns; another, the reverse, in which the horns rise curling almost directly upwards from the skull, having the

Loc. cit., Appendix F.



Illustrating the distribution of Black Mountain Sheep (*Ovis stonei*) and White Mountain Sheep (*Ovis dalli*) with the Intermediate colour grades in Canada (after Sheldon).

The limits indicated on the map are provisional only, but are in accord with present knowledge.

ILLUSTRATING DISTRIBUTION OF MOUNTAIN SHEEP IN AREAS INDICATED ON THE MAP

PLATE VIII

Fig. 1. *Ovis dalli*, Type.

Fig. 5. *Ovis fannini*, Type.

Fig. 9. *Ovis stonei*, Type.

Fig. 2.

Fig. 6.

Fig. 3.

Fig. 7

Fig. 4.

Fig. 8

Distribution Areas

A.—Occupied by Fig. 1 (*Ovis dalli*) exclusively

B.—*Ogilvie Mountains* occupied by Figs. 2, 3, 4, exceptionally Fig. 5, in eastern section. Figs. 2 and 3 greatly in the majority. *Between Yukon and Tanana Rivers* occupied mostly by Fig. 2 with much less black on tail, occasionally Fig. 1. *West of Lewes River* occupied by Figs. 1 and 2 in the majority; Figs. 2, 3, 5 exceptionally

C.—Occupied by Figs. 2, 3, 4, 5, 6, 7. Figs. 3, 4, 5, 6 most common. Intermediate colours between 2 and 3 equally common

D.—Occupied by Figs. 4, 5, 6, 7, 8. Figs. 5, 6, 7 in the majority. Tendency toward lighter colours in the north. Fig. 4 exceptional in the north, still more so toward the south. Fig. 9 occasionally in the south

E.—Occupied by Fig. 9 (*Ovis stonei*). Rarely Figs. 6 and 7 are found in this area

Figs. 1, 5, and 9 were drawn from the *Types*. The other figures are from specimens illustrating the average colours, but actually every intermediate gradation of colour occurs between each form illustrated

(After Sheldon)

appearance of high horns; more exceptional types where the tips thrust at length almost horizontally outward, and where the tips do not turn outward at all. Every possible intermediate form of horns occurs between all these types. The horns of ewes, although generally more uniform, vary between the narrow and diverging types." According to Sheldon the common type of horns of the *dalli-stonei* group everywhere is the narrow type. "In regions where sheep are more abundant naturally there are more rams with large horns, and also, in most places, with a larger proportion of diverging horns."

The known distribution of *Ovis stonei* is shown approximately in the accompanying map (p. 82). Southward they have been found near the head of the South Fork of Stikine to the Iskoot River, not far from the Nass River. The extreme southern and eastern range is not known. Sheldon suggests that it is probably between latitudes 56 and 57 degrees, and west of longitude 122 degrees.

In various parts of their range the black mountain sheep are to be found in abundance. They are reported to be very numerous in the mountains of the Cassiar district, which perhaps constitute their chief centre, and in 1915 Mr. Williams, provincial game warden for British Columbia, reported that good bands were seen on several ranges that had almost been deserted for several years previously. East of Dease Lake they are also abundant. The flocks are often larger than those of the Rocky Mountain sheep. Large flocks may sometimes be found consisting of ewes and young rams. Except in the fall and winter the older rams separate from the ewes, as in the previous species, and they live apart in small flocks. The blackest specimens have been found north and south of Telegraph Creek, B. C.

The inaccessible character of the greater portion of the range of this species prevents great reduction in its numbers either by hunters or Indians. The Cassiar region in which

it ranges is unsurpassed as a big-game country, and will continue to attract sportsmen from all parts of the world, in consequence of which every precaution should be taken to prevent a reduction in numbers of this splendid animal.

Dall's Mountain Sheep (*Ovis dalli*)

(plate vii)

It must have been one of the great occasions of his life when my friend, Doctor E. W. Nelson, now chief of the Biological Survey of the United States Department of Agriculture, first saw this most northerly and certainly the most beautiful species of mountain sheep, which he afterwards described, in the mountains of Alaska in 1881. From the fall to the spring its thick coat of rather long pelage is pure white, and its amber-coloured horns have the graceful sweeping spiral typical of the northern species, *O. stonei* and *O. dalli*. From early June to September the copious winter coat is shed, and the hair is short like that of the Rocky Mountain sheep. Through contact with the red soil and rocks it becomes discoloured and often bears a reddish tint. Intrepid climber of the most rugged peaks of the high northern mountains of Alaska and Canada, it affords a trophy of the finest kind.

The distribution of *Ovis dalli* will be most readily ascertained by reference to the map. Sheldon states that pure-white sheep, that is, *Ovis dalli*, are distributed as follows: Throughout the Mackenzie Mountains, within the Mackenzie watershed south farther than latitude 62 degrees. In the Yukon Territory, north of latitude 66 degrees, south of latitude 62 degrees, and west of 136 degrees. West of the Lewes and Yukon Rivers they greatly preponderate over the intermediate colour grades. In the Ogilvie Mountains the tendency towards the white *O. dalli* prevails increasingly towards the west and north.

The presence of all gradations between the pure white *O. dalli* and the dark-grey or black *O. stonei* in the mountains between the range of these two species has already been mentioned. In the Selwyn Mountains and in the region between the Sheslay River district and the Lewes River the colour of the sheep is extremely variable. From the Sheslay River region north of the Stikine River, north along the uninterrupted area of travel through the Stikine Mountains and the Pelly River region, there is more general uniformity of colour, lighter sheep occurring along the Pelly River.

It would appear that "within the areas of colour variation," to quote Sheldon, "sheep inhabiting the continuous unbroken ranges have a tendency towards uniform colours, while those inhabiting regions where the mountain ranges are broken, having the character of complex groups separated by wide valleys, tend to vary."

R. G. McConnell reported this species from the mountains west of Peel River, in 1901. Jos. Keele, in the report of his reconnaissance of the Mackenzie Mountains, in 1907 and 1908, states that they are plentiful in portions of the Gravel River region, particularly on the low mountains between the Sayunei and Tigonankweine ranges. E. A. Preble (1908) reported their occurrence in the mountains west of the Mackenzie River from the vicinity of Fort Liard to near the Arctic coast. They are killed in the mountains opposite to Forts Norman and Good Hope, and while at Fort Macpherson he saw heads and skins which had been obtained on Black Mountain, the extremity of the range west of the Mackenzie delta.

During the summer the rams and ewes are hardly ever found together. Charles Sheldon informs us that the lambs are born from early May to early June, and sometimes, though this is exceptional, as late as early August. After the lambs are born the ewes and lambs remain in the

most inaccessible parts of the mountains and afterwards seek the best food areas. The rams seek the best food areas, but do not move about so much as the ewes.

The splendid trophy that the head of the white sheep makes causes it to be hunted whenever and wherever possible. R. M. Anderson has reported the use of the skins for clothing by western Eskimos, but this is not common as the range of the sheep is largely outside of Eskimo territory. The great palatability of its flesh has been one of the main causes of its reduction and extermination in many parts of its range, especially in Alaska, where miners, prospectors, and others have not only killed it extensively for their own use but also to serve as dog food in the winter.

No animal can stand the reduction in numbers that such killing involves, and it is to be hoped that such wasteful destruction of this beautiful animal will be checked by more stringent regulations for its protection. The recent establishment of a national park by the United States Government, in the Mount McKinley region, will do much to preserve this species in that territory, and the establishment of protected areas in the Canadian range of this, the most beautiful of our mountain sheep, cannot be too strongly urged, especially as it would not affect the vital interests of either white or native inhabitants.

THE ROCKY MOUNTAIN GOAT

(PLATES IX AND XVI)

The Rocky Mountain or white goat (*Oreamnos montanus*) is another of the unique members of our native mammals. It is the only representative on this continent of the numerous wild species of goats that are found throughout Asia, southern Europe,—where its nearest relative is the chamois, —and northern Africa. Its home is to be found on the slopes and inaccessible summits of the western mountains.

The mountain ranges of British Columbia, from the Rockies on the east to the Coast Mountains on the west, constitute the chief stronghold of this remarkable animal.

Habits.—The characteristic haunts of the Rocky Mountain goat are the precipitous rocky slopes and ledges, and the grassy alpine ridges above the timber-line, of the high mountains, where they feed on the grasses, lichens, and other stunted vegetation found among the rocks. In choice of habitat they differ from the mountain sheep. The difference in choice of locality between these two inhabitants of our western mountain ranges is generally known, and the fact is frequently acknowledged by the statement that mountain sheep and goats are not often found together on the same mountain. Usually the difference of geological formation between neighbouring mountains provides separate and suitable habitats for both species.

They combine remarkable steadiness of nerve with agility and sure-footedness on the most precipitous and inaccessible rock faces, and in rock-climbing are the most expert of all American hoofed animals, with more apparent than real stupidity, and great deliberation on occasions when it is least expected. The oddness of their temperament is hardly surpassed by that of their appearance, which is exaggerated greatly when they are seen away from their native crags. In spite of the fact that they do not offer the sportsmen either so splendid a trophy or so palatable a carcass as the mountain sheep, they are, nevertheless, an inducement to the most intrepid of climbers and cragsmen, who will seek them in their rock-bound pastures, over which their small, sure feet carry them with the greatest ease and safety. The difference in the shapes of the feet of the mountain goat and sheep leads to a difference in the appearance of their tracks. In the case of the goat, the open end of the V is in the direction the animal travels, whereas it is reversed in the case of the sheep.

Distribution.—While the greatest numbers, not only in Canada but in North America, are to be found in British Columbia, they are also found in Canadian territory on the eastern slopes of the Rocky Mountains in Alberta and in the Yukon.

In Alberta they appear to be holding their own. The following are the numbers of mountain goats obtained by hunters, under license, in this province within the past few years.

1909	1910	1911	1912	1913	1914	1915	1916	1917	1918
38	46	56	58	42	61	40	26	37	43

In the Dominion Parks in Alberta there will always be a plentiful supply of mountain goats, as the parks that include portions of the Rocky Mountains afford exceptionally good localities for these animals. In Jasper Park they are increasing in numbers and may frequently be seen there in their characteristic haunts by visitors. They are also increasing in numbers in the Rocky Mountains Park, where they may be found in nearly all parts of the park, particularly on the Sulphur Range and on the high, rocky ridge at the summit of the White River and the West Fork of the Elk River. In the Waterton Lakes Park they are very plentiful.

In British Columbia they are very abundant, and may be found on the mountain ranges from the summit of the Rockies to the sea-coast. In his annual report for 1915 Mr. Bryan Williams, provincial game warden, states: "More people hunt goat than formerly, but the number killed is so small as to have no effect on the enormous numbers of these animals. Except in one or two places very easy of access, they are as numerous as they ever were." And in the report for 1916 Mr. Williams states: "Goats have been but little hunted this year; they seem to have increased in several of the places where they were getting a bit scarce."

On account of its habits and its comparative lack of meat value, there is little fear that this animal, with the adequate protection that it now receives, will become very greatly reduced in numbers, and probably it will continue to afford an inducement to the boldest of hunters, and a pleasing feature of the higher altitudes of our magnificent western mountains.

THE MUSK-OX

The musk-ox (*Ovibos moschatus*) (Plate III) is, in many respects, one of the most interesting of the larger members of our wild life. It is also one of our native animals that is fast disappearing, as will be shown, from causes which are avoidable; and it is in need of absolute protection.

From a scientific standpoint it is of the greatest interest, as it occupies a unique position in the animal world. While it is not, strictly speaking, a link between the two families of sheep, on the one hand, and cattle on the other—a relation indicated by its scientific name—it nevertheless combines anatomical and other characters belonging to these two large groups. In size it equals one of the small breeds of Welsh or Scotch cattle, and in appearance it resembles a small buffalo. This resemblance to the buffalo is not only external, but, as J. A. Allen,* in his valuable monographic study of the musk-ox, has shown, the musk-ox has many anatomical features which would indicate that its nearest living relative is the American bison. In certain other features, such as the linear horizontal pupil of the eye, its short tail, and especially in its behaviour, it displays its affinities to the sheep. Allen also shows that the musk-oxen which at the present time inhabit northern Can-

* "Ontogenetic and Other Variations in Musk-oxen, with a Systematic Review of the Musk-ox Group, Recent and Extinct," by J. A. Allen. *Memoirs Amer. Mus. Nat. Hist.*, N. S., vol. I, pt. 4, pp. 103–225, 45 figs., 8 pls., 1913.

ada and Greenland can be separated into three well-defined types, and that in the absence of further evidence the musk-oxen of the continental Barren Grounds are referable to the one species, *Ovibos moschatus moschatus*. Like the buffalo, its head, throat, and shoulders are covered with long hair arising through a thick coat of under fur, but in the musk-ox this long hair covers the greater part of the body, and serves to protect the animal from snow, while the thick covering of under fur is essential to an animal which lives in some of the coldest and most inhospitable regions of the world. The valuable character of its fur has been one of the main causes of its great decrease in numbers, as musk-ox robes have always been in great demand by fur traders.

Formerly it was widely distributed in the arctic regions of northern Europe and Asia as well as North America, and remains of musk-ox have been found in fairly recent geological deposits (Pleistocene) in Siberia, Russia, Germany, Austria, France, and England, with the remains of the mammoth, reindeer, and woolly rhinoceros. It is now entirely confined to northern Canada, some of the islands of the Arctic, and Greenland. It is, as its appearance so strongly suggests, a descendant of those prehistoric animals that ranged the regions of ice, snow, and rock that in former times spread over the land areas of the northern hemisphere. Within historic times the musk-ox ranged over the whole of the Barren Grounds from Alaska and the mouth of the Mackenzie River on the west to the Churchill River on the east, but to-day the region it occupies is very restricted compared with its former distribution, as will be shown later.

Habits.—In these regions the musk-ox, which does not migrate in the manner shown by the barren-ground caribou, by reason of its abundant coat of thick hair withstands the blizzards and the deep snows, and, with the aid of the furious gales which sweep across those wastes, it is able to eke out an existence on the dried grasses and creeping wil-

MAP ILLUSTRATING THE DISTRIBUTION OF THE MUSK-OX IN CANADA

The shaded portion indicates the present known distribution of the Musk-ox; the thick black line, taken from Allen's map, indicates the extent of the former range of this animal

lows that the winds lay bare. According to MacFarlane, during the severest cold it will, sometimes, enter the northern fringe of the forest region to a depth of forty or fifty miles. With the advent of spring the thick winter coat is shed and the animals wander farther north. Mr. Stefansson believes they migrate about five miles per month. He states that they seem to be unwilling to cross narrow strips of water, and therefore do not migrate from one Arctic island to another, as in the case of the caribou. They are gregarious in habit and usually live in bands of six to twenty individuals, but herds containing as many as one hundred animals have been recorded. In these bands there are usually but few males; Mr. Stefansson counted 114 animals in a single herd on Melville Island. In spite of their heavy and ungainly appearance and the shortness of their legs, they run with considerable speed. When alarmed they show their sheep-like habits. The herd collects together, forming a circle around the calves, the larger animals facing with their formidable-looking horns the source of danger. In this manner they are usually able to withstand the attacks of wolves, but the Eskimos take advantage of this habit and surround the herd, from which, as a rule, not a member escapes, the whole herd being killed (Plate VI). This reckless slaughter, sometimes imitated by white men, has been the cause of the reduction of the musk-ox to the alarmingly small numbers in which they exist to-day. When they are able to escape they take to the hills, where they are able to ascend precipitous slopes and to traverse rocks and crags with astonishing agility, led usually by an old bull. The female produces one, rarely two, young at the end of May or the beginning of June. Ekblaw (see p. 97) records the birth of a musk-ox calf on or about April 28, near Cañon Fjord, Ellesmere Island. The flesh of a fat musk-ox is said to be excellent, resembling caribou somewhat, but coarser in grain. The bulls may attain a

considerable size, Seton having killed a very large old bull in August, 1907, on the north shore of Aylmer Lake, where it had undoubtedly wandered from the more northern territory inhabited by this animal. The bull was estimated to weigh 900 pounds. Its total length was 96 inches, and its height at shoulder 59 inches.

Economic Value as Furbearer.—The possession of a large and valuable pelt by the musk-ox led to the destruction by the Eskimos, Indians, and white traders of every musk-ox that could be reached, and the gregarious habits of the animal brought about a speedy reduction in its numbers. Roderick MacFarlane, a former chief factor of the Hudson's Bay Company, who has contributed so much to our knowledge of the animals of the north, gives an account of the trade in musk-ox skins. He states:

> The Company's posts at which musk-ox skins are usually traded are Fort MacPherson (from the Eastern Coast Eskimos); Forts Good Hope and Norman (from the Anderson Eskimos and from post Indians who hunt them); Rae and Resolution on Great Slave Lake (from Indian hunters); Lac du Brochet, Reindeer Lake (from inland Eskimos); and Fort Churchill (from the Hudson Bay Eskimos). It is only in recent years, however, that the Company has strongly encouraged the hunting of musk-oxen, and although there is no record of the sale of any in the London Statement, 1853–1877, yet we know that a number of pelts were occasionally, if not annually, traded at Forts Churchill and Anderson, at least subsequent to 1860, and that they must have been sold there or in Montreal (the British Company's market for buffalo robes) as the statement of the northern department fur returns for outfit 1865, . . . shows that the districts of Mackenzie River and York, Hudson Bay, collected 26 and 66 musk-ox skins, respectively, in that year. During the last thirty years, the Indians and Eskimos have devoted more attention than before to the hunting of this valuable animal. In 1902, 271 skins and in 1903, 246 skins were exposed for sale, and the average for the past twenty years probably ranged between 200 and 250 pelts. The greater portion of those secured by the Company are purchased in London and re-shipped to and used in Canada and the United States, chiefly as sleigh and cutter winter robes.

In his report of his exploration trip from Great Slave Lake to Chesterfield Inlet via Thelon River, in 1900, J. W. Tyrrell states that they first found musk-oxen among the lakes in the vicinity of the height of land between the basin of the Great Slave Lake and that of the Thelon, and, after emphasizing the fact that the musk-oxen are among the most valuable resources of the north country, he recommends that the territory between Thelon and Backs Rivers be set aside as a game sanctuary, on account of the rapid diminution of their numbers. In his volume, "Through the Sub-arctics of Canada," he refers to the musk-ox (pp. 241–242), and states that he has seen "musk-ox robes stacked by the Eskimos like hay-cocks, along the shore of Chesterfield Inlet, awaiting opportunity to market them." In 1912 the Hudson's Bay Company established a post at Chesterfield Inlet, and I am informed by a recent explorer from that region that the natives were being encouraged to bring in all the musk-ox robes that it was possible to obtain. As the remaining herds of musk-ox are now restricted on the mainland to the region between Chesterfield Inlet and Backs River, the significance of such hunting is only too obvious.

It had been hoped by many of those of us who are endeavouring to prevent the extermination of this scientifically unique and economically valuable animal of our Arctic plains that in the interior of the Barren Grounds there was an area, more or less inaccessible on account of the difficulties of travel to the Dog-rib and Yellow-knife Indians on the west, and the Eskimos on the east, in which there would be less danger of the musk-ox being killed out. Unfortunately, the latest reports indicate that this is a vain hope. It is true, as I am reliably informed by one of the Hudson's Bay Company's officers, that the western and southern range of the musk-ox has been so reduced that it was practically impossible to obtain musk-ox skins at the

western trading-posts, owing to the great expense entailed in fitting out the Indians to hunt them at so great a distance away in the interior, but from the Arctic coast on the north and the Chesterfield Inlet region on the east, the Eskimos, better equipped, and able to travel through almost any country, were reported to be attacking the remaining herds.

Distribution.—The most recent account of the present distribution of the musk-ox, and the extent to which its extermination is proceeding, is given in the following report, which has been kindly prepared at my request by Doctor R. M. Anderson, who has had unequalled opportunities for collecting information on the subject as chief of the southern party of the Canadian Arctic Expedition (1913–1916), and on his previous sojourn in the Arctic in 1908–1912. Doctor Anderson states:

The musk-ox has been greatly reduced in numbers during the last few years. The last musk-ox was killed in the region around Franklin Bay about eighteen years ago, and the last records near the coast, west of the Coppermine River, were not later than sixteen years ago, in the Darnley Bay region. No musk-oxen are left on Banks Island, according to Mr. George H. Wilkins, who has recently returned after spending considerable time in 1914, 1915 and 1916, in traversing the greater part of Banks Island with the Northern Party of the Canadian Arctic Expedition. There were formerly numbers of musk-oxen on Banks Island, as is evidenced by skulls and skeletal parts seen frequently on the land. According to Mr. Wilkins, Melville Island, which is not normally inhabited, has a good many musk-oxen left, and the Western Eskimo hunters who were taken north to Winter Harbour to establish a base for 1916–1917, were killing a good many musk-oxen in the spring of 1916.

The Indians have within the past few years practically exterminated the species around the east of Great Bear Lake. Three to my knowledge were seen and killed by the Indians there in the winter of 1910–1911, and they were said to have finished off a herd of eighty almost completely a few years before that. Inspector C. D. LaNauze, R.N.W.M.P., reports that the Indians saw a few musk-ox tracks on the north side of Great Bear Lake in the summer of 1915. No musk-oxen have been seen

for many years near the lower Coppermine. The western limit of musk-ox near the Arctic coast is now about in the region of the Annielik River (improperly named Unialik), flowing into Grays Bay, about one hundred miles east of the mouth of the Coppermine. A few musk-oxen were seen near the coast here in May, 1916, but the Eskimos say they are not found farther west. Musk-oxen are said to be more common in the very rugged country south of Arctic Sound, and a considerable number of skins were taken there by Eskimos in the summer of 1915. The Eskimos in that region (Bathurst Inlet) are better supplied with rifles than the Eskimos farther west in Coronation Gulf and Dolphin and Union Strait, a number of them having been recently supplied from a new post to the southeastward, on or near Hudson Bay, so that the last stronghold of the continental musk-ox is being pretty rapidly cut into on two sides, and the probable decrease in numbers in the past five years, and the next five years, will probably be proportionally greater than in any preceding twenty-five years. The limits of the inroads of the Dog-rib and Yellowknife Indians had probably been nearly reached long ago, as the Indians are not accustomed to hunt more than a certain distance from the edge of the timbered lands. These newly equipped Eskimo hunters are accustomed to travel anywhere on the barren grounds with very little fuel, burning oil or heather, and there is no region which they cannot visit with little trouble.

When a herd of musk-oxen is seen, it is usually slaughtered, being, from the nature of its habits easier to slaughter than most other large animals.

Since the musk-ox, so far as it is found on the mainland of North America, is on as decided and as rapid a decline as was the buffalo a few years ago, it should be put on the protected list. That would at least forestall any possible future market demand for skins, which would accelerate the slaughter, and also reduce temptation for traders to stimulate a demand. Although the savages kill a certain number on their own initiative, they should not be encouraged and abetted in the slaughter by traders who have only a temporary interest in the country and who will leave the natives to their own devices again as soon as the bulk of the game and fur-bearing animals have been destroyed.

On his return in 1918 from his explorations in the Arctic regions of Canada with the Canadian Arctic Expedition, Mr. Stefansson informed me that on the islands he visited musk-oxen were most abundant on Melville Island, where he and his party of seventeen lived on the animals for two sum-

mers and one winter, 1915–1916. On this island, he estimates that there are from 3,000 to 4,000 musk-oxen. According to the latest reports that he received they appear to be extinct on Banks Island, or, if present, are very scarce. A few herds were reported from the northeast of Victoria Island, but none was reported from Prince Patrick Island. He found no musk-oxen on the islands discovered by him, nor on the Ringnes Islands.

At the present time, the chief habitat of the musk-ox in Canadian territory appears to be Ellesmere Island. Their abundance in that region is shown by Doctor Donald B. MacMillan in his account of the Crocker Land Expedition of the American Museum of Natural History.*

In a quotation given by Doctor MacMillan from the writings of Sir Clements Markham, it is stated that Ellesmere Island "is called Oo-ming-man (the land of the musk-oxen) by the Eskimo." Mr. W. Elmer Ekblaw, a member of the Crocker Land Expedition, made traverses of Ellesmere Island, and in the account of his explorations which is given in Doctor MacMillan's interesting narrative, he states:

> The west coast of Ellesmere Island in the vicinity of Bay Fjord, is not generally so precipitous and bleak as the east coast. It is more maturely dissected, the valleys are wide, the slopes are less steep and the mountains do not everywhere rise so abruptly. Large tracts support a relatively luxuriant growth of willow, sedge and grass, the chief foods of the musk-oxen.

In this place a herd of sixty-seven animals was seen, of which fourteen were killed for food. Ekblaw states that the excellent condition in which they were found was due, no doubt, to the excellent pasturage they found on the grassy meadows among the mountains and along the fjord.

* "Four Years in the White North," by Donald B. MacMillan. Harper & Brothers, New York, 1918.

Travelling up Eureka Sound to the northernmost end of Fosheim peninsula, at the mouth of Greely Fjord, Ekblaw states:

> All along the way we had seen musk-oxen on the hills on both sides of the sound, and we killed all we needed for food. Even on the ice, we found their tracks for miles.

The latter observation would indicate that, contrary to the belief of Stefansson, musk-oxen may migrate from one island to another when the intervening water is frozen over.

Increased Protection of Musk-ox.—The reduction in the numbers of musk-oxen has not only been due to recklessness of the natives and the demand for musk-ox robes, but thousands have been slain for the support of the various Arctic expeditions that have visited or penetrated their range. Large numbers have been slaughtered by sportsmen, and, while no fault is found with those who have killed a few individuals for the sake of their heads, or to provide specimens for the larger museums, we have evidence that a number of men, calling themselves sportsmen, have displayed a passion for slaughtering these animals which rivals that of the Eskimo and the game-hog.

The extermination of the musk-ox is only a matter of a few years, unless prompt and adequate steps are taken to put an end to the killing of the animal for the sake of its skin. The extreme scarcity of the musk-ox is now admitted by the fur traders. At the present time I am informed that the price in Canada varies from $50 to $350 a robe, according to the size and quality. In some cases it takes two or three skins to make a robe. In a comparatively recent advertisement in *The Gazette* (Montreal), of musk-ox robes offered for sale by one of the leading dealers in these supplies, the following statement is made as an inducement to purchase:

This animal whose fur is much finer than that of the buffalo is becoming very rare and the skins will soon be absolutely unobtainable.

One of the leading fur merchants in New York, who deals exclusively in raw furs, and through whose hands more musk-ox skins pass, perhaps, than through those of any other firm, in response to my inquiries courteously supplied me with the following information, in November, 1916, regarding the trade in musk-ox robes:

Most of these goods are brought down by whalers, some of which go into San Francisco or Seattle, and others into New Bedford [Mass.]. Also the Hudson's Bay Co. collects a fair quantity every year.

I personally have had a vessel up on the Hudson Bay for quite a few years, and we collect a few from the height-of-land which is situated about 100 miles northwest of Wager River. These animals are becoming more and more extinct, as, ten years ago, if you wanted to get a quantity you would only have to go up to that country and you could get them, but the parcel we sold Messrs. —— [a Montreal firm], about 160 skins, represented three or four years' collection; so there is no doubt but what they will get scarcer.

The Hudson's Bay Company has very kindly furnished me with a statement showing their annual returns of musk-ox skins from 1864, which may be taken as a good criterion of the extent to which the musk-oxen were hunted for their skins. From 1864 to 1878 the number of skins received by the company did not exceed 200 annually. From that year the number increased until 1881, when over 600 were received. In the following eight years the numbers decreased, and then rose again in 1890 to over 1,400 skins. The highest level was reached in 1892, when nearly 2,000 skins were received. Since that year there has been an almost steady decline in the number, the lowest level being in 1907, when less than 100 skins were received, and only once, that is 1912, has the number slightly exceeded 200. We have no record of the large number of musk-ox skins taken out an-

nually by way of the Arctic coast by whalers and traders to San Francisco and Seattle.

The best fur traders now admit that the musk-ox can only be saved from extermination by the absolute prohibition of its slaughter for commercial purposes.

In 1914, and again in 1916, I laid before the Commission of Conservation specific recommendations regarding the amendment of the Northwest Game Act to secure much-needed protection of our northern mammals, including the musk-ox:*

(*a*) The prohibition of the killing of the musk-ox except under license, which should not permit the taking by *bona fide* hunters or other duly authorized persons, of more than two skins and two heads under each license. Natives or *bona fide* explorers to be allowed to kill musk-oxen for food for their own use, but not in order to secure the skins.

(*b*) The prohibition of the killing of musk-oxen on Victoria, Banks, and Melville Islands, thereby constituting these islands permanent reserves for musk-oxen and as centres for their natural distribution to other parts.

These recommendations have since been put into effect in the Northwest Game Act, 1917, and the regulations thereunder, which provide for the permanent protection of the musk-ox, except in such zones and during such period as may be prescribed under the act, and at the present time the killing of musk-oxen is everywhere forbidden in Canadian territory. Section 38 of the regulations sets forth the sole conditions under which musk-oxen may now be killed; the section reads as follows:

38. Musk-ox may be hunted and killed by Indians, Eskimos or half-breeds who are *bona fide* inhabitants of the Northwest Territories, but only when they are actually in need of the meat of such musk-ox to pre-

* *Seventh Annual Report, Commission of Conservation*, 1916, p. 33.

vent starvation. No person shall at any time trade or traffic in musk-ox or any part thereof, and the possession of the skins of such musk-ox by any other person than the said Indians, Eskimos or half-breeds shall constitute an offence.

In another chapter (p. 313), the utilization of the musk-ox as an economic factor in the development of Arctic Canada is discussed.

We hope that the absolute close season for a number of years will prevent its complete disappearance within a very few years from our northern Barren Grounds, where it has maintained itself in those Arctic solitudes for thousands of years before the advent of the white man and his deadly rifle.

BEARS

Canada possesses, in numerical abundance of the chief species of bears, by far the greatest portion of the bear population of North America. The enormous extent of the coast and islands of Arctic Canada constitutes the chief habitat of the polar bear. The Rocky Mountains and the mountain ranges flanking them in British Columbia now form the chief region in which the grizzly bear, which has been largely wiped out in its more southerly range, is to be found; its near relative, the Barren-ground grizzly, is only to be met with in the treeless northern region; while the black bear occurs everywhere in the wooded regions from the Atlantic to the Pacific, and nowhere throughout this extensive range can it be said to be very uncommon; in certain regions it is very common. From all standpoints, therefore, we are particularly fortunate in our bear population, and a special responsibility accordingly rests upon us to take such measures as may be necessary to conserve so interesting and, at the same time, so economically valuable a section of the native mammalian fauna of this continent.

The Polar Bear (*Thalarctos maritimus*)

(PLATE IX)

From the Alaskan-Canadian boundary on the northwest, along the Arctic shores of the Northwest Territories, the Hudson Bay and Labrador, and throughout the islands of the Canadian Arctic, this magnificent denizen of the polar seas, whose very name conjures up a vision of deep-blue Arctic seas and fringing ice-floes, withstands the rigours of the north and the persecution of the hunters of his splendid skin. In the solitude of the Arctic this animal, so splendidly endowed by nature for such an environment of ice and frigid waters, hunts its food along the edge of the ice-pack and drifting floes, where he may secure, by patient hunting, the cautious seal. Whatever animal remains are cast ashore are acceptable, and only during the short Arctic summer is it able to resort to vegetable food such as constitutes a large portion of the food of his more southerly relatives.

As a rule only the more hardy males face the long Arctic winter out-of-doors. The female usually hibernates in some convenient cavity, and there, buried under the deep snow, she brings forth her cubs, which rely on their mother for their sole supply of food during the winter months they spend in the little ice cavern, that is formed by the combined heat of their bodies. With the advent of spring they are released from their snow prison, and the fish and wild fowl form their food until the melting of the snow uncovers the sparse supply of vegetable food, such as herbage, roots, and Arctic berries.

Many years of excessive hunting have materially reduced the numbers of the polar bear, especially in the western Arctic, and they are in serious need of protection. The Hudson's Bay Company's returns show that in the decade,

From photographs of groups in the American Museum of Natural History. Reproduced by courtesy of the Museum

1. Polar Bear
2. Black Bear, showing colour phases
3. Rocky Mountain Goat

1902–11, the number of white bear skins offered for sale at their auctions in London, England, ranged from a maximum of 170 in 1902, to a minimum of 82 in 1911, and the average number offered was only 97. These figures tell their own story, and indicate most strongly the urgent necessity of increased protection which this animal must unquestionably receive and, we hope, will receive in the future. It constitutes an economic resource of no mean value, apart from the obvious duty of preventing so unique a species of mammal from reaching the point of extinction in the territories under our control and supervision.

Grizzly Bear (*Ursus horribilis*)

Distribution.—The fame of the North American grizzly is world-wide. In the days when the buffalo was abundant, and up to the early part of the last century, it ranged the western plains, foot-hills, and mountains with its supremacy unchallenged. The buffalo bull fell beneath its powerful blows, but now in its mountain retreats it more usually contents itself with such infinitely smaller prey as mice and ants.

From the journals of Alexander Henry we learn that in 1800 it occurred in southwestern Manitoba, and the capture of grizzlies at Portage la Prairie will appear somewhat astonishing to the residents of to-day in that region. This was its most easterly range; and westward and southward it ranged the plains and foot-hills of the Rockies. The disappearance of the buffalo and the systematic hunting of the grizzly, which in the early days was both dangerous and destructive to the cattle and horses on the range, led to its extermination over practically the whole of the non-mountainous portion of its range. Even in the mountains it is nowhere common at the present time. The greatest number are to be found in the Rocky Mountains and their

adjacent ranges in British Columbia. The eastern slopes of the Rocky Mountains form the easterly limit of the range of the grizzly in Canada. Northward it may be found as far as the mountains west of the Mackenzie delta. In Alberta they appear to be most abundant in the mountains immediately north of Jasper Park. Throughout the Rocky and Selkirk Mountains in British Columbia grizzlies may be found in varying abundance. In some sections they are by no means uncommon; in the Kootenay region, for example, they are not difficult to find by strenuous hunting. In 1915, I reached the remote and beautifully situated remnant of a former prosperous gold-mining settlement bearing the name of Trout Lake City (to distinguish it from Trout Lake) a few days after three grizzlies, a female and two grown cubs, had been killed in front of the small schoolhouse. In the Stikine Mountains grizzly bears can be found in fair abundance.

Habits.—The grizzly bear has the unenviable reputation of being the most dangerous of our big-game animals; and this reputation is well deserved, for no animal is more powerful and more tenacious of life when wounded. But this reputation was largely gained in the early days of the West, when the arrows of the Indians and the primitive firearms of white men served more to annoy than to destroy him, and when the human aggressor often forfeited his life. His ability to bring to earth, and often drag for some distance, a buffalo, steer, or horse naturally inspired an appreciation of his immense strength.

But the grizzly of to-day is a different animal from the former monarch of the foot-hills and mountains. In his retreat to the mountains he has accepted not merely the superiority of man himself but of man armed with the modern high-powered repeating rifles, the instrument that has put fear into the hearts of all members of our wild life that have escaped its destructive effect. As Thompson Seton has so

well said, in referring to this change in the creed of the grizzly:

> No longer the arrogant despot of all trails and ranges, he has retreated to secluded fastnesses, to wild inaccessible regions of thicket and swamp. He is changed in temper as in life, and the faintest whiff of man-scent is now enough to drive him miles away.

This acquired and now inborn dislike of man, which is perhaps more correct than fear in the case of the grizzly, is a fortunate factor so far as the continued existence of the grizzly is concerned. It means, first, that such a tendency to seclusion will be an important aid to the preservation of the species, if only the required amount of additional legal protection is also given. Secondly, it means that, being no longer the menace it formerly constituted to horses, cattle, or sheep on the ranges, or to man himself, it cannot be classed as a highly noxious animal. The dislike for man renders possible the protection of the grizzly in our national parks, where there is little chance, so far as the bear is concerned, of familiarity breeding contempt. The remoteness of its range from well-travelled haunts and its preference for seclusion may aid in its preservation.

Nevertheless, it would be a mistake to assume that the grizzly has lost its dangerous attributes. This is by no means the case. While its attitude is one of defense rather than aggression, no more dangerous assailant can be met than a grizzly that is cornered, or that imagines that he is cornered. Females accompanied by cubs are usually to be avoided by an unarmed person, as in the majority of cases they will be likely to attack on suspicion. Unless one is well prepared to defend one's right of way, it is advisable not to attempt to dispute a grizzly's right to the same trail. He is likely to resent the interference with what he is perhaps justified in regarding as his rights. No animal is more dangerous than a wounded grizzly, and its

great strength and tenacity of life in spite of repeated shots into non-vital parts is very great. Only a direct hit in the brain or spinal column will make approach to a wounded animal really safe.

In some localities the grizzly bear seems to prefer the open country to the woods, and his chosen habitat is the open and generally rocky mountain uplands of the divides, where sparse timber, dense growth of thickets, and occasional swamps furnish him with suitable environment.

He frequents the open ground only through necessity—the search for food. It is only for a month or two in the summer that the male seeks the company of the female bear. As long as they can secure food in the fall and winter they do not go into hibernation. Grizzly bears are largely carnivorous, provided they can secure animal food, and they will eat anything from steers to mice. Nothing is too small to escape the long claws of these animals, by means of which they can pick the mountain berries, and unearth succulent roots, and insects as small as ants. Before winter covers the mountains with snow they retire to their winter quarters in some convenient cavity or natural den in the rocks, or a den excavated in the mountainside, and there in midwinter the female brings forth her small cubs; usually two cubs are born, sometimes three, rarely four. The small size of the newly born cubs of bears is one of the striking features of these animals. The newly born young of the grizzly bear usually measures only about eight or nine inches in length, a remarkable size for the young of an animal of which the adult male may weigh from 500 to 600 pounds. The cubs usually remain with the mother the first year, but lead a separate existence thereafter.

The most distinctive characters of the grizzly bear are the high shoulder region, formed by a distinct hump, the great length of the front claws, which are twice the length of those of the hind feet, and the somewhat hollow facial

region. In colour great variation is found. The normal colour is deep brown to brownish black, with the outer portions of the longer hairs tipped with light gray, which gives the name "silver-tip." In some cases the fur is completely or partly gray; in others it varies from dark brown to cinnamon, and R. H. Chapman, of Washington, D. C., recently showed me the skins of a female and two cubs, obtained near Revelstoke, B. C., which were of a distinctly reddish shade.

Not only is there great variation in the colour of the skins of grizzly bears, but marked differences in the skulls are also to be found, and, as a result of these, striking anatomical differences in the cranial and dental characters. Doctor C. Hart Merriam, who has kindly demonstrated to me these differences in the very extensive series of skulls that he has collected, has described a large number of species and sub-species within the grizzly-bear group.

The Barren-Ground Grizzly Bear (*Ursus richardsoni*)

Throughout the Barren Grounds this species may be found, but it does not appear to be anywhere abundant. Its occurrence along the Arctic coast was reported by the early explorers, Samuel Hearne, Franklin, and Richardson. It was found in the neighbourhood of the Coppermine River and Bathurst Inlet. In J. B. Tyrrell's explorations in 1900 evidence of its occurrence on the Thelon was found, and J. M. Bell saw, during the same season, these large greyish-brown bears quite often along the north and west shores of Great Bear Lake.

In his account of northern mammals MacFarlane states: "This bear is not uncommon in the Barren Grounds of the Anderson region, nor on the polar shores of Franklin Bay." He recounts a number of instances illustrating the danger-

ous character of this formidable animal. It is omnivorous in its habits, and in the stomachs of specimens that have been killed the remains of venison, seal, marmot, berries, edible roots, and grass have been found, showing the varied nature of the diet upon which it subsists.

Black Bear (*Ursus americanus*)

(plate ix)

Everywhere throughout the wooded regions of Canada, from Nova Scotia to British Columbia, this, our most common and familiar bear, is to be found in greater or less abundance. Its range is practically co-extensive with our northern forests, for, unlike the aforementioned species of bear, the black bear is essentially a forest species, and its northward distribution is limited by the limit of forest growth. The fur returns of the Hudson's Bay Company would indicate that this species, in common with the other species of bears, shows a tendency exhibited by the other fur-bearing animals to periodic increase and decrease in abundance. The greatest number of skins was obtained by the Hudson's Bay Company in 1889 and 1892, when about 11,500 were received annually, but, since 1900, the numbers have gradually declined, and in 1915 only 4,500 skins were obtained. Nevertheless, no trip can be made into the woods in any section of Canada without evidences or specimens of this bear being encountered. It is a shy animal, and for that reason it is less commonly seen than might otherwise be expected. But its retiring habits are to its advantage, and so long as the main evidence of its existence in a region lies in the presence of its well-worn trails, claw-marked trees, and overturned stones or rotting logs, it cannot be considered an objectionable neighbour. Frequently it would not be seen by travellers in the woods were it not

for its spirit of curiosity in the doings of human intruders into its haunts.

Black bears usually mate about June or July, and they part a little later. The young are born in January, while the mother is still in her winter den, which may be a natural cavity in the rocks, under a fallen tree or its upturned roots, or even in a hole dug by the bear herself. Usually two cubs are born, but three are not uncommon. The newly born cub is remarkably small. It measures about eight inches long and weighs from nine to twelve ounces. When the spring sun melts the snow and ice in the woods the mother leaves her winter quarters and sallies forth with her young family, than which no more interesting or amusing youngsters can be found in the whole realm of wild life. The brown or cinnamon-coloured bear is merely a colour-variety of the black bear. In the same litter of cubs one may find both black and brown varieties.

For some time in the spring the black bear subsists largely on roots of various plants, supplemented by an occasional mouse or insect, for it is omnivorous to a degree. Insects constitute a large part of their diet. In the spring and early summer bears frequenting lakes and streams feed extensively on May-flies and shad-flies. Hearne states that they may catch these insects by swimming with their mouths open, and he found their stomachs filled with these insects.

As summer wears on they hunt out the nests of bees and rob the accumulated stores of honey or brood. In the hunt for such delicacies their ability to climb trees stands them in good stead. Nor do they hesitate to attack any wasps' or hornets' nests. The nests of ants are sought in rotting logs or under stones, etc., and the ants and larvæ are greedily devoured.

Where fish can be obtained they are very acceptable, and the black bears in British Columbia are especially favoured by the large quantities of salmon that they are able

to obtain without much trouble. Scavenging is a favourite occupation, and near human habitations their predilection for garbage is well known. In the autumn they take full advantage of nature's lavish provision of wild fruits. Wild strawberries, blackberries, raspberries, blueberries, and other small fruits are greedily devoured, together with the more satisfying acorns and beechnuts, which enable them to lay up the necessary store of fat for absorption during the winter's rest and enforced fast. In British Columbia I have seen orchards bordering the woods assiduously robbed by bears, which may become a nuisance on this account.

In spite of its shyness and normal desire to escape when man approaches, the black bear can be a dangerous animal when her cubs are in danger or when the adult animal is wounded or cornered. On such occasions it can prove a formidable foe to an unarmed man. But under ordinary circumstances the black bear is no more to be feared than most of the timid creatures of the woods.

Kermode's White Bear (*Ursus kermodei*)

On the islands of the northern coast of British Columbia, and on the adjacent coast of the mainland, is to be found a white bear. The type specimen was killed on Gribbell Island in May, 1904, by Mr. F. Kermode, the director of the Provincial Museum, Victoria, B. C., after whom the species was named. Mr. Kermode informs me that this interesting species, which is illustrated herewith, is found from South Bentinck Arm to Burke Channel, north along the coast region, including Swindle, Princess Royal, Gribbell, and all the larger islands except the Queen Charlotte group; to Nass River, and up the Skeena River as far as Kitsumgallum.

The records of specimens killed, which are given in the *Bulletin of the American Museum of Natural History*, show

that most of the bears have been killed on the islands, particularly on Princess Royal and Gribbell Islands. As Mr. Kermode has pointed out to me, this does not mean that they are any more common on the islands than on the adjacent coast of the mainland; but it shows that they are more easily seen and hunted on mountain slides on these islands. There are no white goats; whereas, on the mainland, when observed from a distance, these bears are likely to be mistaken for goats, owing to their size and cream-white colour, both these animals being found on the open grassy slide country, which is a favourite feeding-ground for bear in the spring.

Protection of Bears

Attention already has been called to the great need of giving protection to the polar bear, which is rapidly decreasing in numbers in the more accessible regions of the Canadian Arctic coast, although their numbers are, no doubt, being maintained to a greater degree on the more remote islands of the Arctic.

Only in the provinces of Quebec and British Columbia are there close seasons or bag limits on black bears. In Quebec a close season on the black bear is maintained from July 1 to August 20, which covers the mating season. In British Columbia a close season on the black bear was instituted in 1918; this season is from July 1 to September 30. In view of the great decrease of grizzly bears in the United States, owing to the absence of any restrictions on the killing of this animal, it would seem very desirable to give it more protection in Canada, as continuous and assiduous hunting will undoubtedly seriously jeopardize its future, and a bag limit should be fixed, if only as a precautionary measure. I received a report of big-game hunting in 1916 in the Cassiar region of British Columbia, in which one

hunter from the United States had five grizzly bears to his credit. Comment on such butchery disguised under the name of "sport" is hardly necessary, but it indicates the abuse on the part of unscrupulous persons that is liable to accompany the absence of any restriction. Bears will probably hold their own in our mountains and forests for many years to come, even without protection, owing to their dislike for man and the sparse population in or near their haunts. But there are a number of adverse natural factors that tend to reduce their range, of which, perhaps, the chief is forest fires; and it is with a view to counterbalancing the effect of such factors and the gradual diminution of their range by the increase of settlement and population that some form of protection should be granted this interesting and economically valuable group of our wild life while such protection will have the desired effect.

CHAPTER V

THE BUFFALO OR BISON

Its Present, Past, and Future

The history of the buffalo in North America constitutes one of the greatest tragedies in animal life in historical times. The extent of its destruction appals one by its immensity when we consider the character of the animal. It would seem inconceivable that this, the largest of the wild fauna of our continent, should within the limits of the last century, be reduced from countless millions to the point of extermination. Formerly ranging over about one-third of the entire continent, it has been practically wiped out of existence except for small bands of so-called "wood bison," now to be found in the region north of Peace River. That its disappearance was an inevitable result of the development of the country does not diminish the character of the tragedy. It is the greatest of all our wild animals, and undoubtedly the most noble of its family in any part of the world. Now, it has practically disappeared from the face of the continent, and only by the foresight of the Canadian and United States Governments has it been prevented from becoming completely exterminated. The history of its disappearance and the most complete account we have of this noble member of our native fauna have been given by Hornaday in his memoir, "The Extermination of the American Bison," and it is from this work that I have taken most of the facts that I am about to give regarding its history.

Its former range in North America, according to Hornaday, was as follows: "Starting almost at tide-water on the Atlantic coast, it extended westward through a vast tract

of dense forest, across the Alleghany Mountain system to the prairies along the Mississippi, and southward to the delta of that great stream. Although the great plains country of the west was the natural home of the species, where it flourished most abundantly, it also wandered south across Texas to the burning plains of northeastern Mexico, westward across the Rocky Mountains into New Mexico, Utah, Idaho, and northward across a vast treeless waste to the bleak and inhospitable shores of the Great Slave Lake itself."

Early Distribution in Canada.—The favourite range of the buffalo in Canada was the northern extension of the great plains region, lying between the Missouri River and the Great Slave Lake. The most northerly record of its occurrence was made by Franklin in 1820, when he found it at Slave Point, on the north side of Great Slave Lake. In 1829 Richardson defined the easterly distribution of the buffalo in Canada as follows: "They do not frequent any of the districts formed of primitive rocks, and the limits of their range to the eastward, within the Hudson's Bay Company's territories, may be correctly marked on the map by a line commencing in longitude 97 degrees on the Red River, which flows into the south end of Lake Winnipeg, crossing the Saskatchewan to the northward of Basquian Hill* and running thence to the Athapescow†; thence to the east end of Great Slave Lake. Their migrations westward were formerly limited to the Rocky Mountain range and they are still unknown in New Caledonia and on the shores of the Pacific to the north of the Columbia River; but of late years they have found out a passage across the mountains near the sources of the Saskatchewan and their numbers to the westward are annually increasing."

As late as 1871 the buffalo inhabited the shore of Great Slave Lake, as is shown by a letter from E. W. Nelson to

* Pasquia Hills. † Lake Athabaska.

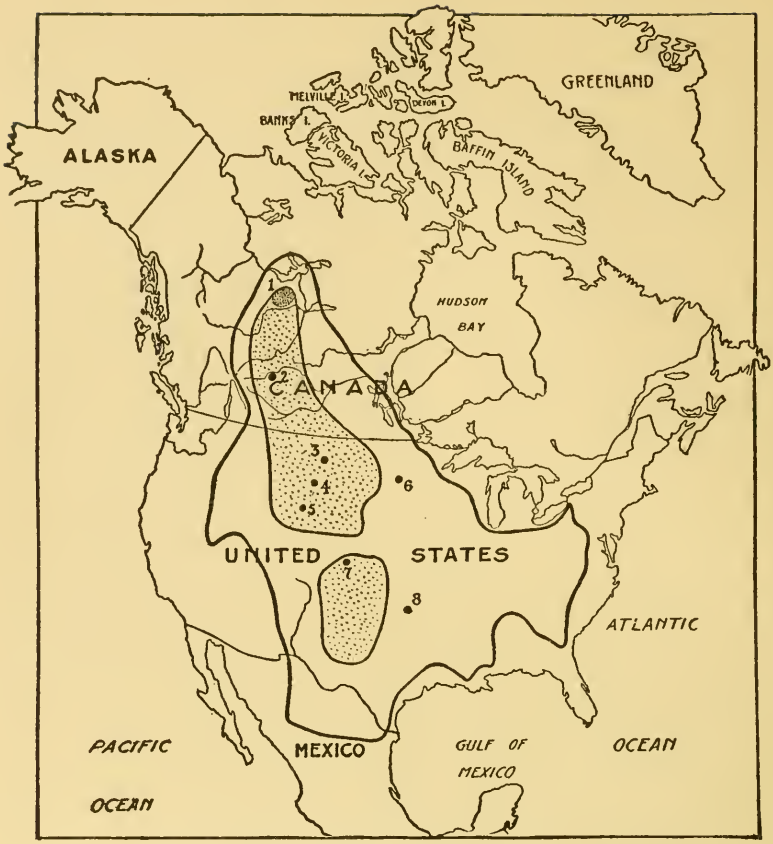
BUFFALO BONES PHOTOGRAPHED BY MR. HUGH LUMSDEN, C.E., AUGUST 9, 1890

This is probably the largest accumulation of buffalo bones ever made in Canada. They were piled along the siding just then constructed at Saskatoon. The piles were about eight feet wide and eight feet high, the skulls being built up on the outside and all broken skulls and other bones thrown into the centre

The bones were gathered by Indians and half-breeds from a radius of, say, 12 or 15 miles around that point. They were sold at from $5.00 to $7.00 per ton to buyers from Minneapolis, U. S., and were used for the manufacture of bone charcoal. Mr. Lumsden estimated that these bones represented the remains of over 25,000 Buffalo

J. A. Allen, dated July 11, 1877, and quoted by Hornaday. Nelson states: "I have met here [he was writing from St. Michael, Alaska] two gentlemen who crossed the mountains from British Columbia and came to Fort Yukon through British America, from whom I have derived some information about the buffalo (*Bison americanus*) which will be of interest to you. These gentlemen descended the Peace River and on about the one hundred and eighteenth degree of longitude made a portage to Hay River, directly north. On this portage they saw thousands of buffalo skulls and old trails, in some instances two or three feet deep, leading east and west. They wintered on Hay River near its entrance into Great Slave Lake and here found the buffalo still common, occupying a restricted territory along the southern border of the lake. This was in 1871. They made inquiry concerning the large number of skulls seen on the portage and learned that about fifty years before, snow fell to the estimated depth of 14 feet, and so enveloped the animals that they perished by thousands. It is asserted that these buffaloes are larger than those of the plains." It should be pointed out in passing that the only herd of wild buffalo (as opposed to those enclosed in government reserves) is to be found in the region referred to above. Further details regarding this herd will be given later.

The buffalo was migratory in its habits, and in this respect it differed from most of the other terrestrial quadrupeds of America. In the spring, on the return of mild weather, it migrated about 300 or 400 miles northward to feed on the better pasturage it found there, and in the fall, when winter approached, it left its range, extending from the Peace River southward, and the great herds moved south. This migratory habit was no doubt responsible for the failure of the buffalo to break up into local races, except possibly in the case of the buffalo occupying the aforementioned region southwest of Great Slave Lake. The



MAP ILLUSTRATING THE DISAPPEARANCE OF THE BISON

The outer dark line indicates the area formerly inhabited by Bison
(*Mainly after J. A. Allen*)

The inner shaded areas indicate the range of the great northern and southern herds in 1870, after the building of the Union Pacific Railway
(*After Hornaday*)

The present distribution of the chief Bison herds is indicated by the following numbers:

1. Range of Wood Bison
2. Buffalo Park, Wainwright, Alta.
3. Montana National Bison Range, Dixon, Mont.
4. Yellowstone National Park, Wyoming
5. Salt Lake City, Utah
6. Pierre, South Dakota
7. La Vela Pass, Colorado
8. Wichita National Game Reserve, Cache, Okla.

migratory movements of the buffalo are described by Alexander Henry in "The Manuscript Journals of Alexander Henry and of David Thompson, 1799–1814," from which Seton has taken the extracts given in his "Life Histories of Northern Mammals," which are given below:

> 18 September, 1800. The plain was covered. . . . They were moving southward slowly, and the meadow seemed as if in motion.
> 7 November. Great herd of cows going at full speed southward.
> 1 January, 1801. Buffalo in great abundance . . . the plains were entirely covered; all were moving in a body from north to south.
> 14 January. The ground was covered [with buffalo] at every point of the compass, as far as the eye could reach, and every animal was in motion.

During January, 1803, Henry found the country from Park River, N. Dak., to the Riding Mountains crowded with buffalo. These definite records of Henry's not only give exact information regarding the migration of the buffalo, but they also serve to convey an idea of their immense numbers.

Hind, who led the expedition which explored the Canadian prairies in 1859, found that the Saskatchewan herd wintered in central Saskatchewan in a region of which Saskatoon now occupies approximately the central point. This observation on the wintering habit of this herd is of interest as indicating the suitability of that region as a wintering place for the buffalo.

The Destruction of the Buffalo.—But to gain an adequate idea of the immense nature of the herds of buffalo that inhabited the plains and prairies the reader must consult Hornaday's account. The vast herds seemed to clothe the prairies in a coat of brown. They were as thick as the leaves in the forest. These countless herds greeted the advance guards of civilization and that process spelled their doom.

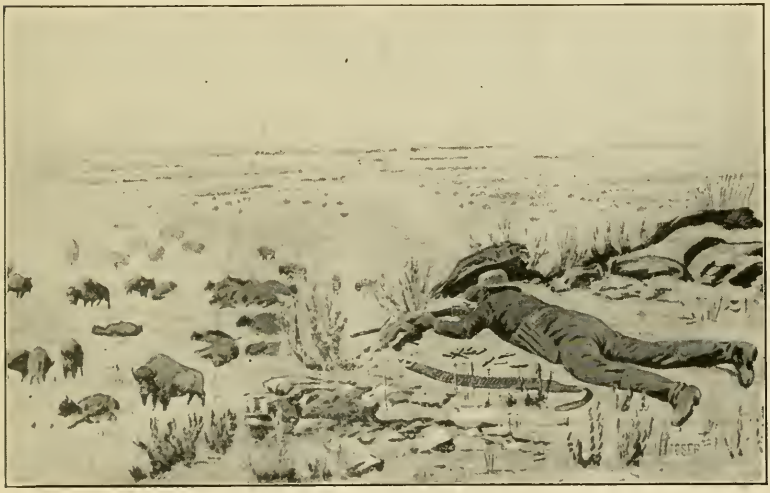
The history of the buffalo was only an illustration on the largest possible scale of the history of every species of wild animal when man invades its natural haunts with an

unrestrained desire to kill. No part of our wild life can withstand the destructive influence of men armed with modern guns; man and gun spell their doom, and the only salvation for any species is the restriction by law of the number that may be killed. These considerations, however, had no import in the early days of the buffalo. It was faced with men armed with powerful firearms, who killed without any regard for the future, and there was a complete absence of any restrictions on the part of all the governments concerned. The Indians, who had always regarded the buffalo as the source of their meat supply, had their point of view entirely changed in so far as the number of animals to be killed was concerned. Their passion for killing was inflamed by the example of the white hunters, with serious economic results when their source of meat was wiped out.

Various methods of slaughter were followed. The extraordinary stupidity of the animals made them an easy prey for the still-hunters. Still-hunting (Plate XI) was conducted on business lines, and was highly profitable when over a hundred animals could be killed from one stand, and the robes were worth two dollars and four dollars each. The practice of hunting on horseback provided an exciting sport, and when the hunters—white, half-breed, and Indians—went out in armies the results were disastrous to the herds, particularly as the cows were especially chosen, owing to the superior value of their skins. A favourite method employed by the Indians was that of impounding or killing the animals in pens, into which they were driven. This method was commonly practised by the Plains Crees in the South Saskatchewan country. The terrible scenes that attended these wholesale slaughters of the herds are beyond description. Other methods of slaughter on a large scale were surrounding, decoying, and driving the animals, and all tended towards the same end—complete extermination of the herds. As the animals became more scarce the half-breeds and In-

From Hind

CREE INDIANS IMPOUNDING BISON



STILL-HUNTING BISON

From the painting by J. H. Moser in the National Museum, Washington, D. C.

dians vied with the white hunters in destroying them. Far more buffalo were destroyed than could possibly be utilized, but this could not long continue. No longer did the prairies thunder with the sound of thousands of galloping hoofs. The great herds were driven farther and farther afield. Indians who formerly merely cut out the tongues of their victims, if they took any part of the carcass at all, now almost starved for want of food. In 1857 the Plains Crees, inhabiting the country around the headwaters of the Qu'Appelle River, decided that, on account of the rapid destruction of the buffalo by white men and half-breeds, they would not permit them to travel in their country, or travel through it except for the purpose of trading for their dried meat, pemmican, or robes. In the following year the Crees reported that between the North and the South Saskatchewan Rivers buffalo were very scarce. Hind's expedition in 1859 saw only one buffalo between Winnipeg and Sandhill Lake, at the head of the Qu'Appelle near the South Saskatchewan, where they encountered the first herd.

Catlin has given some idea of the enormous numbers that were killed during the first half of the nineteenth century. In 1832 he stated that 150,000 to 200,000 robes were marketed annually, which meant a slaughter of 2,000,000, or perhaps 3,000,000 buffalo. So great was the destruction that he prophesied its extermination within eight or ten years! Frémont about the same time also bore witness to the appalling destruction.

The death-knell was struck when the construction of the Union Pacific Railway was begun at Omaha, in 1865. Previous to the advent of the first transcontinental railway the difficulties of marketing the results of the slaughter served as a slight check on the rate of extermination, for, although they were being killed out at a rate greatly in excess of their natural increase, they would have existed for some years longer than the coming of the railroads and ad-

ditional swarms of white hunters rendered possible. This railroad divided the original great body of buffalo into southern and northern herds. That was the beginning of the end. Although the range of the northern herd was about twice as extensive as that of the southern, the latter contained probably twice as many buffaloes. Hornaday estimates that in 1871 the southern herd contained about 3,000,000 animals, although most estimates give a higher total than this.

The slaughter of the southern herd began in 1871, and reached its height two years later. From 1871 to 1873 the wastefulness was prodigious. The number of skins that were marketed bore no indication of the enormous slaughter. In four short years the great southern herd was wiped out of existence, and by 1875 it had ceased to exist.

By the time the destruction of the northern herd commenced in earnest, buffaloes in Canada had already become very scarce. The remnants of our former herds were assiduously hunted by the Indians as they constituted their main supply of food. As Hornaday states: "The herds of British America had been almost totally exterminated by the time the final slaughter of our northern herd was inaugurated by the opening of the Northern Pacific Railway in 1880. The Canadian Pacific Railway played no part whatever in the extermination of the buffalo in the British possessions, for it had already taken place. The half-breeds of Manitoba, the Plains Crees of Qu'Appelle and the Blackfeet of the South Saskatchewan country swept bare a great belt of country stretching east and west between the Rocky Mountains and Manitoba. The Canadian Pacific Railway found only bleaching bones in the country through which it passed. The buffalo had disappeared from that entire region before 1879 and left the Blackfeet Indians on the verge of starvation. A few thousand buffaloes still remained in the country between the headwaters of the Battle River, be-

tween the North and South Saskatchewan, but they were surrounded and attacked from all sides, and their numbers diminished rapidly until all were killed."

"The latest information I have been able to obtain in regard to the disappearance of this northern band," Hornaday continues, "has been kindly furnished by Prof. C. A. Kenaston, who in 1881, and also in 1883, made a thorough exploration of the country between Winnipeg and Fort Edmonton for the Canadian Pacific Railway Company. His four routes between the two points named covered a vast scope of country, several hundred miles in width. In 1881 at Moose Jaw . . . he saw a party of Cree Indians who had just arrived from the north-west with several carts laden with fresh buffalo meat. At Fort Saskatchewan, on the North Saskatchewan River, just below Edmonton, he saw a party of English sportsmen who had recently been hunting on the Battle and Red Deer rivers, between Edmonton and Fort Calgary, where they had found buffaloes, and killed as many as they cared to slaughter. In one afternoon they killed fourteen, and could have killed more had they been more bloodthirsty. In 1883 Prof. Kenaston found the fresh trail of a band of twenty-five or thirty buffaloes at the 'elbow' of the South Saskatchewan. Excepting in the above instances he saw no further traces of buffalo, nor did he hear of any in all the country he explored.* In 1881 he saw many Cree Indians at Fort Qu'Appelle in a starving condition, and there was no pemmican nor buffalo meat at the fort. In 1883, however, a little pemmican found its way to Winnipeg where it sold at 15 cents per pound, an exceedingly high price. It had been made that

* In October, 1884, a Canadian Pacific tri-weekly train from Calgary to Winnipeg was boarded at way stations by passengers laden with rifles, saddles, and other equipment till it was crowded to capacity. Inquiry elicited the information that *seven* buffalo had been reported in the Cypress Hills. This was undoubtedly the last remnant of the vast herds which once roved the prairies of Western Canada, and, inspired by a desire to slaughter, at least

year, evidently in the month of April, as he purchased it in May for his journey."

The main part of the northern herd was to be found in the United States. Here the Indians of the Northwestern territories were waging a relentless war on the animals. Hornaday computes that the number of buffalo slaughtered annually by those tribes must have been about 375,000. The destruction of the northern herd began in earnest in 1876 and became universal over the entire range four years later. By this time the annual export of robes from the buffalo country had diminished three-fourths. The construction of the Northern Pacific Railway hastened the extermination of the herd. White and Indian hunters killed as long as there were buffaloes to kill. The hunting season which began in 1882 and ended in February, 1883, completed the annihilation of the great northern herd, and only a few thousand head were left broken in straggling bands. The last shipment of robes was made from the Dakota Territory in 1884. In 1889 Hornaday, on the basis of all available data, estimated that the number of buffalo running wild and unprotected, was 635 animals! Was the destruction of an animal ever so completely brought about? It furnishes what is undoubtedly the most striking and appalling example of the fate of an animal existing in apparently inexhaustible numbers when left exposed to unrestricted slaughter, and should be a serious lesson to the people of the country for all time. That the buffalo had to go in the face of advancing civilization was inevitable. It occupied lands that were to furnish homes and occupation

fifty, and probably one hundred, hunters immediately started for the town of Maple Creek, as being the nearest railway station on the Canadian Pacific—then the only railway in what is now the province of Saskatchewan.

It is gratifying to note that, so far as known, these sportsmen were unsuccessful, and this small herd survived for several years. It is believed that it increased to twenty or twenty-five, but eventually it was exterminated by Indians. The fact that it increased at all indicates that, had it received adequate protection, its descendants might be living to-day.—J. W.

for millions of immigrants and that now produce so large a part of the world's staple crops.

Time, however, will not efface the traces of the buffalo's occupation of the continent. They blazed the trails that later became important highways. As A. B. Hulbert, in his "Historic Highways of America," has pointed out, the buffalo selected the route through the Alleghanies by which the white man entered and took possession of the Mississippi Valley. They found the best routes across the continent, and "human intercourse will move constantly on paths first marked by the buffalo. It is interesting that he found the strategic passageways through the mountains; it is also interesting that the buffalo marked out the most practical paths between the heads of our rivers, paths that are closely followed today by the Pennsylvania, Baltimore and Ohio, Chesapeake and Ohio, Wabash and other great railroads."

To-day the only wild buffalo exist in Canadian territory, and it will be of interest now to discuss this herd.

The Wild or Wood Bison

In the area comprising a portion of northern Alberta and the Northwest Territories that is bounded on the north by Great Slave Lake, on the west by the Hay River, on the southeast by the Peace River, and on the east by the Slave River, there roams to-day the only wild remnant of the former millions of buffalo that inhabited this continent. By their segregation they have formed a distinct race or sub-species known as *Bison bison athabascæ* Rhoads. This race is larger in size and darker in colour than the typical buffalo of the plains; also, its hair is said to be more dense and silky, and the horns are larger and more incurved (Plate XII).

Samuel Hearne was the first traveller to record the occur-

rence of these buffalo, and found them "very plentiful" in the country east of Slave River. Mackenzie (1801) also records them in the region adjoining the river named after him to the west of the Great Slave Lake, and on the plains near Vermilion Falls. In 1808 Harmon found them abundant on either side of the Peace River near the Rocky Mountains. Richardson's observations in 1829 have already been quoted (p. 114). Other travellers referred to their abundance in this region in subsequent years, and E. W. Nelson's letter referring to their occurrence has been quoted (p. 115). John Macoun, in his "Manitoba and the Great Northwest," refers to this herd as follows: "The wood buffalo, when I was in the Peace River in 1875, were confined to the country lying between the Athabaska and Peace Rivers north of latitude 57° 37′, or chiefly in the Birch Hills. They were also said to be in some abundance on Hay River and on Salt River, a tributary of Slave River north of Peace River. The herds thirteen years ago were supposed to number about one thousand all told. I believe many still exist as the Indians of that region eat fish, which are much easier procured than either buffalo or moose, and the country is much too difficult for white men."

In an article in the *Field* (London) of November 10, 1888, Mr. Miller Christy (quoted by Hornaday) states: "The Hon. Dr. Schultz, in a recent debate on the Mackenzie River basin in the Canadian Senate, quoted Senator Hardisty of Edmonton, of the Hudson's Bay Company, to the effect that the buffalo still existed in the region in question. 'It was' he said, 'difficult to estimate how many; but probably five or six hundred still remain in scattered bands.' There had been no appreciable difference in their numbers, he thought, during the last fifteen years, as they could not be hunted on horseback, on account of the wooded character of the country, and were therefore very little molested. They are larger than the buffalo of the great plains, weighing

at least 150 pounds more. They are also coarser haired and straighter horned." Doctor Schultz also quoted Hon. Frank Oliver of Edmonton, who recorded the wood buffalo as still existing in small numbers between the Lower Peace and Slave Rivers, extending westward from the latter to the Buffalo River in latitude 60°, and also between the Peace and Athabaska Rivers. Some buffalo meat was brought every winter to the Hudson's Bay Company's posts nearest the buffalo ranges.

In 1888 W. Ogilvie obtained further information regarding these buffalo, and this is given in the Annual Report of the Department of the Interior for 1889. He estimated the number of animals to be about 180, and from information secured in 1891 the same observer thought that their numbers did not exceed 300 (Annual Report, Department Interior, for 1892).

Doctor Otto Klotz published in the *Ottawa Naturalist* for 1901 data furnished him by J. A. Macrae, Inspector of Agencies in the Athabaska region in 1900. At this time it was computed that the buffalo numbered from 500 to 575 head. Mr. Macrae stated that "some eight or nine were killed last winter, but as I tried and punished those who killed them it is thought that no more depredations will occur. I understand that there has been an increase since the animals were protected, of perhaps a couple of hundred, and it would appear to be only necessary to continue vigorous protective measures in order to perpetuate the herd."

Fortunately, the Northwest Game Act was passed by the Dominion Parliament in 1906, and under this act a permanent close season for buffalo was provided for a number of years.

In 1907 Inspector A. M. Jarvis of the R. N. W. M. Police was sent specially from Regina to the Athabaska region to ascertain the existing numbers and condition of the wood buffalo and to recommend means for their pro-

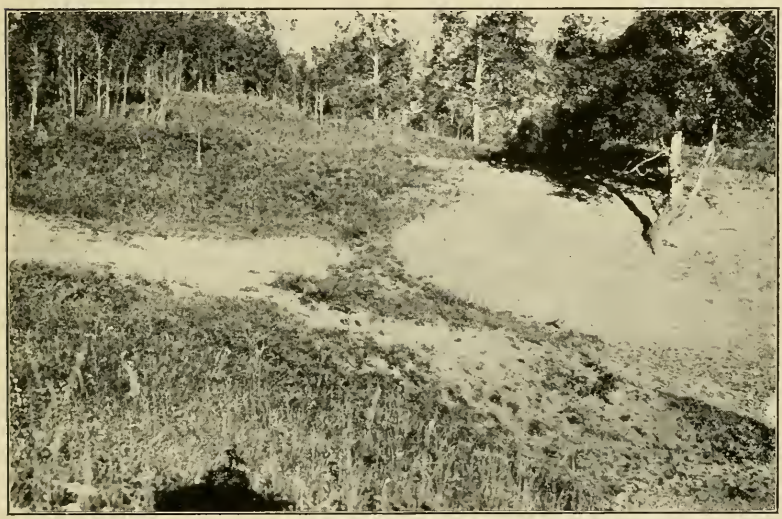
tection. Accompanied by Ernest Thompson Seton and E. A. Preble, he visited the region west and southwest in June and July, 1907. In the region of Upper Salt River one herd of thirteen bison was seen, and a second herd of four bulls, one yearling, four little calves, three two-year-olds, and eight cows was observed a few miles further on. Mr. Seton photographed the first herd and one of his photographs is reproduced in his "The Arctic Prairies." In summing up the results of his investigation Inspector Jarvis, after remarking that it would take from two to three months to make a complete investigation, gives the following conclusions: "That the buffalo are in danger of extermination not by wolves but by poachers. These poachers are all known and live at the village of Smith Landing in the summer time. They could easily be controlled by a local police patrol; without some protection the buffalo will not last five years longer. Therefore, I strongly recommend, as I did some time ago, that if it is the wish of the government to protect the buffalo, resident guardians be placed on the grounds." *

Inspector Jarvis further states: "In conclusion I would point out that the range of the buffalo herds is very limited; that it has certain natural boundaries; that the buffalo do not attempt to leave this area; that it is removed from any village or permanent habitation and that finally, *it would be an efficient and easy measure of protection if the whole area in question were at once turned into a National Park.* Animal life was not abundant. We saw no big game whatever and few signs of moose or bear."

As a result of Major Jarvis's report the buffalo were protected more stringently. A system of occasional patrols by selected non-commissioned officers and men of the Royal

* For a detailed account of Inspector Jarvis's investigation the reader should consult the Annual Report Royal North West Mounted Police for 1907, pp. 122–129, 1909.

Solitary bull on bison range, southwest of Fort Smith, Northern Alberta



From photographs by Charles Camsell. Courtesy of the Geological Survey

Wallows of Wood Bison in Salt River region, Northern Alberta

WOOD BISON

Northwest Mounted Police into the buffalo country was inaugurated, and some resident hunters were engaged as special constables.

In 1909 Corporal Mellor of the R. N. W. M. Police, engaged on a patrol into the buffalo country southwest of Smith Landing, "found buffalo tracks very numerous at Beaver Lake and also on Big Salt Prairie, at Hay Lake and about Peace Point." In the district named, Corporal Mellor was able to get within five yards of a band of about seventy-five buffalo and obtained a good look at them. He says in his report: "Owing to the fact that many of them were hidden from view in the bush, I was unable to count them correctly. Those nearest to view were nine large bulls, all splendid animals and rolling [in] fat. I saw only four calves in the band although there may have been more in the bush, but the guide, after examining the tracks, told me that there were no more. . . ."

In the summer of 1910 Sergeant Mellor, accompanied by Constable Johnson, ascended Big Buffalo River from Sulphur Point on Great Slave Lake to Buffalo Lake. The main object was to determine as far as possible the northern boundary of the wood-bison habitat. As a result of this exploration Sergeant Mellor concludes that the wood bison never range as far as Buffalo Lake, nor across the Caribou Hills, neither do they reach Great Slave Lake at any point; on the other hand, they come close to Slave River from a point about fifty miles below Fort Smith, right up to Peace River, and also reach Peace River, at any rate as far as Jackfish River. Their habitat would therefore appear, he says, to be bounded on the west by the Caribou Mountains, on the south by Peace River, on the east by Slave River, and on the north by an imaginary line drawn from Caribou Mountains on the west to Slave River on the east, touching the latter at about Point Ennuyeuse, and the former about fifty miles south by Buffalo Lake. The buffalo have, so far

as he could make out from careful inquiry, never been seen many miles north of these low points.

The attitude of the Indians towards the buffalo is indicated by the evidence of Inspector H. A. Conroy of the Department of Indian Affairs before the Senate committee in 1907. He says: "You do not require to enforce the law to protect the buffalo. The Indians will not kill them. They want to preserve them as much as any one else. The Indians think if the buffalo are gone they will have nothing left. The Wood Crees are benefiting by the errors of the Indians south of the Saskatchewan. They know that the buffalo are all gone south of them and they want to protect the wood buffalo." Sergeant R. W. MacLeod of the R. N. W. M. Police, reporting on his long patrol from Fort Vermilion to the mouth of the Hay River on Great Slave Lake, in December, 1910, corroborated Mr. Conroy's statement. He states: "The Indians I met were familiar with the regulations for the protection of the buffalo and protested strongly against a white man being permitted to kill any. The Indians told me the western range of the buffalo is thirty-five to forty miles east of Buffalo Lake and there is certainly no feed for them in any part of the country I passed over."

In 1911 the Department of the Interior appointed Mr. G. A. Mulloy to investigate the condition and protection of the buffalo herds, and to obtain information in regard to them under the supervision of Mr. A. J. Bell, government agent at Fort Smith.

Mr. Mulloy, who resigned in 1913, submitted several reports, the most comprehensive of which is contained in the report of the director of forestry for the year 1914 (Appendix No. 8, pp. 129–133). This report gives a good account of the regions occupied by the buffalo and their habits. In a letter of December 2, 1916, Mr. R. H. Campbell, director of forestry, under whose jurisdiction the supervision of these

matters is placed, informed me that "there is nothing to indicate that the herd is at present suffering from lack of feed or from the depredations of either wolves or Indians. The possibility of a decrease in the buffalo range is, however, a danger which has been pointed out by the government agent, and is receiving attention by the strengthening of the fire patrol in that vicinity."

With a view to securing the latest information in regard to the wood bison and their present range, I suggested to Mr. Chas. Camsell, now Deputy Minister, Dept. of Mines, who was visiting that region of the northwest during the summer of 1916, for the purpose of supervising the work of several field parties working under his direction there, that it would be most desirable if he could visit the territory occupied by the buffalo west and southwest of Fort Smith; the Commissioner of Dominion Parks was also anxious to have such information. Mr. Camsell was very fortunately able to make such a visit in September, 1916, and on his return he communicated the following facts to me: Three journeys were made into the buffalo territory. The first was made from Fort Smith westward past the salt springs in Salt River, into the northern part of the buffalo range. A second journey was made from Fitzgerald or Smith Landing southwestward for a distance of about thirty-five miles into the central part of the range. Earlier in the summer the range was entered from Peace Point on Peace River, for a distance of about ten miles.

The wood bison are now divided into two separate bands, occupying two distinct ranges in northern Alberta and the adjacent portion of the Northwest Territories. There does not appear to be at present nor to have been within recent years any migration of the buffalo from one range to the other. The limits of the northern range are not as clearly outlined as those of the southern, but in general it extends north of the 60th parallel between Buffalo and Little Buffalo

Rivers, almost to the shores of Great Slave Lake, and covers as large an area as the southern range if not larger. The southern range extends from Peace River northward to latitude 60° N., between longitudes 112° and 113°, and covers an area of about 2,000 square miles. The two ranges are separated by a belt of muskeg country 30 to 40 miles wide, with a slightly settled area, adjoining the Salt River mission on the west. This tract of country prevents migration from one range to the other, except by way of the Salt Plain. In each range there are said to be about 1,000 head of buffalo, though these numbers must be taken as being approximate, particularly with reference to the northern range, as, so far as known, no white man has traversed it.

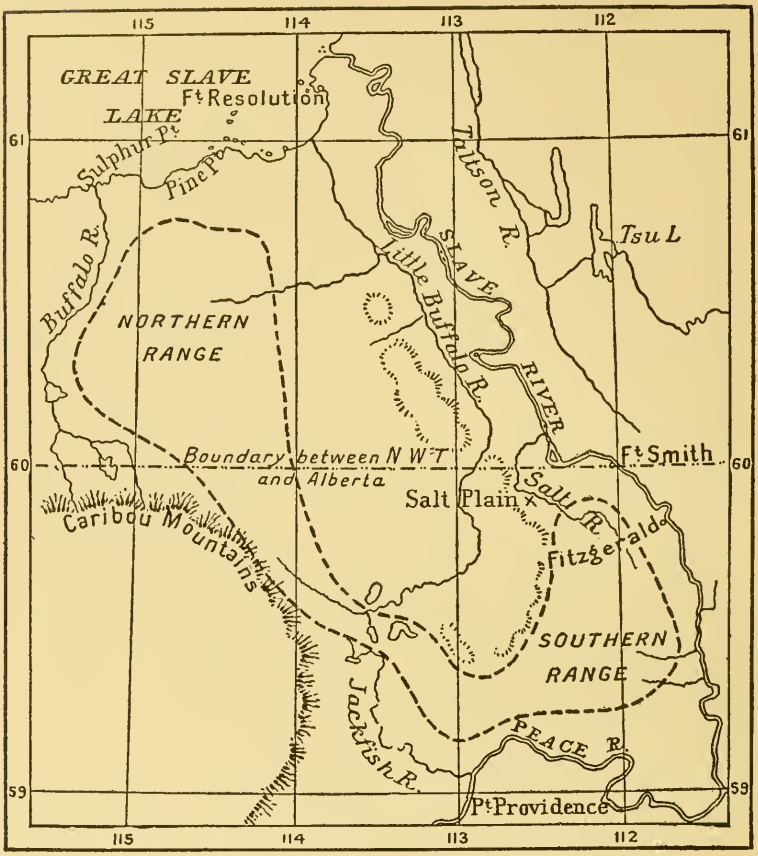
Little is known of the northern range, which is much more inaccessible than the southern, although some idea of its general character was obtained by the journey inland from the south shore of Great Slave Lake into the northern border of the range. The timber, soil, and topography were found to be very similar to those of the southern range.

The southern range is a flat or gently undulating plain, lying at an elevation of about 800 feet above sea-level. On the south its surface is only about 60 feet above the level of Peace River, and on the north it drops sharply away to an escarpment 150 to 200 feet high, down to the broad, level plain of the Slave River; ridges of sand, or boulders of limestone, which are rarely as much as 100 feet high, constitute the only irregularities of its surface, which is, however, frequently pitted by immense sink-holes, due to the solution of the beds of gypsum which underlie the surface of the greater part of the range. There are very few lakes, and several of them contain water too alkaline to drink. Muskegs, which are not very numerous or of great extent, occur on the range. There are very few streams, the greater part of the drainage being apparently underground.

The whole range is more or less timbered, interspersed

with irregular open patches of prairie, a few hundred yards in length and breadth. On the northern range and in the valley of the Salt River there are areas of several square miles of prairie or meadow-land. All are grass-covered, except near the salt springs, where clay flats occur, and cover about thirty square miles of the salt plain. The timber is mainly white poplar, which often reaches two feet in diameter. On the sandy ridges jack-pines are found, and in the lower, wetter portions there are belts of good spruce, with trees up to two feet in diameter. Grass grows everywhere, both in the prairie openings and throughout the woods, affording excellent pasturage. A collection of grasses was made and identified by Mr. J. M. Macoun; among them were found the following: feather, slough, reed-canary, meadow, manna, bromus (introduced), blue-joint and squirrel-tail grasses, wheat and wild rye. Wild vetch, wild pea, and larkspur (*Delphinium glaucum*), which is poisonous to domestic cattle, were also found.

From various sources Mr. Camsell gathered the following information regarding the habits of the buffalo: In the southern range they spend the early part of the summer in the northern part of the range, near the Little Buffalo River. During the greater part of the year they occur in small bands of ten or twelve individuals, but in July and August, when the animals are mating, herds of twenty, thirty, or forty animals have been seen. An Indian informed Mr. Camsell that he had seen a single herd of about one hundred head. In August the buffalo of the southern herd begin to migrate southward, and they spend the winter not far north of Peace River, between Peace Point and Point Providence. In their migration from one part of the range to another they appear to follow the same route every year. This route is marked out by numerous deep trails through the woods, similar to the well-known trails in the prairies made by the plains buffalo. The route is also marked by many wallows on the sides of hills and in



RANGE OF WOOD BISON

Limits of range.....

the open patches of prairie. One place was found which the buffalo were accustomed to visit in order to lick the salty earth; the ground for five or six acres was completely cut up and covered with tracks, the whole area resembling the ground of a cattle-pen. A single bull was seen here (Plate XII), and Mr. Camsell approached within fifty feet of it. It showed little fear, and made no attempt to move

off for several minutes, while photographs were taken of it. This incident would appear to indicate that the animals are not being molested by Indians or other hunters. On the same salt lick there were seen tracks of animals of all ages, and many of these were the tracks of yearlings and calves, indicating that there is an increase taking place in the numbers of the herd. Some of the tracks were those of very large animals.

The general opinion appears to be that the Indians are now observing the law prohibiting the killing of the buffalo, and except perhaps in cases of necessity, where an Indian family is out of food, no buffalo have been killed, at least in recent years.

Timber wolves would appear to be the only natural enemy of the buffalo, and in the various traverses made into the southern range ten or twelve old and new tracks of these animals were seen at various points.

The other wild life found on the buffalo range consists of moose, woodland caribou, black bear, lynx, fox, beaver, marten, mink, otter, fisher, wolverene, coyote, and muskrat. In the spring and fall ducks and geese are found. Spruce partridge, willow grouse, and sharp-tailed grouse occur all the year round and ptarmigan in the winter.

From all the evidence he collected and from his observations when in the buffalo territory, Mr. Camsell has no hesitation in saying that the buffalo are not only holding their own, but are increasing. If, therefore, a portion of their range could be made a national park, there is no reason why the wood bison should not only be saved from extermination, but there is every reason to believe that the surplus would migrate into the adjacent territory, which is unsuited to agriculture and therefore could be justifiably devoted to the preservation of the only examples of our largest and noblest native mammal now living in its original wild state.

The Present State of the Buffalo in Canada

From the latest reports, we are justified in concluding that the number of wild or wood bison in Canada is not less than 1,500 or 2,000 head, and is probably increasing. This has been brought about by the protection of this sole remaining wild herd by the government. If now we consider the present state of the plains buffalo in Canada, we shall find a condition of affairs of which every Canadian may justly feel proud, a condition that has resulted from an endeavour on the part of the government to prevent the extermination of this former monarch of the prairies.

The present state of the buffalo will be all the more striking if we first take into account the low ebb to which the numbers of the animals in North America had fallen. They reached their lowest level in 1889, when there were only 1,091 buffalo then living, according to Hornaday's estimate. Of this total, 256 buffalo were in captivity, 200 were protected by the United States Government in the Yellowstone Park, and 635 were running wild, of which number 550 were estimated to be in the Athabaska region of our Northwest Territories. Twenty years later, the same authority estimated the number of living buffalo in North America to be 2,047, and in 1912 there were computed to be 2,907 by Mr. W. P. Wharton.

In 1907 and 1909 the government purchased the well-known herd of buffalo, the largest on the continent, belonging to Michel Don Pablo, of Montana, consisting of 709 head. For these animals a special buffalo park was created at Wainwright, in Alberta, on the main line of the Grand Trunk Pacific Railway, between Saskatoon and Edmonton. This park covers an area of about 160 square miles, the whole of which is enclosed in a special wire fence about 76 miles in length and consists of land unsuited to agriculture on account of its sandy nature, but admirably suitable

for buffalo, as it evidently formed a favourite place for buffalo in years gone by, as shown by the abundance of old wallows and buffalo trails. Several lakes, the largest of which is Jamieson Lake, about seven miles long, provide an ample water supply. The land is rolling, and includes scattered clumps of poplar and buffalo willow groves everywhere. Under these eminently natural conditions the buffalo have increased annually. In the spring of 1913 the numbers had increased to 1,188 head; a year later there were 1,453 buffalo. When I visited the buffalo park in 1915 there were over 2,000 buffalo. In June, 1919, the herd had increased to 3,830 animals.* In other words, there are at the present time in the Buffalo Park at Wainwright, Alta., under the care and protection of the Canadian Government, more buffalo than existed on the whole North American continent eight years ago, and by far the largest herd of buffalo in existence. In addition the government maintains small herds of buffalo at Banff (8) and Elk Island Park (195). Altogether, there were 4,033 buffalo under the protection of the Canadian Government in June, 1919.

The successful protection of the buffalo at the Buffalo Park is due not only to the choice of a suitable natural range but to the care that has been exercised in looking after the herd. The park, in addition to being enclosed by a high, strong wire fence, is surrounded by wide fire-guards, which are ploughed around the entire park, both inside and outside the fence, to guard against prairie fires (Plate XIV). Many hundred tons of hay are cut each year and fed to the buffaloes in the winter, during which season they occupy a more restricted range. Great care is taken to prevent the introduction of contagious cattle diseases; for example, when the epidemic of foot-and-mouth disease broke out in

* In December, 1920, there were about 5,000 buffalo in Wainwright Buffalo Park. It is proposed to slaughter 1,000 of them in 1921.—J. W.

the Chicago stock-yards about two years ago the park was closed to visitors and the greatest precautions were taken.

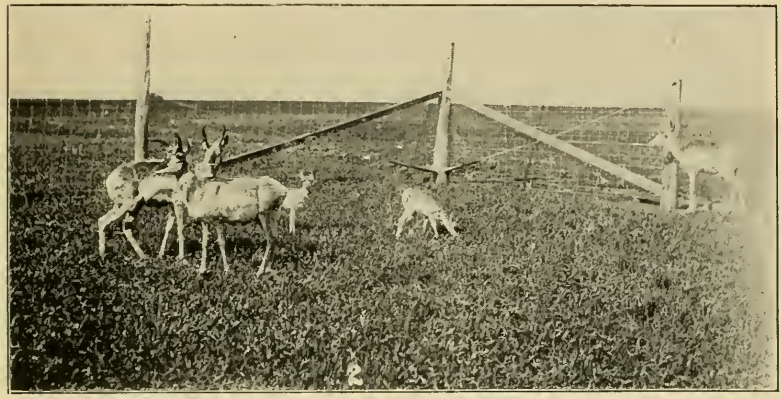
The question naturally arises: how are we to dispose of the surplus stock of buffaloes? With the present rate of increase the time will shortly come when the numbers will reach the capacity of the Buffalo Park. This opens an interesting field, which I will now consider.

The Future of the Buffalo in Canada

An obvious step to be taken with a view to disposing of the surplus buffaloes from the Buffalo Park is to establish small parks in other parts of the Prairie Provinces, where small herds could be maintained, which would be more readily accessible to the people who are interested in seeing and protecting these remnants of the former inhabitants of the prairies. Every large city should have its zoological park, the educational advantages of which have been so conclusively demonstrated in the older countries of Europe. It should be possible for cities starting or maintaining such parks to obtain buffaloes from the government.

Domestication.—The greatest value of the buffalo, however, lies in the possibility of its domestication. This may appear to be a novel idea, but I am convinced that its acceptance and adoption would result in inestimable benefit to the Prairie Provinces and the country as a whole. The greatest need in the Prairie Provinces is an increase in its beef-producing capacity. The buffalo is an animal which offers great possibilities, being pre-eminently suited to prairie conditions, and at the same time it produces a robe of no small commercial value.

The needs of the West in the matter of suitable stock have been well stated by the late Mr. C. J. Jones, of Garden City, Kansas, whose experience with the buffalo earned for



From a photograph by F. Bradshaw

1 *and* 3. Buffalo in barnyard, Elk Island Park, Alberta, during winter, showing possibilities of domestication

2. Antelopes: two males, two young (male and female) born in captivity, and adult female, in the private reserve of R. Lloyd, Davidson, Saskatchewan

him the name of "Buffalo Jones." In the *Farmers Review* of August 22, 1888, Mr. Jones stated the problem as follows:

(1) We want an animal that is hardy.
(2) We want an animal with nerve and endurance.
(3) We want an animal that faces the blizzards and endures the storms.
(4) We want an animal that will rustle on the prairies and not yield to discouragement.
(5) We want an animal that will fill the above bill and make good beef and plenty of it.

"All the above points could easily be found in the buffalo," continues Mr. Jones, "excepting the fifth, and even that is more filled as to the quality, but not in the quantity. Where is the 'old timer' who has not had a cut from the hump or the sirloin of a fat buffalo cow in the fall of the year, and where is the one who will not make an affidavit that it was the best meat he ever ate? Yes, the fat was very rich, equal to the marrow from the bone of domestic cattle."

The buffalo is the best suited of all animals to withstand those conditions which stockmen have found most inimical to domestic cattle. It can weather our western storms and blizzards and can withstand the hunger and cold that would kill our domestic steers. As Hornaday says: "When nature placed the buffalo on the treeless and blizzard-swept plains, she left him well equipped to survive whatever natural conditions he would have to encounter." Unlike domestic cattle, which usually drift before a storm and thus suffer an inevitable fate, the buffalo knows how to face the storm and endure it. And as regards its ability to withstand such conditions we have seen how the buffalo formerly wintered in the middle prairie region.

It is on these facts, therefore, that the claim for a consideration of the possibility of domesticating the buffalo in

the Canadian West is based, and we cannot afford to dismiss the claim lightly. I have already submitted this proposal to the Parks Branch of the Department of the Interior for consideration, in the firm belief that it affords a solution to the question of the disposal of the surplus stock of buffalo in the Buffalo Park. There are undoubtedly stockmen in the West who would be willing to enclose sufficient range unsuited to the production of wheat to permit the maintenance of small herds of buffalo by way of preliminary experiment. And I am convinced that the results of such experiments would demonstrate that the domestication of the buffalo is practicable. Any one who has ridden over the Buffalo Park and mingled with the herds there must realize that the buffalo are as manageable as the beef steers of the range if not more so. They are docile, and untractable bulls can be readily dealt with (Plate XIII).

Cross-Breeding with Domestic Cattle

With a view to combining the excellent natural qualities of the buffalo, that make it so suited to Western conditions, with the beef-producing qualities of the best domestic breeds of cattle, efforts have been made from time to time to cross the buffalo with domestic cattle. The first records we have of such domestication by cross-breeding are those of Huguenot settlers in Virginia in 1701, and later in the eighteenth century buffaloes were domesticated and bred in captivity in that State. It is interesting to note that one of the most important of these earlier attempts to utilize the buffalo, which are recorded by Hornaday in his monograph, was undertaken by Mr. S. L. Bedson, of Stony Mountain, Manitoba. In 1877 Mr. Bedson purchased 1 buffalo bull, 4 heifers, and 5 calves. By 1888 his herd, which was allowed to range the prairie at will, had increased to 83 head, consisting of 23 full-blooded bulls, 35 cows, 3

half-breed cows, 5 half-breed bulls, and 17 calves, mixed and pure. In that year this herd was purchased for $50,000 by Mr. C. J. Jones, of Kansas, who had already been courageously endeavouring to produce a cross-bred race. Hornaday quotes an interesting letter from Mr. Bedson, written in 1888, in which the latter gives his experience. The crossing was generally between the buffalo bull and an ordinary cow, with encouraging results and no greater losses than would be experienced in ranching with ordinary cattle. Buffalo cows and crosses dropped calves at as low a temperature as 20° below zero, and the calves were sturdy and healthy. Mr. Bedson states: "The half-breed resulting from two crosses as above mentioned has been again crossed with the thoroughbred buffalo bull, producing a three-quarter breed animal closely resembling the buffalo, the head and robe being quite equal, if not superior. The half-breeds are very prolific. The cows drop a calf annually. They are also very hardy indeed, as they take the instinct of the buffalo during blizzards and storms, and do not drift like native cattle. They remain in our open prairies while the thermometer ranges from 30 to 40 degrees below zero, with little or no food except what they rustle on the prairie and no shelter at all." After pointing out the advantages of an animal that does not need care and shelter during the winter, he continues: "They are always in good order, and I consider the meat of the half-breed much preferable to domestic animals, while the robe is very fine indeed, the fur being evened up on the hind parts, the same as on the shoulders." When it was necessary through accident to slaughter certain of the half-breed animals, the dressed hides realized from $50 to $75 each, and a half-breed buffalo ox four years old weighed 1,280 pounds dressed beef. The three-quarter breed was an enormous animal, possessing an extra good robe; Mr. Bedson considered them the coming cattle for range cattle in our

northern climate. He believed that "a cross with Galloways would produce the handsomest robe ever handled, and make the best range cattle in the world."

The experiments of Messrs. Bedson, Jones, Goodnight, and other workers conclusively demonstrated the following facts: That the buffalo bull crosses readily with the domestic cow, which produces a half-breed calf successfully, but the buffalo cow has not been known to produce a half-breed calf; that the progeny of the two species is fertile to any extent, yielding half-breeds, quarter, three-quarter breeds and so on; that the hybrids display all the desirable qualities of the buffalo as regards ability to withstand exposure, etc., and, finally, that the buffalo will breed successfully and regularly in captivity.

In order to determine to what extent practical use can be made of the crosses between the buffaloes and domestic cattle, the Dominion Department of Agriculture in 1915 purchased a herd of "cattalos," as the hybrids are called, from the herd which was developed by the late Mossom Boyd on his Big Island stock farm at Bobcaygeon, Ontario. An account of the purchase of this herd and the character of the experimental work that is now being undertaken by the Division of Animal Husbandry of the Dominion Experimental Farms, under the direction of Mr. Archibald, the director, was published in *The Agricultural Gazette of Canada* for March, 1916, from which the following statement is taken:

> The experiment carried on by the late Mossom Boyd was commenced in 1894 and continued until the time of his death, some two years ago. At the outset cows of various breeds and crosses were used. Some of these failed to produce and, after several years of experiment, all but grades of the Aberdeen-Angus and Hereford were discontinued. The resulting herd, therefore, possess the thick form of these beef breeds and a modification of the hump and depth of rib peculiar to the buffalo.
>
> In the early stages of the experiment, sterility was a dominating obstacle to progress, more particularly with the initial cross. With the

FENCE AROUND THE BUFFALO PARK, WAINWRIGHT, ALBERTA

This buffalo-proof fence is about nine feet high and seventy-two miles long; with the interior dividing fences there is a total of one hundred and seventy miles of fencing. Round the entire part fire guards twenty feet wide are ploughed inside and outside the fence, as shown in the photograph

BUFFALO IN THE BUFFALO PARK, WAINWRIGHT, ALBERTA

The Buffalo in the park separate into groups of varying sizes. The photograph shows a small group containing both young and old animals

securing of the true cattalo—the offspring of parents both of which possess mixed blood—and the elimination of shy breeders, Mr. Boyd developed a herd of prolific animals. Abortions were frequent in the early crosses, but this tendency, also, has been overcome in the cattalo, which compares favourably with ordinary cattle in carrying the young to maturity.

The success of Mr. Boyd's work was, no doubt, assisted by a knowledge of what others had accomplished. Knowing from the experience of others that initial difficulties incident to these crosses could with persistence be overcome, Mr. Boyd pursued his work with confidence and ultimately reached a place that began to show the value of the new breed. After his death, however, it was found that the estate could not further pursue the experiment. From time to time during recent years, requests have been made to the Department of Agriculture to undertake experiments with these crosses, and when it was learned that the herd of the late Mr. Boyd was likely to be distributed and the value of his work lost, strong representations were made to the Minister of Agriculture to secure the herd of cattalos and to continue the experiment along truly scientific lines.

The Honourable Mr. Burrell, therefore, had the herd thoroughly investigated by officials of the Experimental Farms, the Live Stock and the Health of Animals branches, and on the results of their findings a selection from the herd was made. The selection consisted of twenty head of the most promising individuals, made up of sixteen females and four males. The females range in age from one to nine years, possess from twenty-five to seventy-five per cent of buffalo blood, and weigh from five hundred to seventeen hundred pounds. The males range from four to nine years of age, carry from thirty-one to seventy-five per cent of buffalo blood, and weigh from one thousand to two thousand pounds. They are all regular breeders so far as they have been tried, and possess every indication of vigour.

It has long been recognized that the buffalo possesses qualities which would be of value if transmitted to beef-producing animals, more particularly for ranging purposes for cold-ridden districts. From the experiments of Mr. Boyd and others it appears that the excellent rustling qualities of the buffalo are retained in the cattalo. During the blizzard conditions the cattalo like the buffalo faces the storm rather than drifts before it as is the tendency of domestic cattle.

Furthermore, the cattalo shows excellent grazing qualities, maintaining a plump body even on scant pastures. They carry a further resemblance to the buffalo in rising on their fore feet, which enables them to rise when in a weakened condition.

The anatomy of the buffalo is favourable to the carrying of heavy carcasses of beef. They possess an additional pair of ribs as well as much longer spines of the vertebra. Although these extra ribs are not always perpetuated in the cattalo, the length of back persists. Along these spines very heavy muscles are carried, enabling the animal to carry an exceedingly high percentage of beef on the back. which is the most valuable part of the carcass.

The value of the pelt of the cattalo is also a matter of importance. It possesses many of the qualities of that of the buffalo, but has a better colour, and more lustre, and the hair, which possesses considerable curl, is nearly as long and not matted.

The cattalo wintered (1915–16) on a quarter-section of land at the Dominion Experimental Station at Scott, Sask. They were enclosed within an ordinary wire fence. Although they grazed to some extent, they were given a ration of straw, hay, green-cut oat sheaves, and a few roots. Subsequently the cattalo were moved from Scott to Wainwright, Alta., where they were placed in a special enclosure in the Buffalo Park. Up to the present time, however (1919), there have been practically no cattalo calves born.

It is also proposed to carry on cross-breeding experiments with the yak, which is closely related to the bison and the true oxen. This work will include crosses between the yak and domestic cattle, and we would also suggest crosses between the bison and yak.

It is greatly to be hoped that success will attend this experimental work, and that the results may be of such a character as to demonstrate the wisdom of the step taken by the Dominion Department of Agriculture in its effort to add to the stock-raising possibilities of our more northerly territories.

CHAPTER VI

THE GAME BIRDS AND LARGER NON-GAME BIRDS OF CANADA

In another chapter the protection of the insectivorous and other small members of our bird fauna is considered. These birds have not received the attention of sportsmen, non-sportsmen (including the market hunter), and the framers of game legislation that has been given to the large class of birds included within the category of game birds, in which category, however, are included a number of birds, such as swans and cranes, that are no longer regarded as game birds.

Within this important class of birds are included such migratory groups as the swans, geese, ducks, cranes, and shore birds, and the non-migratory species, such as grouse and quail.

From the earliest historical times perhaps no country was inhabited during the spring, summer, and early fall by so large a number of swans, geese, and ducks as Canada, whose vast areas of water, in the form of marshes, sloughs, ponds, and lakes, furnished nesting-places and food for myriads of these water-fowl. The opening up and agricultural development of the country, the construction of railroads, and the birth and growth of towns and cities gradually brought about a rapid decrease in their number and drove many of them back into the undeveloped lands of the north, where at the present time by far the vast majority continue to breed. The causes which have mainly contributed to this decrease in the numbers of these migratory game birds are discussed elsewhere (page 172), and

it is the purpose of this chapter to describe as briefly as possible the present state and distribution of the chief representatives of this group.

SWANS

The Whistling Swan.—Formerly this species was abundant. It occurred throughout Canada, from the Atlantic to the Pacific coasts, and northward to the coasts and islands of the Arctic. But its large size, conspicuous character, and the market value of its skin have been responsible for its serious reduction. It breeds only in the far north, and winters in Louisiana, South Carolina, and Texas. During its migrations in the spring and fall it still occurs in large flocks in Ontario. Mr. P. A. Taverner informs me that he has seen flocks on Lake St. Clair, looking like rafts of ice in the distance, and composed of 200 to 500 birds. Small flocks pass over the Western Provinces, and are occasionally seen in British Columbia.

Some idea of the former abundance and subsequent reduction in numbers of this magnificent bird may be gained from the returns of the Hudson's Bay Company, as given by MacFarlane. He states that between 1853 and 1877 a total of 17,671 skins were sold. The number sold annually ranged from 1,312 in 1854 to 122 in 1877. "From 1858 to 1884, inclusive, Athabaska district turned out 2,705 swan skins, nearly all of them from Fort Chipewyan. Mackenzie River district, according to a statement in my possession, supplied 2,500 skins from 1863 to 1883. From 1862 to 1877, Fort Resolution, Great Slave Lake, contributed 798 thereof. For 1889, Athabaska traded 33 skins as against 251 skins in 1853. In 1880 and 1890, Isle-à-la-Crosse, headquarters of English River district, sent out two skins for each outfit." Naturally, so conspicuous a bird, accustomed to alight in its migratory flights on ponds and lakes, offered a tempting and comparatively easy mark

to the man with a gun. This was especially the case when they were overtaken by adverse weather. J. H. Fleming has described * a great destruction of swans that took place in March, 1908, at Niagara Falls. One hundred and twenty-eight birds were taken out of a flock that were swept over the falls. On March 14 a flock of three or four hundred swans was seen floating down the river with the current, till danger of being swept into the Canadian rapids caused it to rise and fly to its starting-point. Below Horseshoe Falls the water was breasted by a struggling mass of swans. The majority of them were carried to the ice bridge and either cast up or ground against it by masses of floating ice. The destruction on this occasion was practically total.

The Trumpeter Swan.—The breeding range of this species extends farther south than that of the whistling swan, and it is found in migration from Manitoba to British Columbia.† Like its near relative, it formerly wintered farther north than is the case to-day. The trumpeter has suffered more than the whistling swan on account of the greater proximity of its breeding-range to the regions in which settlement has taken place.

The Migratory Birds Convention provides for a close season for ten years for swans in Canada and the United States, and it is to be hoped that the protection that is thus given to these fine birds in their northern breeding-grounds, in their wintering places in the South, and during their migration will be a means of increasing their numbers.

GEESE

The Canada Goose.—What sound is a more welcome herald of spring than the honking of the geese, what sight is more pleasing than the Λ-shaped flocks of these geese

* *The Auk*, pp. 306–308, 1908.

† In 1920, trumpeter swans were discovered to be wintering in British Columbia and were "filmed." See *Bulletin American Game Protective Association*, April, 1921, p. 13.

winging their way northward through the evening sky, when the stern winter is loosening its grip on land and water?

It breeds throughout the more northerly parts of Canada from northern Quebec to the Pacific, chiefly within the limits of tree growth, although it may be found nesting in Labrador and on the treeless shores of the Hudson Bay. Its breeding-range extends northward along the wooded basin of the Mackenzie River. Mr. P. A. Taverner informs me that the Canada goose still nests as far south as Red Deer, Alta., and until recently it nested at Shoal Lake, Man.

The remarkable manner in which the Canada goose responds to encouragement and protection has been strikingly demonstrated by Mr. Jack Miner of Kingsville, Essex County, Ontario, whose wild geese have made him famous throughout the United States and Canada. It has been my good fortune to visit Mr. Miner when his wild geese were enjoying his hospitality for a few weeks on their way north, and to hear from him the story of his successful experiment of securing the confidence of so shy a game-bird. After having made the reputation of being one of the greatest Nimrods in Ontario, Mr. Miner became converted to the idea of making friends of the creatures that formerly regarded him as one of their most dangerous enemies. Adjoining his brick-and-tile factory was a small pond, and in 1904 he purchased seven wild geese, clipped their wings, and turned them out on the pond, which he enclosed, and which, it should be noted, is next to a much-travelled public highway. No wild visitor came until 1908, then on April 2 eleven geese stopped with him for a month on their way to their northern breeding-grounds. In 1909 thirty-two wild geese arrived on March 18; and on March 4, 1910, wild geese began to arrive from the South until, in two weeks, 350 had arrived. Each year the geese were fed with corn on the cob. In the following year (1911) the geese began

to arrive "in clouds" on February 20. Every year since they have visited Mr. Miner, not in hundreds but in thousands. On Good Friday, 1913, it was a very windy day and Lake Erie was extremely rough; the geese came to his farm in such numbers that they filled a five-acre field.

For several weeks each year they enjoy his hospitality and consume annually several hundred dollars' worth of corn. For years Mr. Miner has borne the cost of feeding his wild visitors, and it is impossible to praise too highly the spirit that has prompted so great a financial sacrifice on the part of a lover of wild life, who can ill afford the expenditure involved in this unique experiment. To accommodate the increasing number of his visitors Mr. Miner made new and enlarged ponds and added to his farm, the whole of which was devoted to and specially laid out for the protection of the geese, wild ducks,—which also visit him in large numbers,—quail, and insectivorous birds. So successful was the work that the Ontario government has created the Miner farm and adjacent farms a game sanctuary, which, each year, is visited by thousands of people, particularly in the spring, when the geese are staying there.

One of the most wonderful and inspiring sights I have ever seen is the return of the flocks of geese during the early hours of sunrise on an April morning. While the heavens are still glowing with the rosy light of the rising sun, the geese begin to leave the water of Lake Erie, where they have spent the night, and in their characteristic Λ-shaped flocks, they head straight for the sanctuary, where they alight and spend the day, fed by the generous hand of their protector. Such pleasures cannot be purchased; they are the natural sequence to a genuine love of wild life and a patient winning of its confidence.

Mr. Miner was not satisfied with demonstrating the response of the wild geese and ducks to his encouragement

and protection, but desired to learn something of their movements when they left him, for considerable numbers also visited him in the fall on their southward journey. Accordingly he has made a practice of capturing a number of his feathered visitors and marking their legs with aluminium tags, one of which is reproduced (Plate XXII, 3, 4). A number of these leg-tags have been returned to him, some from the breeding-places of the geese in the north and others from their wintering places in the south. As a result of this work valuable information has been secured. From ten wild geese marked in 1915–1916, six tags were returned from the following places: In the north, where they were breeding: Moose Factory, Paint Hill, Watts Island, and Fort George, all on James Bay. In the south, where they winter: Nag Head and Currituck Sound, North Carolina.

The work of Mr. Miner serves as an admirable object lesson in wild-life protection. There is no reason why his example should not be followed by others in all parts of Canada. The educational value of such protection cannot be overestimated, and the results that would accrue from a wider adoption of such a scheme are incalculable as a means of increasing the numbers of our migratory game and other birds. We fervently hope that his example will be followed throughout the Dominion.

Hutchins's Goose.—This is a smaller Western variety of the Canada goose, with which it frequently associates. It is a common visitor in the spring and fall in the western provinces, from Manitoba to British Columbia. In Manitoba it has become fairly plentiful in recent years, and to some extent has taken the place of the Canada goose; they may be found on the stubble about the end of September. In British Columbia it is a common migrant in the spring and fall, and a number winter on the coast of British Columbia. It breeds abundantly on the delta of the Yukon River, on

the Arctic coast and islands, and on the northwestern coast of Hudson Bay.

Snow or White Goose.—This species, known as the "white wavey," breeds in the Arctic from the mouth of the Mackenzie River eastward to Franklin Bay. It is an uncommon migrant in the east, but in the west it winters on the coast of southern British Columbia, sometimes collecting in considerable flocks at the mouth of the Fraser River. The greater snow goose migrates along the Atlantic coast.

Blue Goose.—The breeding-grounds of this more easterly species are unknown, but it is believed to nest on the eastern shores of Hudson Bay or in northern Quebec (Ungavg).

Brant.—Formerly the brant was one of the most abundant of the wild fowl that frequented our coasts, but its numbers have decreased very greatly. It is still an abundant migrant along the entire Atlantic coast, where it visits the coastal flats and estuaries. It breeds in the far north on the coast and islands of the Arctic Sea.

The black brant is a Pacific coast species, and it winters along the coast of Vancouver Island and British Columbia. Its breeding-grounds are on the Arctic coast and islands from Point Barrow to Melville Island.

DUCKS

It is not possible within the limits of the description of our native wild fowl, nor is it desirable in an account of this nature, to discuss in detail the range and habits of all the numerous species of ducks that are native to Canada. Such details as the reader may wish to obtain may be found in the excellent "Catalogue of Canadian Birds," by John and James M. Macoun, in Forbush's "Game Birds, Wild Fowl and Shore Birds," and in the excellent work, "Game Birds of California," by Grinnell, Bryant, and Storer. Reference may be made, however, to a number of the more common species of ducks.

Merganser.—The "saw-billed" ducks are well known and are generally regarded by fishermen as destroyers of fish. The red-breasted merganser nests on rivers and lakes throughout the wooded regions of Canada, from the Gulf and River St. Lawrence and northern Quebec to British Columbia. The hooded merganser breeds from Ontario to British Columbia; the centre of its abundance appears to be in northern Manitoba. It is common in British Columbia and has been found wintering on Okanagan Lake.

Mallard.—Forbush has truly called the mallard "the wild duck of the world." It is a cosmopolitan species, progenitor of our domestic breeds of ducks, a joy to the naturalist and sportsman, and in every way our best wild duck. Its chief breeding-grounds are the western provinces, the Northwest Territories, and British Columbia. It is not common east of the St. Lawrence, but it breeds in some of the marshes in western Ontario. West of the Great Lakes it may be found everywhere. Almost every little slough has its pair of mallards. But nowhere does it exist in the countless numbers that were formerly found when individual gunners killed them by the hundred per day, until they tired of the slaughter. They respond readily to protection and encouragement and are easily propagated.

Black Duck.—In the Maritime Provinces, in Quebec, and in Ontario, this species takes the place of its near relative, the mallard. West of the Great Lakes it is not common.

Gadwall.—In eastern Canada this species is not common; migrants are rarely seen on the Atlantic coast, but it breeds more commonly on the prairies, although it appears to be the rarest of our ducks, having a wide distribution.

Baldpate or American Widgeon.—Like the gadwall, this fresh-water species is a valuable food duck, and consequently has suffered from excessive hunting. In eastern Canada it occurs as a migrant, becoming less common from Ontario eastward. It breeds abundantly in Manitoba and north-

ward through the Northwest Territories; it is also common in the Fraser Valley and the interior of British Columbia.

Teal.—The green-winged teal is common from Manitoba to British Columbia, and breeds throughout that region and northward to the Arctic. The blue-winged teal breeds sparingly in eastern Canada; its chief breeding-range is from Manitoba to the Rocky Mountains and northward. It is a summer resident in the lower Fraser Valley, though uncommon in the rest of British Columbia. The teal are the smallest of our ducks, and, being swift fliers, are good sporting ducks.

Shoveller or Spoonbill.—This handsome bird is distinguished by its peculiar spoonlike bill, which enables it to sift the mud of the ponds which it frequents. As a migrant it is fairly common in Ontario and Quebec, but rarer in the Maritime Provinces. It is one of the commonest ducks of the prairies as far as the Rocky Mountains, where it finds the most suitable feeding-grounds. It is a common summer resident in British Columbia.

Pintail.—Few of our native ducks excel this species in beauty of colouration, and certainly not in grace of outline. While it breeds in some of the Ontario marshes and eastward to Nova Scotia in small numbers, the chief breeding-places of the pintail are in the Northwest Territories northward to the Arctic coast.

Wood Duck.—Of all our wild ducks this species is by far the most gorgeous in its colouring; in fact, it is not excelled in beauty of colouration by any other wild duck in the world. Formerly it was abundant throughout the wooded regions of Canada, but so reduced have its numbers become that it has now been considered necessary to protect it by a permanent close season. It is still found in small numbers from Nova Scotia to British Columbia, but it is rare in the region west of Manitoba to the Coast Mountains of British

Columbia. Its peculiar habit of nesting in hollow trees and stumps above ground is well known.

Redhead.—This species resembles somewhat its near relative, the canvas-back duck. It is a large duck and favoured by sportsmen. In the Maritime Provinces it is a rare migrant, but more abundant in Ontario, where it breeds in certain of the marshes. It breeds commonly throughout the Prairie Provinces, where it frequents the abundant sloughs.

Canvas-back Duck.—In the opinion of the epicures this is the king of the game-ducks. It is rare in the Maritime Provinces, but it is a more common migrant in Quebec and in Ontario. Its chief breeding-grounds are in the Prairie Provinces and the Northwest Territories. It also breeds in central British Columbia and winters on Okanagan Lake and around the mouth of the Fraser River and Victoria.

Scaup or Bluebill.—This swift-flying duck offers excellent shooting to the sportsmen, and migrates southward later than many of the other ducks. It breeds throughout northwestern Canada and east of the Coast Mountains in British Columbia. It may be found in the winter in southern British Columbia and on the Pacific coast.

Golden-eye or Whistler.—The latter name of this species is due to the whistling sound made by its wings in flight. Like the wood-duck, it nests in trees and stumps. It is a migrant in Ontario, Quebec, and the Maritime Provinces. Its chief breeding-places are the wooded regions of Manitoba, Saskatchewan, and Alberta, particularly along the lower portions of the Saskatchewan, Nelson, and Churchill Rivers. It also breeds abundantly along the Athabaska and Slave Rivers.

Eider-Duck.—The sea is the natural home of these large ducks, that do not come within the category of game-birds. There are a number of species which make their home in the Arctic and sub-Arctic regions of Canada. On the Atlantic coast, the northern and American eider are the chief

species. The king eider breeds on the Arctic and Labrador coasts. The Pacific eider breeds on the northern Pacific and Arctic coasts, being abundant around the mouth of the Mackenzie River (Plate XVI, 4).

The great economic importance of the eider as the source of the valuable product, eider-down, a product of particular value in our northern latitudes, should need no emphasis. In the northern European countries of Norway and Iceland the birds are most zealously cared for by the inhabitants, who collect their down from the nests of the birds for commercial purposes. They realize fully the importance of conserving the birds, and encourage them by making nesting-places, so that they become semi-domesticated, and do not fear the intrusion of their protectors. During the early part of the nesting-season the down is taken, and also a proportion of the eggs, but sufficient eggs are left to enable the birds to rear the young required to keep up the numbers of the birds. How widely different has been the treatment of the American eider on the coasts of Labrador, Newfoundland, and eastern Canada! Owing to the enormous destruction of the eggs, not to mention the adult birds, the eider is rapidly nearing the point of extermination on the Atlantic coast. Doctor Grenfell has described to me the ruthless destruction that takes place on the Newfoundland and Labrador coasts. For years this relentless destruction has been carried on. It is the modern version of the story of the killing of the goose that laid the golden eggs. In the eider the inhabitants of our coastal lands, all too destitute of commercial resources, have a resource of inestimable value if the birds were protected to the same extent that the eider is protected in northern Europe. A valuable eider-down industry could be developed which would alleviate materially the conditions of life that are endured by the inhabitants of those inhospitable northern shores.

A most admirable account of the serious reduction in the abundance of the eider, its protection and use in Norway and Iceland, and an appeal for its conservation on our Atlantic coast, is contained in Doctor Charles W. Townsend's paper, "A Plea for the Conservation of the Eider," published in *The Auk*, vol. XXI, pp. 14–21, 1914, and in the *Seventh Annual Report of the Commission of Conservation*, p. 250, 1916, to which the reader interested in this subject is referred. Under the Migratory Birds Convention the eider is protected for a period of ten years. It is fervently hoped that Newfoundland will co-operate in protecting this bird, and that an eider-down industry may be developed on the coasts of Canada, Newfoundland, and Labrador.

Scoters.—There are three species of scoters, which are black sea-ducks, native to Canada. As they are fish-eaters, their flesh is not generally esteemed, but they are eaten by the natives, and on the coast of British Columbia the Indians kill for food the white-winged and surf scoters, which are locally known as "siwash ducks." During the migration the American scoter occurs commonly on the Atlantic coast.

CRANES

In Canada we have three species of these birds, which have become so reduced in numbers as to necessitate the special protection they now receive under the Migratory Birds Convention. The whooping-crane is perhaps the most stately of all our large native birds, but at the present time it is threatened with extermination. Formerly it bred in all the large marshes on the prairies from Manitoba to the Rocky Mountains and northward. Thompson, in his "Birds of Manitoba" (1890), describes it as a tolerably common migrant and rare summer resident, and states that "this beautiful bird is common in the Touchwood

Hills." But the advent of man and railroads spelled the destruction of so fine and conspicuous a bird, and its nest has not been found for a number of years. A few birds are occasionally seen in Manitoba and Saskatchewan, and only in the region between the Quill Lakes and Last Mountain Lake in Saskatchewan do they appear to exist or breed in any numbers. The little brown crane is often confused with the sandhill crane, which is the well-known resident brown crane of the prairies; the little brown crane, on the other hand, is only a migrant within civilization and nests in the far north. The sandhill crane is a rare migrant in Ontario, and it is not common in British Columbia. But in the Prairie Provinces and to the north the sandhill cranes are fairly common, and one's eyes may still be gladdened by the long lines of these birds sailing through the sky. It has been the custom to shoot these birds for food and to regard them in certain localities as injurious to grain crops.

SHORE-BIRDS, OR WADERS

The shore-birds, or waders, have a special interest to Canadians, as these birds, which migrate unusually long distances, in most cases breed entirely and, in other cases, principally within our territories, where suitable breeding-grounds exist on a large scale. Large numbers breed in or near Arctic Canada, and migrate to Central and South America. The knot, one of the sandpipers found on our Atlantic coast during the migration, breeds on the most northern islands of the Arctic, such as Victoria and Ellesmere Islands, and, after migration along the Atlantic coast, winters in Patagonia, a distance of over 9,000 miles separating its summer and winter abodes.

Formerly shore-birds of all kinds occurred on our coasts and inland in countless numbers, but now some have practically disappeared, and even the species that have managed to hold their own are far from abundant. No class of

birds has suffered so serious a reduction in abundance, and no class stands in so great need of vigorous protective measures. Their serious reduction in numbers has been brought about largely by the same causes that have affected our own game-birds, namely, the destruction of their former haunts by agricultural development and the extension of settlement both in their summer haunts in Canada and their winter habitat in such parts of South America as the Argentine, the increase in the number of gunners and the better facilities that now exist for hunting.

The only manner in which the influence of these adverse factors can be offset to an extent that will prevent reduction in the numbers of shore-birds to the point of extermination, is by stringent protection—short open seasons and small bag limits; and such protection must necessarily be of an international character.

Under the Migratory Birds Convention, a close season for a period of five years is provided for all shore-birds, with the exception of the woodcock, the Wilson or jack snipe, the black-breasted and golden plover, and the greater and lesser yellowlegs. The curlews, sandpipers, other species of plover, and the rest of the shore-birds are now protected absolutely north of Mexico, and it is to be hoped that our South American bird-lovers will secure some measures of protection for all these birds in their winter homes in the South.

Woodcock.—But a remnant of the former numbers of this bird now remains in eastern Canada, where it breeds in Nova Scotia, New Brunswick, Quebec, and the more southern portions of Ontario. As it breeds on land unsuitable for agriculture, there is no reason why it should not increase in numbers with adequate protection and provide sport for those real sportsmen who prefer the difficult shot to the easy mark.

Snipe.—The Wilson or jack snipe is considered by many

to be the finest of game-birds; certainly no bird affords better sport. But so long as it was butchered in the Southern States during its winter sojourn, little advantage was gained from the protection it received in Canada, where its chief breeding-grounds occur. The serious decrease in numbers has been chiefly due to excessive slaughter in the Gulf and Southern Atlantic States. We are informed that a single hunter in Louisiana killed 69,087 birds from 1867 to 1887, or an average of 3,500 snipe a winter. Cooke, in his valuable article on "Our Shorebirds and Their Future"* states: "Fortunately, the breeding grounds of most of the Wilson snipe are in Canada, where the birds are protected by law and custom throughout the nesting seasons. Moreover, their nesting sites are on land that will not for many years, possibly not for several generations, be used for agricultural purposes. Hence, there is provided in Canada an enormous favourable breeding area for these game birds, a region which formerly supported a snipe population many times more numerous than at present, and which will return to us in the United States each fall a liberal increase on whatever numbers we may allow to cross our northern border in spring." The Federal migratory bird regulations in the United States and the keener sense of responsibility in this phase of bird protection now displayed in the administration of game-laws in the States concerned, would indicate a more hopeful future for this excellent game-bird.

In Canada the snipe breeds in all the provinces, and northward to the Mackenzie delta, and in Yukon and Alberta.

The Plovers.—With the exception of the black-bellied and golden plovers, all the plovers, such as the killdeer, semi-palmated, and piping plovers, are protected for a period of

* *Year Book of the United States Department of Agriculture for 1914*, pp. 275–294.

five years under the Migratory Birds Convention. All the plovers are valuable to the agriculturalist, as they feed on grasshoppers, cutworms, white grubs, and other pests of our field and garden crops. The black-bellied plover is a fall migrant in Nova Scotia and New Brunswick; in Quebec and Ontario it appears both in spring and fall, but in the Prairie Provinces it is a spring migrant. It breeds on the Arctic coast, and winters from California southward to Brazil and Peru.

The golden plover breeds along the Arctic coast from Alaska to the northwest coast of Hudson Bay, including the Barren Grounds. In the fall it travels southward to spend the winter chiefly in Brazil and Argentina. It is a common migrant in the fall in the eastern provinces, and in the Prairie Provinces it appears as a migrant in both spring and fall. Formerly the golden plover was perhaps the most abundant of all the shore-birds, vast flocks sweeping northward and southward across the continent in their long migratory journeys. But excessive hunting has reduced them to but a small fraction of their former numbers. Audubon estimated that in the annual slaughter that he witnessed in 1821, near New Orleans, about 48,000 plovers were killed in one day.

Sandpipers.—This group includes about half of the shore-birds. They are chiefly small birds frequenting the edges of stream, river, lake, and sea. In spite of their small size they have been killed in thousands to satisfy the palates of the epicures. Now all species, with the exception of the greater and lesser yellowlegs, are protected for five years. Among the commoner species may be mentioned the following:

The Semipalmated Sandpiper.—This is a common migrant in the fall along the Atlantic coast and the Gulf of St. Lawrence. In the western provinces they appear in the spring on their journey to their northern breeding-grounds,

although they occur as both spring and fall migrants in British Columbia.

The Least Sandpiper is a common migrant from the Atlantic to the Pacific.

The Solitary Sandpiper is a summer resident in New Brunswick, northern Quebec, the Prairie Provinces, and British Columbia.

The Upland Plover or Bartramian Sandpiper is a bird of the open prairie, and is a common summer resident in the Prairie Provinces, where its chief breeding-centre is in western Manitoba and eastern Saskatchewan. Without the complete protection it is now afforded, it was doomed to complete extermination at no distant date, owing to the excessive destruction it has suffered at the hands of the market gunner. With adequate protection the melodious call of this bird, as it migrates northward in the spring, will continue to please the ears of bird-lovers.

The Greater and Lesser Yellowlegs may be hunted during their fall migration. On the Atlantic coast it is a common migrant in spring and fall, and frequents the shores of tidal marshes. It is also a common migrant in Quebec, Ontario, Manitoba, and Saskatchewan. In British Columbia, it is an abundant resident in the winter along the coasts. The lesser yellowlegs is reported to be more abundant than the former species. It is found throughout the same range and breeds in large numbers in the Barren Grounds.

The Curlews.—The history of the Eskimo curlew resembles somewhat that of the passenger pigeon. Formerly one of our most abundant shore-birds, and although fairly common up to 1890, it is now almost extinct. Its disappearance has been chiefly due to unrestricted market hunting in the United States, particularly during its northward migration in the spring. It bred in the northern Barren Grounds, and in the fall travelled southward along the Labrador and

Atlantic coasts to Argentina and Patagonia, a distance of 6,000 to 9,000 miles. In the spring it took a westerly course northward, and covered the prairie regions of the United States and Canada. It was in the Middle States, on the prairies of Texas and Kansas, that the "dough birds," as they were called, met their fate. They congregated in such closely massed, large flocks that their wholesale slaughter by the market gunners was rendered easy. Forbush has given an excellent account of the history and the disappearance of this bird. He records the occurrence of immense flights of these birds on their southward journey; their dense flocks of millions would darken the sky, and the fishermen of Labrador and Newfoundland salted them down in barrels. All down the east coast the slaughter in the fall was terrific. In the spring they were killed in thousands in the Mississippi Valley, and were shipped into the Eastern market by the ton, in barrels. No bird could stand such slaughter, and in less then thirty years they were practically exterminated. It is a sad story of the exterminating effect of unrestricted destruction, and affords one of the most powerful object-lessons.

The Long-billed Curlew is not common east of the prairies, but it is still fairly abundant in the southern portions of Saskatchewan and Alberta, where it breeds on the open prairie, and in British Columbia. But like other members of the family it is suffering from the inevitable extension of agriculture and the consequent reduction in its breeding-grounds. At the present time this species, the Hudsonian, and other curlews enjoy a permanent close season until 1923, and, with adequate protection, it should be possible to prevent their extermination.

BOB-WHITE, OR QUAIL

In Canada the bob-white is confined to the extreme southern portion of southwestern Ontario, although its

range formerly extended farther eastward.* As this region forms the extreme northern limit of its range, it is with the greatest difficulty that this useful little bird is holding its own; in the spring of 1917 it was feared by many that the previous severe winter had destroyed the remnant of what was formerly a fairly abundant bird on the farms of southwestern Ontario. It is unfortunate that a bird so useful as the bob-white from the agricultural standpoint should be considered a game-bird. As a destroyer of insect pests it is one of the best friends the farmer has, and how much poorer the countryside is when it lacks the bob-white's cheery call. The bob-white should no longer be listed as a game-bird, attractive as it is to sportsmen, but it should be given absolute protection on account of its value to agriculture. Under present conditions its continued existence will not be possible if it is hunted as game, and the sportsman who would be a party to its destruction is unworthy of the name.

GROUSE

The different groups of grouse and ptarmigan are well represented in Canada. The following may be taken as representing the chief groups:

Richardson's Grouse.—With the exception of the sage-hen this species and its related races are the largest of the grouse family. They may be found from the eastern foot-hills of the Rocky Mountains through the mountains to the Coast Mountains, and northward to the Yukon and the Mackenzie regions.

Spruce Grouse.—The spruce forests from the Atlantic coast to the Yukon are the home of this species, which, in many parts of its range, has suffered on account of its comparative tameness.

* Quail have been successfully introduced into British Columbia, and are thriving in the southern part of Vancouver Island.

Ruffed Grouse.—This species, commonly known as the "partridge," offers excellent sport to the hunter. It ranges through the wooded regions of all the provinces from Prince Edward Island and Nova Scotia to British Columbia, and the "drumming" of the male birds is a well-known sound of springtime, when the winter snows are melting. During the last few years there has been an alarming decrease in the numbers of this and other species of grouse, the causes of which will be discussed presently. With adequate protection, however, when the numbers of grouse become seriously reduced, there is no reason to fear their disappearance, provided the protective regulations are adequately enforced, as the breeding range is so wide that the species have sufficient means for recuperation.

Ptarmigan.—These hardy birds breed in our most northerly latitudes, and are chiefly distinguished by the fact that they assume a plumage of pure white during the winter months. The willow ptarmigan breeds throughout northern Canada from the Labrador coast and northern Quebec to the Yukon. In the autumn they unite to form flocks of considerable size, and constitute an important article of food for the Indians and Eskimos and the few white inhabitants of the north during the winter. Above the timber-line in the Rocky Mountains and other high mountains in British Columbia is to be found the white-tailed ptarmigan.

The Pinnated Grouse or Prairie Chicken.—This well-known game-bird of the prairie regions has followed the extension of the area devoted to grain-growing. It migrated into Canada from the south; the first specimens appear to have been killed in Manitoba about 1881, according to Thompson. By 1884 it had become tolerably common, and in 1886 it was abundant near Winnipeg, and is now spread over the entire prairie region of Canada. During recent years, however, its numbers have been reduced to such an extent through natural causes and overshooting that the provin-

cial governments of Manitoba, Saskatchewan, and Alberta were compelled to establish an absolute close season. Complaints have been made that the use of poisoned grain in the Prairie Provinces in the destruction of gophers, or ground-squirrels, has been responsible for the deaths of prairie chicken. The investigations of Pierce and Clegg in California on quail, and of Bradshaw in Saskatchewan, have shown that under natural feeding conditions poisoned grain will not kill these birds.

The Prairie Sharp-tailed Grouse.—Unlike its near relative, the pinnated grouse, this bird, which is commonly known as the "prairie chicken" on our prairies, retreats before settlement. It is more usually found in deep woods and on uncultivated land overgrown with poplar, willow, or other low-growing trees, and it may be found throughout such wooded sections in the Prairie Provinces. The pinnated grouse keeps in the open country and frequents the willow scrub in the winter for protection.

The Scarcity of Grouse.—During the last few years there has been a remarkable and almost alarming decrease in the number of grouse throughout Canada, from the Atlantic to the Pacific. The chief species, such as ruffed grouse or partridge, pinnated grouse or prairie chicken, and sharp-tailed grouse, were all affected, and in some sections of the country they disappeared almost completely. Many factors contributed to their scarcity. Of the artificial factors there is no doubt that overshooting, particularly for the market, was responsible for the scarcity of birds; this is especially the case in the Prairie Provinces, where the increasing use of the automobile in hunting "chickens" has increased the slaughter of birds to a serious degree. Natural factors have played an important rôle. In the case of all species, cold, wet springs have killed off the young birds. Many reports indicate that large numbers of ruffed grouse have been killed in the spring. They have been imprisoned

under the snow, under which they are accustomed to shelter, but which proves to be a death-trap when alternate thawing and freezing causes the formation of an ice-crust.

The most important and at the same time the most interesting cause of the scarcity of grouse during recent years has been the migration southward of certain large species of northern predatory birds such as the goshawk and great horned owl. This southern migration of these predatory birds was evidently due to the scarcity throughout the northern regions of the rabbit or varying hare, which experiences, as is well known, periodic cycles of abundance and scarcity, as I have described in another chapter (see p. 216). This relation between the scarcity of rabbits and the decrease in the numbers of grouse was independently studied by Mr. P. A. Taverner and myself in Canada, and Mr. John B. Burnham, president of the American Game Protective Association, who has published an interesting report on the subject.* Owing to the scarcity of rabbits, which normally constitute the chief food of such predatory birds as the goshawk and great horned owls, these birds migrated southward in large numbers and sought other prey. This migration brought these enemies of our game-birds in abnormal numbers into the natural haunts of the various grouse, and these birds suffered from the consequent excessive slaughter. In cases of this kind the natural balance usually becomes restored in a few seasons, and, if close seasons are wisely fixed to counteract the baneful influences of natural factors over which we have no control, it is possible to prevent excessive reduction in numbers provided steps are taken at the same time to prevent overshooting. These species of grouse afford such excellent sport and recreative exercise that the greatest care should be taken in the fixing of open seasons, bag limits, and in regulating the methods

* *Bulletin of the American Game Protective Association*, vol. VII, no. 1, pp. 4–8, January, 1918.

of hunting so that the conditions will be favourable to the birds. Too often the claims of the hunter receive consideration at the expense of the quarry. True game protection consists in the consideration of the claims of the game, rather than those of the improvident pot-hunter, for no sportsman worthy of the name will consent to kill game at the risk of its continued existence.

Sage Grouse or Sage Hen.—The range of the sage grouse, which is the largest of all our grouse, is very restricted in Canada. They may be found in small numbers in certain sections of southern Saskatchewan, and probably in southern British Columbia, near the international boundary, where the sage-brush (*Artemisia*) grows. The sage-brush country is their natural habitat, and, provided the permanent close season that they now enjoy is maintained, we may hope to continue to count this fine bird among our species of grouse.

The foregoing review of our game-bird resources indicates the remarkable wealth of species that are included in our Canadian fauna. As I have pointed out, the abundance of many species must inevitably be adversely affected by the opening up and settlement of the country, which results in the destruction of their normal feeding and breeding-grounds. But, provided we legislate wisely, fixing open seasons and bag limits that will prevent excessive killing, prohibit the sale of game-birds, and make every effort to counteract the adverse natural factors that are beyond human control, there is no reason why our game-birds should not continue to provide the future generations of Canadians with health-giving sport and recreation.

CHAPTER VII

BIRDS IN RELATION TO AGRICULTURE

Economic Value.—As agriculture is the basic industry of Canada, a thorough appreciation of the important relation that the protection of our insectivorous and other birds bears to agricultural production is essential to progress in this branch of national activity. While every farmer, fruit-grower, and forester knows to his cost the results of insect depredations, the non-agricultural section of our population, which depends on the products of the farm and forest, is by no means so fully aware of the immense losses that are caused by insect depredations. As a result of careful investigation we are able to determine the average loss on crops due to insect attacks. On the basis of this knowledge and taking the known yield of our different field crops, I have estimated that the loss due to insect depredations on the agricultural crops is not less than $125,000,000 annually. Birds constitute one of the chief natural factors tending to keep insects in check. If injurious insects were to increase without any natural control, there would be no vegetation left on this continent in a very short time. Therefore, the protection of birds is essential from the point of national economy.

Again, as the investigations of the Commission of Conservation have demonstrated, one of the most serious adverse factors affecting Canadian agriculture at the present time is the increasing prevalence of weeds. In the Prairie Provinces especially the weed problem is one of the most serious with which the farmers have to contend. And yet the value of certain species of birds as weed-destroyers is hardly realized by most agriculturists.

Few people realize the extent to which birds feed upon and destroy insects. Certain species feed upon them wholly, others during part of the spring and summer seasons. Those birds that are partially insectivorous generally destroy large quantities of insects during the period of the year when they are raising their young broods, and this period coincides with the period of the year when insects are most prevalent. Certain families of birds diligently search the surface of the ground for insects, others search the vegetation, and others the air, and in this manner the insects on the earth, under the earth, on the plants, and in the air are ceaselessly hunted (Plate XV). Investigations conducted on this continent and in Europe have shown the extent to which insects go to make up the diets of birds. For example, it has been found that insects constitute 65 per cent of the total yearly food of woodpeckers, 96 per cent of that of flycatchers, 95 per cent of that of wrens, and 89 per cent of that of phœbes. Birds require an enormous amount of food when they are growing and, owing to their active habits, in the adult state. A young crow will daily consume twice its weight in food. Nash found that a young robin weighing three ounces would eat five and one-half ounces of cutworms in a day. It has been calculated that a pair of tits and the young they rear will consume about 170 pounds of insect food in a year. A blue tit will destroy six and one-half millions of insects in a year, and in bringing up a family of about twelve to sixteen young ones about 24,000,000 insects would ultimately be accounted for. Grab, in Switzerland, states that three blue tits and three cole-tits consumed 8,000 to 9,000 insect eggs daily; three marsh-tits, one cole-tit, one long-tailed tit, and a golden-crested wren consumed 600 caterpillars in 100 minutes. Similar facts based on accurate observation and investigation might be quoted at great length to indicate the enormous destruction of insect life that is accomplished by birds.

Feeding Habits of Chief Groups.—It will be of interest to review briefly the feeding habits of the chief groups of birds.

Hawks and *owls*, which, as a group, are wrongly regarded as noxious birds, prey not only upon injurious small mammals, such as field-mice, gophers, and various rodents, but also consume injurious insects. The little sparrow-hawk lives largely upon grasshoppers and crickets, and such larger hawks as Swainson's hawk live almost exclusively upon such insects in the summer-time. The noxious hawks and owls (see p. 210), such as Cooper's hawk, the sharp-shinned hawk, and the great horned owl, form a very small proportion of the family.

The *thrush family*, including such well-known birds as the robin and bluebird, are not only well known but useful birds. While robins are sometimes destructive to fruit, a large portion of the vegetable matter they consume consists of wild fruits; 330 stomachs contained 58 per cent vegetable matter, of which 47 per cent consisted of wild fruits, and 4 per cent of cultivated fruits.* About two-thirds of the food of the bluebird consists of insects, such as caterpillars, grasshoppers, and beetles.

The *nuthatches*, *tits*, and *tree-creepers* are among the most diligent of hunters after insects in all their stages, particularly in the egg stage, and figures have already been given to indicate the enormous destruction of insect life they effect. The *warblers* constitute a family of almost purely insectivorous birds that is well represented in Canada. Wherever insects may be found some species of warbler will also occur. Shyly they pursue their work of searching every leaf and twig of shrub or tree for eggs, larvæ, or adults of destructive insects. We have found them to be not unimportant factors in the control of certain pests of

* Except where it is otherwise stated, these analyses of stomach contents are taken from the publications of the Biological Survey of the U. S. Department of Agriculture.

DIAGRAMMATIC REPRESENTATION OF THE ECONOMIC STATUS OF SOME OF OUR COMMONER BIRDS

Protection of trees and foliage: 1. Phœbe. 2. Vireo. 3. Warbler. 4. Chickadee. 5. Nuthatch. 6. Downy woodpecker. 7. Flicker
Aerial insect-destroyers: 8. Whippoorwill. 9. Swallows. 10. Kingbird. 11. Crows and Gulls
Destroyers of noxious rodents: 12. Owl. 13. Hawk
Destroyer of soil-infesting insects: 14. Robin
Destroyers of weed seeds: 15. Chipping Sparrow and Juncos. 16. Goldfinch

our forest and shade-trees. The *vireos* also are unrivalled as destroyers of insects which feed on the foliage of trees.

The *swallows* and *martins* scour the air in the search of adult insects of all forms, which make up their entire diet.

Our native *sparrows*, in which group we do not include the undesirable alien house-sparrow, are among the greatest weed-destroying agencies, owing to their appetite for weed seeds. The song-sparrow is one of our most welcome spring arrivals. About three-fourths of its food consists of weed seeds and one-fourth of insects. Beetles, especially weevils, form the greater portion of the insect food. The chipping sparrow, whose confiding ways give it a warm place in our affection, is the most insectivorous of our sparrows. About 42 per cent of its food consists of insects and spiders, and caterpillars make up the major portion of the insect food, especially when the young are being reared, when as many as seventeen feedings per hour, on an average, for a brood of four nestlings, have been recorded. The retiring and sombre junco or snowbird destroys insects and feeds on weed seeds. An examination of 500 stomachs gave 23 per cent animal food (caterpillars, bugs, and beetles), and 77 per cent vegetable food, of which over 61 per cent consisted of weed seeds. In September the proportion of weed seeds may rise as high as 95 per cent of the food.

Among the commoner weed seeds consumed by the sparrows we find the seeds of bindweed, lamb's-quarters, ragweed, amaranth, pigeon-grass, etc. Judd records the result of the examination of over 4,000 stomachs of twenty species of sparrows. It was found that for the entire year weed seeds form more than half their food, and during the colder months of the year these seeds constitute about four-fifths of the food of many species. A single bird will often be found to have eaten 300 seeds of pigeon-grass, or 500 seeds of lamb's-quarters or pigweed. Beal estimated that the tree-sparrow may consume one-quarter ounce of weed

seed per day, and on that basis, in a state the size of Iowa, the species would consume about 800 tons of seeds annually.

In passing, it should be pointed out, however, that the weed-destroying power of graminivorous birds may be exaggerated if the question is not investigated with great thoroughness, for while the powerful gizzards of some birds may grind up the hardest-coated seeds, in other cases seeds may be capable of germination after passing through the digestive tract, as Collinge has shown in a number of cases in English birds. In such cases the birds would act as disseminators of weed seeds. Then again, in the case of insectivorous birds, besides destroying noxious insects, they will destroy various kinds of insects which are useful by reason of their parasitic habits upon noxious insects. These facts indicate that the question of the economic status of a bird is not always an easy matter to determine, and demands *thorough* investigation in each case.

Furthermore, in certain instances useful birds eat grain or fruit. The horned larks occasionally eat grain, vegetable food constituting about 80 per cent of their total food. Six-sevenths of this total amount of vegetable food consists of the seeds of such weeds as foxtail, amaranth, ragweed, and bindweed. It surely is not too much to ask that, in view of the good they effect, a little injury shall be overlooked, especially as they make no charges for the good work they accomplish. It has sometimes seemed to me that in the case of those useful birds which sometimes take to fruit-eating, it is far cheaper to protect the fruit from the birds than from the insects. As insecticides birds are the cheapest and most generally efficient that can be found.

The much-maligned *crows* are to no small extent friends of the farmer. In my investigations in England I found that at certain periods of the year they consumed large quantities of cutworms and root-feeding insect larvæ. In the United States Beal has found that the crow deserves protection and not wholesale destruction. The crow is an

experienced cutworm-hunter, and these birds have been observed in large flocks destroying cutworms in badly infected fields, which they carefully work over. When fields are ploughed they follow the plough and consume immense quantities of the destructive white grubs, one of our worst agricultural pests. Where, through their numbers, crows become destructive, it is necessary to take steps to reduce them.

The *woodpeckers* are specially fitted by nature to destroy the wood-boring insects that so speedily kill our forest, shade, and orchard trees. The flicker feeds largely on ants; a single stomach has been found to contain over 5,000 ants. In another instance 28 white grubs were found in the stomach of one of these birds, which feed largely on the ground. The downy woodpecker feeds largely on the borers of trees, and is one of our most useful insectivorous birds. An examination of 723 stomachs showed that 76 per cent of the diet was animal food, consisting chiefly of insects. The yellow-bellied sapsucker is practically the only member of the woodpecker family that is injurious. Its fondness for the inner bark of trees leads it to girdle the trees with holes, the effect of which is either to kill the trees outright or seriously disfigure the timber.

Gulls are constantly associated in the minds of most people with the sea or our large inland lakes, and their agricultural value is therefore largely obscured. Nevertheless there exist very extensive breeding-places of certain species inland, and such a species as Franklin's gull is a true inland species. Sometimes hundreds of ring-billed, herring, and Franklin's gulls may be seen following the plough on the prairie and feeding on the white grubs, wireworms, and other insects and their larvæ that are turned up. It has been found that about four-fifths of the food of the Franklin's gull consists of grasshoppers.

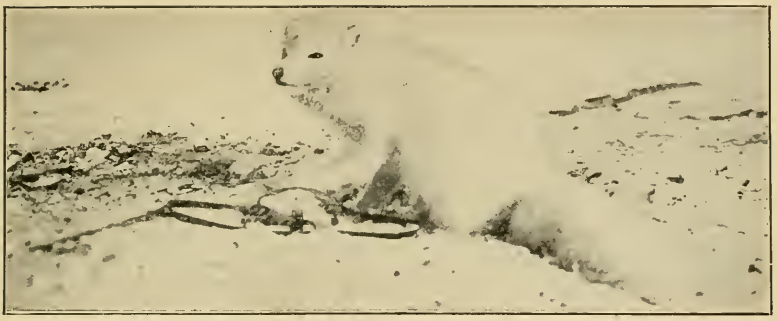
From the foregoing review it is obvious that all the chief groups of birds contain representatives, or entirely consist

of birds that are an actual necessity in the maintenance of as great a control as possible over the infinite variety of insect pests that attack the roots, stems, branches, and leaves of our cultivated plants and trees. And whatever may be the habitat of the insect it is usually found by some species of bird owing to the diversity of their feeding-habits.

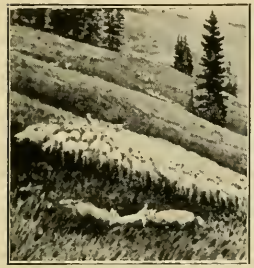
In view of the great economic value of our insectivorous birds from an agricultural standpoint, but not forgetting the æsthetic motives which surely need not be supported by argument, it is evident that the protection of these birds must form an important part in the maintenance or increase of our agricultural production.

Experience has shown that not only directly by killing, but indirectly by the destruction of their natural haunts and breeding-places, man has intentionally and unintentionally been more anxious to destroy bird life than to protect it. Leaving aside the wilful destruction which birds have suffered by their misfortune in offering an easy and living target, we find that the former haunts of our birds are obliterated by the advance of agriculture and settlement. Woodlands and forest are cut down and give way to open fields; bird-haunted snake fences yield to wire. Near our cities subdivisions and lots wipe out the waste places and wooded haunts of birds. With their breeding and feeding places more and more reduced, and their lives frequently endangered, it is not surprising that birds are not more abundant, and that protection and encouragement are essential.

Local Abundance of Birds.—Few people realize the variety of birds that breed within a certain area, as so many species are shy in their habits. During the last few years the Biological Survey of the United States Department of Agriculture has been conducting a bird census of the United States. As illustrating the valuable and interesting data that such a census provides, the following are the results of an annual census taken since 1914 by Mr. Norman Criddle,

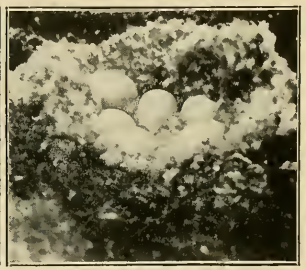


From a photograph by R. M. Anderson (1)



From a painting by C. Warburton Young (2)

From a photograph by Bruce Rose (3)



From a photograph by R. M. Anderson. Courtesy of the Geological Survey (4)

From a photograph. Courtesy of G. Black (5)

1. Arctic Fox
2. Coyotes attacking sheep in Kamloops district of British Columbia
3. Rocky Mountain Goat, female with young
4. Nest of Pacific Eider Duck (*Sumateria v.-nigra*); Dolphin and Union Strait, Arctic Ocean
5. Ptarmigan in the Yukon Territory

of the Entomological Branch, Department of Agriculture, Ottawa, in two areas near Aweme, in southern Manitoba:

Area No. 1 consists of seventy-six acres, comprising chiefly unbroken prairie surrounded by low woods, chiefly aspen poplar, and scrub lands. It also includes farm-buildings and gardens containing ornamental shrubs and trees. The following is the result of the census of birds breeding in this area:

Name of Bird	1914	1915	1916
	Pairs	Pairs	Pairs
Upland plover	1	1	1
Canadian ruffed grouse	1	..	..
Prairie sharp-tailed grouse	1	1	..
Black-billed cuckoo	2	2	1
Downy woodpecker	..	..	1
American crow	..	..	1
Whippoorwill	1	1	..
Nighthawk	1	1	1
Least flycatcher	2	4	3
Kingbird	1	2	1
American goldfinch	..	..	1
Prairie horned lark	10	11	12
Western meadow-lark	2	1	2
Baltimore oriole	1	2	1
Western vesper sparrow	9	14	9
Chipping sparrow	2	4	5
Clay-coloured sparrow	6	10	8
Rose-breasted grosbeak	..	1	1
Barn swallow	..	..	1
Cedar-bird	1	2	2
Red-eyed vireo	1	..	2
Warbling vireo	1	1	1
Orange-crowned warbler	..	..	1
Yellow warbler	..	..	1
Sprague's pipit	1	1	1
Brown thrasher	1	1	1
Catbird	5	4	5
Western house-wren	5	6	9
Long-tailed chickadee	1	..	..
American robin	2	2	1
Bluebird	..	..	1
Total number of breeding pairs	58	72	74
Total number species of birds	23	21	27

Area No. 2 consists of twenty-six acres, comprising chiefly woodland. The trees are aspen and balsam, poplar, and, in parts, a dense growth of willow. The land is low-lying, but the only water available is in shallow wells and a horse-trough.

Name of Bird	1914	1915	1916
	Pairs	Pairs	Pairs
American ruffed grouse	11	13	7
Mourning dove	2	1	1
Black-billed cuckoo	2	4	2
Downy woodpecker	1	1	1
Yellow-bellied sapsucker	..	1	3
Northern flicker	4	3	2
Whippoorwill	1	2	2
Least flycatcher	3	6	11
Western wood pewee	1	..	..
Wood pewee	..	1	1
Kingbird	..	1	..
Bluejay	2	1	1
American crow	1	..	1
American goldfinch	1	1	1
Pine siskin	..	2	1
Baltimore oriole	..	2	1
Western vesper-sparrow	1	..	1
Chipping sparrow	..	2	..
Clay-coloured sparrow	3	4	3
Rose-breasted grosbeak	1	1	1
Cedar-bird	..	1	2
Red-eyed vireo	2	3	2
Warbling vireo	..	1	1
Black-and-white warbler	1	1	2
Orange-crowned warbler	1	..	..
Tennessee warbler	1	..	1
Yellow warbler	1	..	1
Oven-bird	4	3	2
Mourning warbler	1	..	..
Catbird	1	2	1
Brown thrasher	2	1	1
Western house-wren	9	9	8
Long-tailed chickadee	2	2	1
Willow thrush	3	1	2
Olive-backed thrush	2	1	1
American robin	1	1	1
Total number of breeding pairs	65	72	66
Total number species of birds	28	29	31

The bird census conducted by the United States Department of Agriculture for the years 1914 and 1915 showed that on the farms of the northeastern States there was about one pair of birds to the acre, which is much less than it would be if the birds were given proper protection and encouragement. For example, it was found in 1915 that where the birds were protected on a farm of 40 acres near Middletown, Conn., containing 10 acres of ploughed land, 3 acres of woodland, 5 acres of pasture, 12 acres of orchard, and 20 acres of meadow, this farm had a bird population of 165 pairs of native birds, 8 pairs of house-sparrows, and 15 pairs of starlings, making a total of 188 pairs of breeding birds, or more than four times the average.

Mr. W. E. Saunders has given an excellent example of the result of protecting and encouraging birds. The owner of about three-quarters of an acre of land surrounding a summer cottage in the Rideau Lakes, Ontario, decided to encourage the birds. When the experiment was commenced there were five pairs of breeding birds in this area. In five years, by the provision of nesting-boxes and the elimination of cats, the bird population had increased to thirty-three pairs of breeding birds. In seventeen bird-boxes he had fifteen pairs of tree swallows, as well as two pairs of each of five other species, and one pair of each of five others near by.

The conclusion reached from the United States bird census was that the birds are too few on the farms, and that they may be largely increased by protection and a little care in furnishing natural food and shelter. Such bird populations as 70 pairs of native birds of 31 species in 8 acres, at Olney, Ill.; 135 pairs of 24 species on 5 acres, at Wild Acre, Md.; 193 pairs of 62 species on 44 acres, at Indianapolis, Ind.; and 189 pairs of 40 species, on 23 acres at Chevy Chase, Md., a half acre of which showed 20 pairs of 14 different species, all indicate how readily birds will respond to food, shelter, and protection.

METHODS OF PROTECTION AND ENCOURAGEMENT

In view of the economic value of insectivorous birds to the farmer, the fruit-grower, and to the owner of forest and shade-trees, or to the possessor of the smallest city and suburban garden, and as we now know how readily, and indeed rapidly, birds respond to encouragement and protection, the methods of encouraging and protecting these birds will now be considered.

The chief means by which insectivorous birds may be encouraged and protected are the following:

1. Provision of nesting facilities.
2. Destruction of enemies, particularly the control of cats.
3. Provision of fruit-bearing trees and shrubs.
4. Provision of other forms of food, and especially of water.
5. Bird sanctuaries.

1. Provision of Nesting Facilities

Owing to the destruction of natural nesting-places, which, as I have already shown, is unfortunately an accompaniment of agricultural and municipal development, birds are driven far afield and are compelled to leave their former haunts. The total destruction of such natural breeding-places is not always necessary. In clearing land farmers would be well advised to leave, where it is possible, patches of low-growing trees or scrub, such as alders, willows, etc., particularly around small swampy water-holes and ponds, places that are much beloved by birds. Also in civic development and improvement an endeavour should be made to leave in the open spaces, which are essential to civic improvement, remnants of the former shrub and tree growth, until they can be replaced by what may be considered to be more ornamental substitutes. I shall discuss later the establishment of bird sanctuaries in and near cities.

For birds which nest on or near the ground, such as cer-

tain of the native sparrows, piles of brushwood or logs should be left in sheltered places where they need not prove an eyesore, and they could be covered with vines. Piled logs not only serve as nesting-places but as shelters in the inclement weather that often occurs in the spring after the return of the earlier spring migrants.

Nesting-boxes or Bird-houses.—One of the most important methods of providing nesting-places is by the distribution of nesting-boxes or bird-houses. In certain European countries the provision of nesting-boxes for birds constitutes a recognized adjunct of forest protection, and such artificial nesting-sites are distributed by the thousand in forests owned by the state and private individuals. The cutting out of hollow and rotten trees which follows proper forestry management renders such a procedure necessary as a means of replacing the natural nesting-places so destroyed.

The greatest exponent of the practice of bird-protection was, undoubtedly, the late Baron von Berlepsch, and to him we are indebted for the splendid example he has given at Seebach, in Germany. His ideas have been adopted by various states in Germany and in countries where the protection of birds and the provision of nesting-boxes constitute an important and necessary adjunct of forestry methods. An instance, given by Baron von Berlepsch, of the practical value of bird-encouragement, may be quoted. The Hainich wood, south of Eisenach, which covers several square miles, was stripped entirely bare in the spring of 1905 by the caterpillars of the oak leaf-roller (*Tortrix viridiana*). The wood of Baron von Berlepsch, in which there had long been nesting-boxes, of which there are now more than 2,000, was untouched. It actually stood out among the remaining woods like a green oasis. At a distance of a little more than a quarter of a mile farther, the first traces of the plague were apparent, and at the same distance farther on still it was in full force. It was plain proof of the distance the tits and

their companions had gone during the winter and after their breeding-time. Similar observations were made during a plague of the same insect (*Tortrix viridiana*) in the grand duchy of Hesse, where the protection of birds has been carried on in a sensible and energetic fashion for over ten years. Of 9,300 boxes hung up by the government in the state and communal woods of the grand duchy of Hesse, 70 to 80 per cent were occupied in the first year, and in 1907 all were inhabited. On and near Baron von Berlepsch's Seebach estate, 90 per cent of 2,000 nest-boxes in one wood were occupied, and nearly all of 500 and 2,100 in other localities. In Hungary similar measures are taken, largely owing to the admirable work of Otto Hermann, one of the foremost European advocates of bird-protection.

Some years ago, when investigating the depredations of the larch sawfly (*Nematus erichsonii*) in the English Lake District, I was impressed with the value of birds as natural means of control, and, as birds in the worst-infested district, namely, Thirlmere, were not so abundant as they should have been, it was recommended that they should be protected and encouraged by means of nesting-boxes. The corporation of the city of Manchester owns Thirlmere, this lake being their water supply, and they distributed nesting-boxes of the pattern which I devised and which is illustrated herewith (Fig. IV). The advantage of this box was that it could be made out of the slabs or rejected outer portions of the lumber bearing the bark. Three equal lengths of the slab are nailed together to form three sides of a long box, the outside of which, bearing the bark, was round and the inside square. The fourth side is made of a flat piece of wood forming the back of the box; this piece is longer than the other sides, and projects above and below the box, thus providing means of attaching the box to the tree. The top and bottom of the box may be made of slab wood. Several holes should be bored in the bottom, which

is nailed on, to keep the nest dry. The top is hinged to the back-board, and when in use is fastened down by means of a screw, which permits the lid to be opened for the pur-

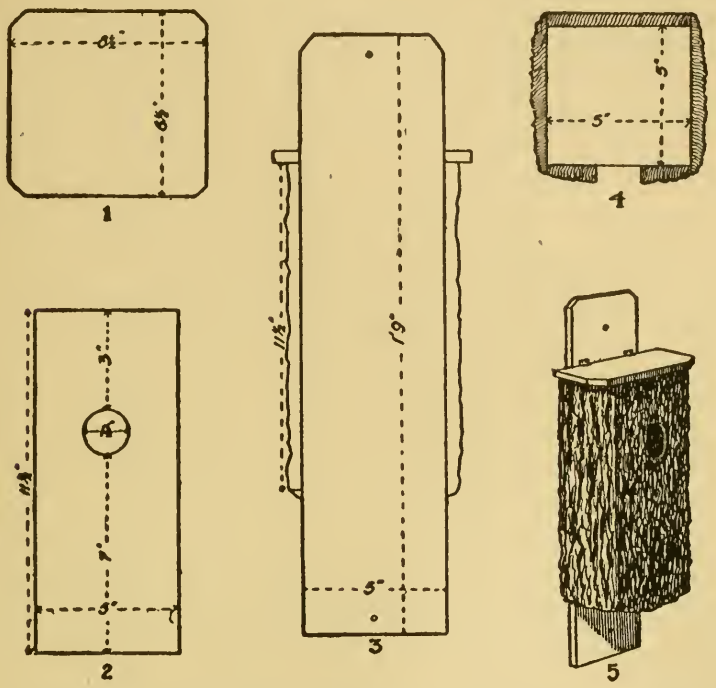


FIG. IV.—CONSTRUCTIONAL DETAILS OF A BIRD-HOUSE DESIGNED BY THE AUTHOR TO BE MADE FROM SLAB WOOD, USUALLY A WASTE PRODUCT FROM SAWMILLS

The size given is suitable for a bluebird, but the dimensions may be changed in accordance with the table on page 180

1. Cover
2. Front of box
3. Back view
4. Section of box
5. Complete house

pose of cleaning out the old nests. By so utilizing waste lumber these boxes were made very cheaply at the sawmill. A boy could readily make similar boxes. Fig. IV (5) shows the box complete. In the first year (1908) 60 boxes were distributed, and 31 per cent were occupied. The number

of boxes was increased yearly until, in 1911, there were 347 boxes, of which 66 per cent were occupied.* I am informed that in 1913, 75 per cent of the boxes were occupied.

The nesting-box that I have described above can be made in different sizes to suit the various classes of birds that it is desired to encourage. The following dimensions are modified from *Farmers' Bulletin No.* 609 of the United States Department of Agriculture:

	Inside Dimensions of Cavity	Depth of Cavity	Entrance Above Floor	Diameter of Entrance	Height of Box Above Ground
	Inches	Inches	Inches	Inches	Feet
Wrens and chickadees	4 x 4	7 to 9	8	1⅛	6 to 12
Bluebird and tree swallow	5 x 5	6 to 8	6	1½	5 to 15
Flicker	7 x 7	16 to 18	16	2½	6 to 20
Downy woodpecker	4 x 4	8 to 10	8	1¼	6 to 20
Screech owl and sparrow hawk	8 x 8	12 to 15	12	3	10 to 30

Nesting-boxes for certain birds that do not nest in cavities may be made with open tops, and placed in sheltered places, such as under the eaves of buildings or verandas. The sizes for such boxes are as follows:

Robin.....Sides 6 inches by 8 inches; depth 4 inches
Phœbe and barn swallow " 6 " " 6 " " 3 "

In the aforementioned *Farmers' Bulletin* designs of different kinds of nesting-boxes are given.

In many parts of the country, houses for purple martins may be seen erected on poles. Such houses are also used by tree swallows. They are generally built on the colony plan, as these birds are gregarious in their habits, and their

* For further particulars and illustrations see my memoir on "The Large Larch Sawfly," *Bull.* 10, *Second Series, Experimental Farms,* Dept. Agriculture, Canada, 1912.

construction and size is a matter upon which taste can be exercised if the following directions are followed:

If possible they should contain not less than ten to twelve rooms. The individual chambers should measure six inches square and high, and they should be completely separated from the adjoining chambers. The entrance holes should measure two and one-half inches in diameter, and the centre of the hole should be slightly above the centre of the outer side of the chamber.

2. The Destruction of Enemies

The greatest enemy to bird life in more thickly populated districts is the domestic cat. After many years' experience I have arrived at the conclusion which all lovers of bird life reach, namely, that no matter how carefully a cat is cared for by its owners, its bird hunting and destroying instinct is not greatly diminished. Naturally, stray cats will destroy a large number of birds, and such garden-loving species as robins and yellow warblers fall an easy prey. The destructive character of the cat has been well described by E. H. Forbush in his book, "Useful Birds and Their Protection," and in other publications. The following evidence is given in his book:

Mr. William Brewster tells of an acquaintance in Maine who said that his cat killed about fifty birds a year. Mr. A. C. Dike wrote of a cat owned by a family and well cared for. They watched it through one season and found that it killed fifty-eight birds, including the young in five nests.

Nearly a hundred correspondents scattered through all the counties of the state (Massachusetts) report that the cat is one of the greatest enemies of birds. The reports that have come in of the torturing and killing of birds by cats are absolutely sickening. The number of birds killed by them in this state is appalling.

Some cat lovers believe that each cat kills on the average not more than ten birds a year; but I have learned of two instances where more than that number were killed in a single day, and another where seven

were killed. If we assume, however, that the average cat on the farm kills but ten birds per year and that there is one cat to every farm in Massachusetts, we have in round numbers, seventy thousand cats killing seven hundred thousand birds annually.

The average taken by Forbush, of ten birds to each cat, is a low one, as every observer will agree, and his figures for a single State, however striking they may appear, are only too near the truth. If we are to preserve our birds we must take steps to destroy all stray cats, and to reduce the number of cats to a minimum. Birds form a natural part of our wild life, cats do not; they form a destructive factor that has been introduced into the natural order of things by man, and in a state of nature an abundance of cats and birds is an impossibility.

In city parks and other places in which it is desired to encourage and protect birds, it is necessary that care should be exercised to prevent the undue multiplication of red squirrels, which frequently prove to be serious destroyers of bird life. Further, they often appropriate nesting-boxes and turn them into storage places for their food supplies.

In the neighbourhood of dwellings the house-sparrow is generally an enemy to our native birds. In many places these sparrows have driven away the useful insectivorous birds, particularly those of the swallow tribe. While they feed, to some extent, upon insects during the season when they are raising their broods of young, and on the seeds of weeds when other food is not available, they are, on the whole, very undesirable, and every effort should be made to destroy them. They are seriously destructive to young plants, especially garden vegetables such as peas; in country districts they destroy and spoil large quantities of grain, and their habits are such as to earn for them the title of "avian rats." The best methods of destruction are shooting, the taking of their nests and eggs, and the use of poisoned grain.

Although, as I have already pointed out, the majority of hawks are useful birds, several species are destructive to bird life and should be dealt with accordingly. Among the destructive species are the following: Cooper's hawk, the sharp-shinned hawk, the pigeon hawk, and the duck hawk. Fortunately these species are not very abundant.

3. Provision of Fruit-bearing Trees and Shrubs

The vegetable food of many of our insectivorous birds under natural conditions consists largely of wild fruits and berries. Such birds as robins and bluebirds eat a greater proportion of animal food during the spring and summer, but as insects become less abundant and wild fruits ripen in the fall, vegetable food appears to predominate. When man changes the natural environment by planting cultivated fruits, such as cherries, currants, raspberries, and strawberries, birds such as robins are apt to prefer the larger and more succulent cultivated varieties to the wild ones. When this happens the owner of the fruit is apt to forget the benefits that the birds have conferred upon him earlier in the year by destroying the insect enemies of his crops, and is apt to deal with them accordingly. There are, however, alternative methods of preventing such damage. I have already pointed out that it is cheaper to protect cultivated fruit trees against the attacks of useful birds such as robins, than to permit insects to increase uncontrolled by birds. Another method of reducing the damage done by birds to cultivated fruits is to provide them with wild fruits as a small return for their services in destroying injurious insects.

The planting of fruit-bearing trees and shrubs in gardens and parks and bird sanctuaries is a very effectual method of attracting birds to a place. Lovers of birds and gardens, when planting gardens and parks, should, therefore, give preference to those species of trees and shrubs that bear

fruits or seeds that birds prefer. It is not a difficult matter, and the results will astonish the owner, for he will have birds in his garden at a time when animal food is scarce, and when his less provident neighbour will be complaining of the scarcity of bird life. It is especially desirable that those persons, such as commissioners of parks, who are entrusted with the planting of city parks, should endeavour to plant as many shrubs and trees that bear attractive fruits as possible.

Lists of fruit-bearing shrubs and trees which are known to be attractive to birds have been compiled and published* by W. L. McAtee, of the Biological Survey of the United States Department of Agriculture.

With the assistance of Mr. W. T. Macoun, Dominion horticulturist, the accompanying list of attractive trees, shrubs, and some herbaceous plants suited to Canadian conditions, has been prepared. In presenting this list Mr. Macoun states: "Various considerations have influenced choice, as ornamental value, earliness, lateness or length of fruiting season, and especial availability of plants through ordinary channels of trade."

LIST OF TREES AND SHRUBS BEARING FRUITS ATTRACTIVE TO BIRDS

Species Suitable to Eastern Canada

Juniper	*Juniperus communis.*
Red cedar	*Juniperus virginiana.*
Bayberry	*Myrica carolinensis.*
Hackberry	*Celtis occidentalis.*
White mulberry	*Morus alba.*
Pokeweed	*Phytolacca decandra.*
Barberry	*Berberis vulgaris.*

* "How to Attract Birds in Northeastern United States," by W. L. McAtee, *Farmers' Bulletin No.* 621, U. S. Dept. Agric. 1915.

"How to Attract Birds in Northwestern United States," by W. L. McAtee, *Farmers' Bulletin No.* 760, U. S. Dept. Agric. 1916.

Spice bush.....*Benzoin æstivale.*
Wild gooseberry.....*Ribes Cynosbati.*
Red currant.....*Ribes vulgare.*
Asiatic currant.....*Ribes fasciculatum.*
Flowering crab-apple.....*Pyrus floribunda.*
Choke cherry.....*Pyrus melanocarpa.*
Mountain ash.....*Pyrus americana.*
Juneberry.....*Amelanchier canadensis.*
Asiatic service-tree.....*Amelanchier asiatica.*
Cockspur thorn.....*Cratægus Crus-galli.*
Wild strawberry.....*Fragaria americana.*
Wild blackberry.....*Rubus allegheniensis.*
Dwarf raspberry.....*Rubus triflorus.*
Wild blackberry.....*Rubus canadensis.*
Pasture rose.....*Rosa humilis.*
Wild black cherry.....*Prunus serotina.*
Beach plum.....*Prunus maritima.*
Sand cherry.....*Prunus pumila.*
Crowberry.....*Empetrum nigrum.*
Fragrant sumac.....*Rhus canadensis.*
Mountain holly.....*Nemophanthus mucronata.*
Bittersweet.....*Celastrus scandens.*
Buckthorn.....*Rhamnus cathartica.*
Virginia creeper.....*Psedera quinquefolia.*
Summer grape.....*Vitis æstivalis.*
Frost grape.....*Vitis vulpina.*
Leatherwood.....*Dirca palustris.*
Wild pepper.....*Daphne Mezereum.*
Oleaster.....*Elæagnus angustifolia.*
Buffalo berry.....*Shepherdia canadensis.*
Wild sarsaparilla.....*Aralia nudicaulis.*
Asiatic sarsaparilla.....*Acanthopanax sessiliflorum.*
Bunchberry.....*Cornus canadensis.*
Flowering dogwood.....*Cornus florida.*
Red osier.....*Cornus stolonifera.*
Alternate-leaved dogwood.....*Cornus alternifolia.*
Wintergreen.....*Gaultheria procumbens.*
Bearberry.....*Arctostaphylos Uva-ursi.*
Creeping snowberry.....*Chiogenes hispidula.*
Black huckleberry.....*Gaylussacia baccata.*
Early sweet blueberry.....*Vaccinium pennsylvanicum.*

Swamp blueberry.....*Vaccinium corymbosum.*
Cranberry.....*Vaccinium macrocarpum.*
Partridgeberry.....*Mitchella repens.*
Fly honeysuckle.....*Lonicera cærulea.*
Tartarian honeysuckle.....*Lonicera tatarica.*
Snowberry.....*Symphoricarpos racemosus.*
Coralberry.....*Symphoricarpos vulgaris.*
High-bush cranberry.....*Viburnum Opulus.*
Arrowwood.....*Viburnum acerifolium.*
Sheepberry.....*Viburnum Lentago.*
Common elder.....*Sambucus canadensis.*
Red-berried elder.....*Sambucus racemosa.*

Species Only Suitable to Southwestern Ontario

In addition to the species suitable to eastern Canada, the following species may be grown in southwestern Ontario:

Green briar.....*Smilax rotundifolia.*
Red mulberry.....*Morus rubra.*
Sassafras.....*Sassafras variifolium.*
Washington thorn.....*Cratægus phænopyrum.*
English thorn.....*Cratægus Oxyacantha.*
Smooth sumac.....*Rhus glabra.*
Holly.....*Ilex opaca.*
Inkberry or black alder.....*Ilex verticillata.*
Japanese creeper.....*Ampelopsis tricuspidata.*
Sour gum.....*Nyssa sylvatica.*
Persimmon.....*Diospyros virginiana.*
Privet.....*Ligustrum vulgare.*
Purple berry.....*Callicarpa purpurea.*

Species Suitable to the Prairie Provinces

Juneberry or saskatoon berry.....*Amelanchier spicata.*
False indigo.....*Amorpha fruticosa.*
Japanese barberry.....*Berberis Thunbergii.*
Siberian pea-tree.....*Caragana arboresceus.*
Hackberry.....*Celtis occidentalis.*
Western clematis.....*Clematis ligusticifolia.*
Erect clematis.....*Clematis recta.*
Cotoneasters (several species).....*Cotoneaster* spp.
Hawthorn (several species).....*Cratægus* spp.

Wolf willow or silver berry.....*Elæagnus argentea.*
Honeysuckle bush (several species).....*Lonicera.*
Ninebark.....*Physocarpus opulifolius.*
Pin cherry.....*Prunus pennsylvanica.*
Sand cherry.....*Prunus pumila.*
Western wild cherry.....*Prunus demissa.*
Siberian crab.....*Pyrus baccata.*
Mountain ash.....*Pyrus americana.*
Buckthorn.....*Rhamnus cathartica.*
Mountain currant.....*Ribes alpinum.*
Wild black currant.....*Ribes floridum.*
Missouri currant.....*Ribes aureum.*
Wild rose.....*Rosa blanda.*
Wild raspberry (several species).....*Rubus* spp.
Elders (several species).....*Sambucus* spp.
Buffalo berry.....*Shepherdia argentea.*
Snowberry.....*Symphoricarpos racemosus.*
Nannyberry.....*Viburnum Lentago.*
High-bush cranberry.....*Viburnum Opulus.*
Wild grape.....*Vitis vulpina.*

Species Suitable to Southern British Columbia

Irish yew.....*Taxus hibernica.*
Western juniper.....*Juniperus occidentalis.*
Rocky Mountain juniper.....*Juniperus scopulorum.*
Russian mulberry.....*Morus alba* var. *tatarica.*
Nandina.....*Nandina domestica.*
Barberry.....*Berberis vulgaris.*
Oregon grape.....*Berberis nervosa.*
Currant*.....*Ribes divaricatum.*
Currant†.....*Ribes irriguum.*
Currant*.....*Ribes sanguineum.*
Currant†.....*Ribes aureum.*
Salmon-berry*.....*Rubus spectabilis.*
Purple raspberry.....*Rubus leucodermis.*
Evergreen blackberry.....*Rubus laciniatus.*
Sweetbriar.....*Rosa rubiginosa.*
Rose.....*Rosa gymnocarpa.*
Rose.....*Rosa nutkana.*

* West of Cascade Mountains only.
† East of Cascade Mountains only.

Rose	*Rosa pisocarpa.*
Strawberry*	*Fragaria chiloensis.*
Strawberry†	*Fragaria platypetala.*
Service berry	*Amelanchier florida.*
Thornapple	*Cratægus Douglasii.*
Firethorn	*Pyracantha coccinea.*
Firethorn	*Cotoneaster Simonsii.*
Crab apple*	*Pyrus diversifolia.*
Mountain ash	*Pyrus sitchensis.*
Wild cherry	*Prunus emarginata.*
Choke cherry	*Prunus demissa.*
Sumac*	*Rhus glabra.*
Holly	*Ilex Aquifolium.*
Burning-bush*	*Evonymus occidentalis.*
Cascara	*Rhamnus Purshiana.*
Virginia creeper	*Psedera quinquefolia.*
Japanese ivy	*Ampelopsis tricuspidata.*
Buffalo berry	*Shepherdia canadensis.*
Devil's-club*	*Fatsia horrida.*
Red osier	*Cornus stolonifera.*
Dogwood*	*Cornus occidentalis.*
Dogwood*	*Cornus Nuttallii.*
Bunchberry	*Cornus canadensis.*
Arbutus*	*Arbutus Menziesii.*
Manzanita*	*Arctostaphylos tomentosa.*
Manzanita*	*Arctostaphylos Manzanita.*
Kinnikinnick	*Arctostaphylos Uva-ursi.*
Salal*	*Gaultheria Shallon.*
Blueberry*	*Vaccinium ovatum.*
Blueberry	*Vaccinium cæspitosum.*
Red huckleberry	*Vaccinium parvifolium.*
Cranberry	*Oxycoccus intermedius.*
Snowberry	*Symphoricarpos racemosus.*
Honeysuckle	*Lonicera involucrata.*
Honeysuckle	*Lonicera utahensis.*
Elderberry*	*Sambucus glauca.*
Elderberry	*Sambucus callicarpa.*
Pimbina	*Viburnum pauciflorum.*
Black haw*	*Viburnum ellipticum.*

* West of Cascade Mountains only.
† East of Cascade Mountains only.

4. The Provision of Other Forms of Food and of Water

In some parts of Canada, such as Nova Scotia, the southern portions of Ontario and British Columbia, certain species of birds remain throughout the entire winter. In such regions it is especially desirable that steps should be taken and provision made for feeding the birds during the winter months, particularly during inclement weather, when they would experience difficulties in obtaining their natural food. Winter feeding is an important part of bird protection and encouragement in such regions, and there are many ways of providing such food.

The winter food usually comprises animal food, such as suet and other forms of fat, meaty bones and cooked meat, and meal worms. Fat- or oil-containing seeds such as sunflower-seeds and nuts, and various grains and seeds such as buckwheat, pumpkin and squash seeds, bird-seed, hempseed, wheat, millet, cracked corn or oats may be used. Cracked dog-biscuits, crackers, crumbs and bread and chopped apple are all useful.

These winter foods are usually placed in some form of feeding-device. The feeding-shelter may be small or large, but it should be so constructed as to enable birds to reach the food easily and to feed comfortably during stormy weather; at the same time they should be protected against such enemies as cats. Food-trays partially enclosed by glass sides may be attached to windows, or stand near a window. One of the most useful types of feeding-shelters is the Hessian food-shelter, which contains two trays—a lower unprotected tray and a tray placed under the roof and sheltered by glass sides. Such feeding-devices are easily made, or they can be purchased from dealers in such supplies. A simple feeding-device can be made by suspending a cocoanut which has a hole cut in one end; this is very attractive to such birds as tits.

The provision of water is very important. During the hot days of summer, birds require water for drinking and bathing purposes, and a bird fountain or bath in a garden will always insure the presence of numerous birds. No garden should be considered complete without a supply of water for the birds. This may take the form of a small fountain, a natural or artificial water-hole, or a pebble-lined tin or concrete bath. Very artistic concrete or artificial-stone bird-baths on pedestals are now made and sold by dealers, and such baths can be made by any one with a little ingenuity.

5. Bird Sanctuaries

A bird sanctuary is an area of land, or of land and water, in which birds are rigorously protected and permitted to live undisturbed. Such a sanctuary may be a tract of woodland or prairie, a marsh, the banks of a river, a sea-girt island or cliffs. A bird sanctuary may be created in or near a town or city with as great advantage to bird protection as a sanctuary in a more remote region. Moreover, there can be no greater expression of the bird-loving tendencies of a community than such an area in which birds are protected.

I would strongly recommend local organizations and public bodies to adopt and carry out the following scheme as a first step: The absolute protection of birds in public parks and cemeteries in cities, towns, and villages should be secured by the co-operation of the local civic authorities, and such areas should be publicly declared to be bird sanctuaries. At the same time, bird-house competitions should be organized, and a proportion of the bird-houses so made by the school-children should be distributed in the civic bird sanctuaries, and thus the children would have that personal interest in the work which tends to secure success. Further, the assistance of the local horticultural societies should be

WILD DUCKS ON UNITED STATES GOVERNMENT RESERVE

PORTION OF EXHIBITION OF BIRD-HOUSES MADE BY THE BOYS IN ONE OF THE OTTAWA PUBLIC SCHOOLS IN A COMPETITION ORGANIZED BY THE OTTAWA HUMANE SOCIETY IN 1917

enlisted, and they should be asked to help the civic or other authorities in the work of planting suitable fruit-bearing and other shrubs and trees attractive to birds in the local sanctuaries; or these associations could make themselves entirely responsible for such work. Prominent citizens should then be encouraged to present bird fountains and baths, to be placed in the bird sanctuaries. Each year, preferably in the spring, a local "bird day" might be instituted. On that day the schools would devote special attention to the subject of birds and bird protection, and means could be taken to enlist the interest of the general public. By these and other means that might be devised, every section of the community could be called upon to take a personal interest in the protection and encouragement of the birds in the district, and the work would express the community spirit. I cannot conceive of any practical measure that would have a greater effect in stimulating public interest in this subject, and the value of such work throughout Canada as a whole would be inestimable. Where interest is kindled in the minds of young and old on the subject of birds it increases with time, and few subjects have a wider appeal, or elicit to a greater extent that sympathy with and admiration for our wild life.

In the city of Ottawa bird sanctuaries have been established through the efforts of the Ottawa Field-Naturalists' Club and the Ottawa Humane Society. The Ottawa Improvement Commission consented to make the beautiful natural tract of land, Rockcliffe Park, a bird sanctuary, and made and distributed nesting-boxes throughout the park. The Dominion Department of Agriculture distributed nesting-boxes throughout the grounds of the Central Experimental Farm and the Botanical Garden, all of which constitute a most admirable refuge for many species of birds which are not usually seen within the limits of a city. Through the personal interest of H. R. H. the Duke of

Connaught nesting-boxes have been distributed through the grounds of Government House, and the owners of large gardens have taken similar steps. Other Canadian cities should follow the example of Ottawa in this respect. On the author's recommendation the Board of Park Commissioners of Vancouver, B. C., have decided to establish a bird sanctuary in Stanley Park, which is admirably suited to such a purpose. Few cities in Canada are without areas that would serve as excellent bird sanctuaries.

Passing from what might be termed civic bird sanctuaries to larger areas of rural territory, we find that both the Dominion and provincial governments have taken steps to set aside suitable areas as bird sanctuaries for the protection of wild fowl and other forms of bird life, and these sanctuaries or refuges are considered in another chapter.

Bird sanctuaries constitute the surest means of protecting our insectivorous and other birds by preventing their destruction and ultimate extermination.

CHAPTER VIII

THE ENEMIES OF WILD LIFE AND THE CONTROL OF PREDATORY ANIMALS

Any rational system of wild-life protection must take into account the control of the predatory species of mammals and birds. And while the complete extermination of such predatory species is not possible, desirable, or necessary, a degree of control must be exercised to prevent such an increase in numbers as would affect the abundance of the non-predatory species. In the treatment of predatory animals it is necessary to determine whether the species concerned are responsible for more harm than good in a particular region.

The creation on any extensive scale of wild life reserves will inevitably result in an increase within, and the attraction to such reserves of predatory mammals such as wolves and coyotes, and of birds such as eagles, great horned owls, and such noxious hawks as the goshawk, Cooper's, and sharp-shinned hawks, owing to the fact that these reserves will not only contain a larger number of the animals and their young which predatory animals destroy, but as the reserves afford sanctuary to such animals they will tend to contain a much greater abundance of wild life than neighbouring territory. Following the general rule in nature that predatory species collect where the species on which they subsist occur in unusual abundance, an increase in game and other animals will bring about an increase in their enemies, especially when the latter are harassed elsewhere.

Wolves.—The large gray or timber wolves, varying in colour from white to black, which range from Quebec to

British Columbia and northward to the Yukon and the Arctic coast, are the most serious natural enemies of all members of the deer tribe, not to mention their destruction of domestic stock. In the more northerly forested regions of Quebec and Ontario they have been reported as being very destructive to deer, and their attacks on moose and caribou have had a marked effect on the abundance of these animals in certain regions. In northern British Columbia and the Yukon they have also been reported to be so abundant as to destroy mountain sheep in considerable numbers.

Coyote.—The coyote or prairie wolf is to be found throughout the western provinces, from Manitoba to British Columbia, and northward to the Northwest Territories and the Yukon. Unlike the gray or timber wolf, which has retreated to a great extent from the open prairies, although it ranges the Barren Grounds of the north and now is to be found chiefly in the wooded sections of the country, the coyote prefers the open plains, but it may be found also in wooded regions throughout its range. Coyotes are more gregarious in habit than wolves, and co-operate in hunting. There is no doubt that they destroy not only young deer, mountain sheep, and antelope, but also large numbers of game-birds, such as geese, ducks, etc. The agricultural development of the country does not tend to a diminution in their numbers, as in the case of wolves, but appears rather to encourage an increase, with the result that they become a serious menace to farmers through their attacks on sheep and poultry; the aspect of their economic importance will be considered presently. In spite of their destruction of game animals and birds, and of live stock, they also prey on rodents that are injurious to agricultural interests, such as rabbits, gophers, and mice. Where coyotes decrease in number by natural causes or hunting, the numbers of gophers usually increase. This fact is important, and means that an active campaign against gophers must accompany

any campaign against coyotes. Such injurious insects as grasshoppers, crickets, June-bugs (white grubs), etc., are also eaten by coyotes. Nevertheless it would appear that the damage they inflict far outweighs the benefits they accomplish. Peculiarly enough they are also fond of fruit and consume wild fruits and berries.

Cougar.—The cougar or puma, also known as the mountain lion or panther, is the largest of the cat tribe in North America. In Canada it is to be found in the Rocky Mountains and westward to Vancouver Island, on which it appears to be most common. Large specimens may measure 7 to 8 feet in length, and weigh over 200 pounds. They prey upon every kind of game, but are specially destructive to mountain sheep, goat, and deer, and a large male cougar will kill a horse, cow, moose, or wapiti. Deer form their chief prey. When cougars occur in numbers the deer and mountain sheep invariably decrease in numbers; for example, I am informed that the decrease in deer and sheep in the Lillooet region of British Columbia, which formerly abounded in such game, has been largely due to the depredations of cougars, which are increasing in that region, although a steady decrease in cougars in British Columbia as a whole is reported.

The Wolf and Coyote Problem as Affecting Live-Stock Interests

From an economic point of view the destruction of live stock, especially sheep, by wolves, and particularly by coyotes, constitutes a more serious problem than the destruction of wild life, and it is fitting that in such a presentation as I am making of the economic aspect of our native predatory animals we should consider the relation of these animals to our agricultural interests.

British Columbia.—As a result of an extensive investigation that I have made into the losses inflicted by these

animals in the live-stock interests, it would appear that the problem is most serious in British Columbia, which contains very extensive areas admirably suited to sheep-raising, particularly in the central Dry Belt region. For much of the information I am about to give concerning conditions in British Columbia, I am indebted to Mr. C. E. Lawrence, Secretary-Treasurer of the Interior of British Columbia Wool Growers Association, who writes:

> The matter is an increasingly serious one, and all our efforts to increase production of wool and mutton seem to be frustrated by this abominable pest. For ranchers to lose one-third of their lambs is not uncommon—quite a number in this district (Kamloops) have sold their breeding ewes to the butcher to save them from the coyotes.

Mr. Thomas P. Mackenzie, provincial grazing commissioner for British Columbia, states that records show the presence in British Columbia of not more than 50,000 sheep, and that with properly organized range and a scientific rotation system of grazing he sees no reason why British Columbia should not graze at least 2,000,000 sheep.

The following reports indicate the serious nature of the losses due to coyotes in the Dry Belt region of British Columbia:

F. F. Wilkinson, Monte Creek: "My losses were so severe that I have sold my sheep to save what were left from going the way of the others."

Lawrence Bros., Heffley Creek: "After doing our best to combat the total loss of our choice breeding flock of Oxford Downs, we have come to the conclusion that we can only save what we have left by sending them to the butcher. After exercising every precaution this is the third year that we have lost 33% of the lambs, and the audacity of the coyotes this year promises to rob us of all the ewes as well as the lambs. We have put into practice all the information and instructions we could obtain as to poisoning the brutes—but no fear, they will not pick up bait nor return to a half consumed carcass while they can get a nice fresh, live lamb. The anxiety, loss of time and vexation is too much and we have, most reluctantly, decided to go out of sheep."

F. Cornwall, Cherry Creek: "I shall not know the extent of our loss until we make count in the fall, but we have a large number of ewes with full udders and no lambs. At the Sugar Loaf, our sheep range, it is impossible to keep the sheep there this year. Every day they are scattered to the lower ground by coyotes, beyond the power of the herder to prevent it, good man as he is. One of my neighbours raised a lot of poultry —including many turkeys—the coyotes have made sad havoc with them in spite of every effort to circumvent them, and the result will be a very heavy financial loss."

D. W. Strachan, Superintendent Alexandria Ranch (King Edward Sanatorium), Tranquille: "I cannot tell you our exact losses, but they are heavy, in spite of having an extra boy to look after the bunch. The sheep are pure bred Cotswolds and the loss of over 30% of lambs each year is a serious one for the ranch and also for the community in face of the shortage in both mutton and wool. Let me say, speaking as President of the Wool Growers Association, that this subject is ever before us at our meetings, for we are all sufferers, and the inevitable conclusion is that, until some drastic steps are taken to attack the pests in their breeding places, and this must be vigorously followed up, there will be no further development of sheep husbandry, and consequently no addition to the mutton supply, or the production of wool."

Mrs. Hoffman, Shuswap: "We dare not let our sheep outside the fence, and during the early part of last year my son shot 15 coyotes which came inside the pasture after the lambs."

W. W. Shaw, Heffley Creek: "Purchased 125 sheep last year. Up to midsummer of this year, had lost by coyotes 30 ewes and 60 lambs."

Mr. H. F. Mytton, B. C. Fruitlands Co.: "A thorough sportsman who spends all his spare time in hunting coyotes and encouraging others to do so, had only last week a chicken chased to and killed on his door step —this was defiance with a vengeance."

Coyotes are no Respecters of Persons

The Superintendent of the Provincial Government Experimental Farm, Cariboo Road, says: "Coyotes are very bad and we have lost at least 25% of the lambs, and it looks like selling off the bunch or letting the coyotes finish them."

C. G. Cowan, a neighbouring cattle rancher, with a flock of sheep, says: "The coyotes having punished the Provincial Government flock have turned their attention to ours. Although we did not keep sheep as a commercial proposition they were profitable and afforded us fresh meat

when it would not be desirable to kill a steer for the ranch hands. But the coyotes have got the whip hand of us and our bunch will all be sold in a few days."

An Expert Opinion

Mr. A. Bryan Williams, for many years Provincial Game Warden, in a letter to the Wool Growers Association last March (1918), *states:* "It appears to me that the coyote question is one in which your Association and my Department are equally interested, and if I had been retaining my present position I should have been extremely pleased to have worked in conjunction with you. There is one thing, however, to which I might call your attention, which I believe is of particular interest to your Association, and that is that the sheep-killing coyote is very seldom killed. The great majority of coyotes killed are not sheep-killers, the latter is very wary, and it takes a really first class professional to catch him, and I believe it would pay to have such a man employed by the Department of Agriculture, to go from place to place, wherever his services were required, and trap these coyotes. I believe that more good has been done in the United States by these professionals than any other way. I imagine, however, there would be extreme difficulty in getting such a man, at any rate at the present time, but the idea is well worth considering."

In British Columbia a vigorous campaign against these animals has been carried on for a number of years. During recent years bounties have been paid on the following numbers:

	1914	1915	1916
Wolves	382	299	210
Cougars	280	235	221
Coyotes	4,138	7,482	17,352

The greatest number of cougars was killed in Vancouver Island. In spite of this destruction the number of these predatory animals has undoubtedly increased, and the coyote nuisance, in particular, has become more serious in the sheep-raising sections. In his annual report for 1916 the provincial game warden of British Columbia states: "The coyote nuisance has become a very serious one, as

not only have they practically cleaned up all the stock of grouse, killed fawns and the deer themselves by the hundreds, but they have made the keeping of sheep in some parts of the interior almost an impossibility at the present time, and the number of domestic fowl they have killed would total a good many thousand dollars. The whole of the Dry Belt simply swarms with these pests. . . ." Over $50,000 was paid by the provincial government in bounties on these pests, and in spite of this expenditure the evil was not abated.

This demonstrates most conclusively that as a means of destroying predatory animals the bounty system is a failure.

Alberta.—In response to my inquiries, Mr. B. Lawton, chief game guardian and wolf bounty inspector for the Province of Alberta, has furnished the following information with regard to the payment of bounties by the provincial government for the destruction of wolves and coyotes, and the extent of the damage caused by these predatory animals:

1. Since the formation of the Province in 1905, bounty has been continually paid for the destruction of grey or timber wolves. In the years 1907, 1908, 1909 and 1917 bounty was paid on prairie wolves, or coyotes.

2. The amount of bounty paid each year is as follows:

1906	$1,860.00	1912	$2,141.30
1907	2,940.00	1913	2,984.75
1908	26,701.32	1914	4,208.30
1909	25,231.28	1915	4,188.70
1910	3,005.30	1916	409.48
1911	2,763.90	1917	1,160.15

3. Grey or timber wolves are very destructive to game in the mountains and in the northern part of the province. In the ranching districts in the southern part of the province a limited amount of damage is caused by timber wolves. Quantities of poultry and some calves, colts, sheep and lambs are destroyed by the prairie wolves; they are also very destructive to game and other birds. They appear to be much more plentiful at times; this is more noticeable when there is a scarcity of rabbits. At such times they are compelled to come into the settlements to obtain a

livelihood, the result being that some animals and poultry suffer to a greater extent than at other times. I do not think that timber wolves are as destructive as they were some years ago, owing to being fewer in number, neither do I think that there are as many coyotes as formerly. The statistics as to losses are not available.

4. Stockmen's associations have been offering a bounty independent of the bounty offered by the Government; this applies more particularly to a bounty on timber wolves.

The following letters which I have received indicate the loss and expense caused by the depredations of coyotes in Alberta:

Mr. W. E. Ross, Clive, Alta., writes: "I lost 8 calves out of 55 and had to build a fence around two acres to take in the houses with a chicken-proof fence to raise chickens."

Mr. Alex. Lewis, Bon Accord, Alta., writes: "I have lived in Edmonton for over 20 years. The past three years I was troubled with coyotes. I had to keep one of the children with them [the sheep] when they were on the range. I did not lose more than one or two by coyotes. The last two years (1916–17) the coyotes have again started to devour them. Last summer (1917) I lost at least $150.00 worth of lambs by coyotes. And every year since I lived on my homestead we have lost poultry, sometimes an old turkey and her whole flock of young; we have lost as many as 50 hens and chickens in a season. I have just completed my sheep pasture by fencing with a 14-line wire. I had to act as shepherd last summer and stay with the sheep whenever they were in the pasture. I have lived 17 years on my homestead and I am certain that my loss in that time would exceed $500.00, besides the expense of fencing and watching."

Saskatchewan.—On account of the menace to the live-stock interests of the province, the provincial government has endeavoured by means of the bounty system to encourage the destruction of wolves and coyotes. In response to my inquiries Mr. F. H. Auld, deputy minister of agriculture for Saskatchewan, has furnished me with the following information on the control of coyotes and wolves in Saskatchewan:

Your letter of the 20th ultimo, having reference to the control of wolves and coyotes, is hereby acknowledged.

In reply I have to say that during the six years prior to the establishment of this province in 1905 the sum of $14,000 was expended in bounty on timber wolves in the southern portion of what was then the Northwest Territories. During this period 616 adults and 1,633 pups were killed.

In 1906 the appropriation set aside for the destruction of wolves was not made use of by the Provincial Range Stock Growers Association for whose benefit it was appropriated, and therefore it was decided to institute a competition and substantial prizes were offered for the greatest number of wolves killed by individuals, and also for the greatest number of skins shipped, so that a local market for wolf pelts might be established. Eleven prizes ranging from $20 to $150 were awarded, and the results obtained were considered to be very satisfactory.

The Wolf Bounty Act was passed in 1907. Under its provisions it was optional with municipalities as to whether or not they established Wolf Bounty districts. The bounty was fixed at $10 for timber wolves and $1 for coyotes, half of which was refunded by the Government upon surrender of the wolf bounty certificate. This policy was changed in 1913 when The Wolf Bounty Act was amended making it compulsory for all municipalities to pay bounty. Provision was also made that municipalities may increase the amount of bounty if they so desire, but the refund paid by the Government remained the same—fifty per cent of the stipulated bounty of $10 for timber wolves and $1 for coyotes and pups. The results of this policy are tabulated below:

Statement of grey wolves and coyotes killed in Saskatchewan from 1907 to 1917.

Year	Coyotes	Grey Wolves	Total Bounty Paid by Municipalities	Amount Refunded by Government
1907.....	2,647	2	$2,704.00	$1,323.00
1908.....	15,072	114	15,951.00	7,932.50
1909.....	11,080	230	13,380.00	6,690.00
1910.....	8,966	221	11,176.00	5,588.00
1911.....	10,230	270	12,930.00	6,465.00
1912.....	7,626	206	9,686.00	4,843.00
1913.....	11,400	38	11,776.00	5,888.00
1914.....	16,906	30	17,202.00	8,601.00
1915.....	34,662	...	34,973.00	17,486.50
1916.....	44,835	40	57,263.00	22,617.50
1917.....	41,000	49	45,000.00	20,750.00
	204,424	1,200	$232,041.00	$108,184.50

We have no statistics regarding the actual losses due to the depredations of wolves and coyotes, but it is generally stated that they are very destructive to sheep and poultry, and sportsmen claim them to be one of the worst enemies of big game and ground-nesting game birds and eggs. On the other hand, they destroy gophers and field mice which are very injurious pests of the farm, and the value of wolf pelts is quite a consideration at this writing, an average price of $10 being paid for No. 1 skins, and extra good pelts have sold as high as $18.

Present methods of control can certainly be improved upon provided the co-operation of the citizens can be enlisted. I doubt very much whether the bounty system is instrumental in the killing of more than twenty per cent of the wolves for which bounty is paid. In my opinion most of the wolves are killed incidentally by farmers in the course of their daily duties, others make a practice of hunting wolves in the winter for sport, or for the value of the fur. I believe that the money appropriated annually for the payment of wolf bounties would be productive of better results were it expended in paying experienced hunters and trappers to systematically attack this problem. Under their guidance attempts might be made to comb out the wolves methodically in certain districts, the areas being extended in successive units year by year. Although this plan would not exterminate the wolves I think better results would accrue than have been secured in the past. The pelts thus taken would be the property of the Government and sold to help defray expenses.

It is often argued that if the Government would increase the bounty it would be an added incentive to kill the wolves. In my opinion the present high prices paid for wolf pelts is a sufficient inducement to hunt wolves when the fur is prime. It might be advantageous to discontinue the payment of bounties under the present plan, and try paying a bounty of say $10 on all females killed during the first four months of each year.

The principle of co-operation adopted to any plan of campaign is undoubtedly beneficial to the project in hand, and far better results may be expected than would be secured in the case of individual haphazard methods of control. On this ground alone your proposal seems worthy of the united support of all concerned, and in my opinion some such action as you suggest would go a long way toward the solution of this difficult problem.

The foregoing statement shows that in spite of the expenditures made in an earnest effort to control these predatory animals the bounty system has not succeeded, as the live-stock men admit.

The views of the stockmen of Saskatchewan on the danger from coyotes in that province are set forth in the following statement of the Live Stock Commission:*

Protection Against Sheep Pests: "So far as sheep are concerned, the timber wolf, the coyote and the dog are more dangerous than any bacillus; the sheep of Saskatchewan are free from the intestinal parasites which plague flocks in so many parts of the United States. The coyote is particularly harmful in many rough or partly wooded sections which would otherwise be well adapted to sheep, and worrying dogs may appear in any section.

"It has been the practice of the Government of Saskatchewan for some years to pay a bounty of $1.00 per head on coyotes killed in the province. As this sum is only a small portion of the value of the pelts, it is open to question whether the offer of the bounty has led to the killing of many more wolves than would have been killed without it. It would be well, therefore, to consider whether part or all of the amount usually expended in this fashion could not be used to better purpose in some alternative method of combatting the wolf pest, and particularly in encouraging the breeding and use of wolf hounds."

The following is typical of the experience of stockmen:

Mr. J. C. Hall, Lumsden, Sask., writes: "They [the coyotes] are a perfect pest here; also the cause of very material damage and expense. I bought this farm with the intention of raising stock of various kinds, but I find that to start sheep raising would be very poor business under the circumstances."

Manitoba.—The coyote problem in Manitoba is admirably set forth in the following letter, which I have received from Mr. W. W. Fraser, provincial live-stock commissioner:

"We regard this pest as being an exceedingly serious one, more particularly in the newer districts and where there is more or less shelter by way of trees and scrub. He is a menace chiefly to the sheep industry. I desire to point out clearly that it is not only what he destroys in the form of sheep, poultry and game to an alarming degree in the aggregate, but where I consider the real damage is done is that hundreds of our farm-

* *Final Report of the Live Stock Commission of the Province of Saskatchewan*, 1918, p. 21. Published by the Department of Agriculture of Saskatchewan, Regina.

ers in this western country refuse to go into the sheep industry because of the above facts. As I go through the country discussing the sheep and poultry situation, every district has numerous men who state they would go into the sheep industry were it not for the destruction done by the coyote, and they can point out concrete cases where their neighbors have been subjected to this pest for years. They declare it remains equally as bad at the present time as in the past; therefore, they cannot go into the sheep industry, although they would like to.

"Whole flocks of poultry, such as turkeys and geese, have been wiped out after the owner carefully fostered them all summer, and, if not, the whole flock has frequently been reduced to 50 or 60 per cent.

"This pest does not seem to have been seriously taken into consideration by many of our representative men, such as local and Dominion representatives in our Legislatures, as well as men who represent us in other capacities."

The following extracts from letters that I have received are typical of the experiences of many farmers in the province:

Mr. A. A. Titus, Napinka, Man., writes: "All sheep men lose heavily. Not one in ten shepherds escapes loss. I lost 25 sheep and lambs last year (1917); more than half were pure-bred Shropshires. I lost $200 in time watching as well. Total loss close to $1,000. Coyotes eat half the turkeys of the country and from 10 to 50 per cent of other poultry, according to district. A few new-born calves are eaten."

Mr. James MacField, Two Creeks, Man., writes: "We have been bothered with them for years around this part of the country. There are no sheep farmers to speak of as they think the coyotes would be a great menace, but every farmer tries to raise poultry and I may say every farmer loses in cold cash anywhere from $50 to $100 every year. The people are doing what they can to exterminate the wolf but we cannot afford the time to hunt wolves for two dollars per head. This winter (1917–18) there have been a great many try their hand trapping but with little success. I figure I can trap as well as the average man and I worked my spare time all winter and only got three for my trouble."

The Necessity of Organized Control by Hunting and Trapping

The most successful method of destroying coyotes, wolves, and other predatory animals is by the organization of sys-

tematic hunting by paid hunters, receiving no bounties and working under government control. This policy is giving excellent results in the United States, as will be shown presently.

The problem is by no means a local one, nor even a provincial one; it is both interprovincial and international in character, and it is only by organization along these lines that ultimate success will be obtained. What we need is co-operation among all concerned: individuals, live-stock organizations, and governments; all of them should contribute to the funds that are needed to carry out the work after a broad policy has been formulated.

The present time is most appropriate for the initiation of a comprehensive scheme for the destruction of the predatory animals affecting our live-stock interests and wild-life resources. There is an urgent need for the increasing of our live stock in Canada, and Dominion and provincial governments are conducting vigorous campaigns with this end in view; but, as the preceding facts have clearly shown, these efforts cannot be wholly successful, especially in the matter of sheep-raising and wool production, unless the failure of the bounty systems as a means of destroying predatory animals is recognized by our governments and steps are taken to put into effect a similar scheme to that now in successful operation in the United States.

Steps must be taken to remove the obstacles in the way of successful sheep-raising. At the present time farmers are either prevented from taking up or they are compelled to discontinue sheep-raising on account of the losses caused by these predatory animals. In addition, when an effort is made to raise sheep the farmers experience loss of stock, loss of time shepherding their stock, and loss of money in building the necessary fences.

With the return of large numbers of soldiers from military service in Europe there should be no difficulty in ob-

taining a sufficient number of hunters and trappers; in fact, such work would be the means of finding employment for many men who are skilled in hunting and trapping, and who prefer such occupation, and might advisedly form part of the resettlement scheme.

Control of Predatory Animals in the United States

Owing to the enormous losses experienced by the live-stock interests in the United States, particularly in the stock-raising areas of the West, the Federal and State governments have been compelled to take very active measures to eradicate the predatory animals which are responsible for their losses.

It is estimated by Dr. E. W. Nelson, chief of the Biological Survey of the United States Department of Agriculture, that predatory animals destroy annually from twenty to thirty million dollars' worth of live stock on the western cattle ranges. The United States Forest Service estimates that each wolf destroys annually an average of $1,000 worth of live stock, each coyote $50, each cougar or mountain lion $500, each bobcat $50, and each stock-killing grizzly bear $500.

In the annual report of the United States Biological Survey for 1917–1918 it is stated that the chairman of the State Live Stock Board of Utah estimates an annual loss in that region amounting to 500,000 sheep and 4,000,000 pounds of wool. The President of the New Mexico College of Agriculture, as a result of a survey of conditions in that State, estimates an annual loss there of 3 per cent of the cattle, or 34,000 head, and 165,000 sheep. A single wolf killed by one of the Bureau hunters in southern New Mexico was reported by stock-owners of that vicinity to have killed during the preceding six months 150 head of cattle, valued

at not less than $5,000. In July, 1917, 2 male wolves were killed in Wyoming which in May had destroyed 150 sheep and 7 colts. Another pair of wolves killed near Opal, Wyo., were reported to have killed about $4,000 worth of stock a year. Another Wyoming wolf, trapped in June, 1918, had killed 30 cattle during the spring. These figures indicate the destructive powers of predatory animals.

During the year ending June 30, 1919, the following numbers of predatory animals were taken by hunters under the direction of the United States Biological Survey:

Wolves	584	Bob-cats	4,123
Coyotes	27,100	Lynxes	43
Cougars	149	Bears	81

In the case of especially destructive animals, exceptionally skilled hunters and trappers are detailed to capture such animals as rapidly as they are reported, and it is stated that the success in capturing them has resulted in a great addition to the meat output of the ranges.

In response to my inquiries respecting the organization of the Biological Survey of the United States Department of Agriculture for the control of predatory animals, Dr. E. W. Nelson, chief of the Bureau, has very kindly furnished me with a memorandum giving full details of the manner in which this important work is carried on, from which statement, which is dated March, 1917, the following account has been prepared:

The infested area is divided into ten districts with an inspector in charge of the work in each district, and an inspector at large is continually in the field co-ordinating and supervising the entire work. The districts are as follows:

Oregon-Washington,
California-Nevada,
Idaho,
Utah,
Arizona,
Montana,
Wyoming,
Colorado,
New Mexico,
Texas.

The actual destruction of the animals is accomplished through hunters and trappers, at salaries of $75 per month, with additional allowances in meritorious cases of $10 per month for camp equipment, and $15 per month for each of two horses, the hunter to pay his own expenses, including subsistence for himself and horses. Almost all hunters furnish one or more horses. The pay of hunters is rated on their skill and the results secured, only the best receiving the full $115 per month. They are not allowed to receive bounties, and deductions are made for time lost. A careful record is kept of the number and kind of animals taken by each hunter as shown by reports, skins, scalps, and skulls submitted.

Trapping with steel traps has been very successful, and has the advantage of giving known results and preserving for sale the skins of the animals taken. Beginning with the methods known to the professional trapper, the policy of the Bureau has been to adopt the best devices, develop new methods, and discard in favour of new methods such practices as do not give satisfactory results. Annually the inspectors are called to some central point for conference with the Bureau officials in charge of this work.

Poisoning individual animals is occasionally done to advantage where stock are killed and carcasses fed upon by depredating animals. General poisoning campaigns have proved very successful, but have the disadvantage that the number of animals destroyed cannot be definitely determined, and the furs are not recovered. Strychnine capsules are being used in these operations, and experiments are being made with cyanide and other poisons. Hunting with dogs has been carried on in an experimental way, but without signal success.

The skins of all fur-bearing animals taken by the hunters are cured and saved, being shipped to Washington from time to time. They are sold by auction. It is estimated

that the receipts from these sales will aggregate 8 to 10 per cent of the cost of operations, and the net proceeds are turned into the United States Treasury.

In the annual report of the Biological Survey for the year ending June 30, 1919, it is stated that a force of from 400 to 500 hunters is employed in the destruction of predatory animals, under the direction of district inspectors in the nine districts mentioned above. About one-fifth of these are paid from co-operative funds provided by the States or contributed by local organizations or individuals. The net proceeds already received for the skins taken during the year amount to $76,128.56.

The work of the United States Department of Agriculture demonstrates very conclusively the success of the policy of properly organized and systematic hunting by paid hunters, working under the close direction of district inspectors, as a means of destroying predatory animals over a large area, and it affords an excellent object-lesson of what might be done in Canada by the adoption of a similar policy.

Lesser Predatory Mammals

Lynx.—The Canada lynx is found throughout the Dominion from Nova Scotia to British Columbia, and northward as far as the limits of our northern forests. Richardson states that it is found on the Mackenzie River as far north as latitude 66°. It is too well known to need description, but, as it is sometimes confused with the bobcat or bay lynx of eastern North America by the uninitiated, it may be pointed out that the Canada lynx is distinguished from the latter animal by its lighter gray colour, the tuft of long black hairs on the tips of its ears, and the large, hairy paws.

Its chief food is the varying hare or rabbit, and the close relation between the periodic fluctuations of the rabbit and those of the lynx is discussed in another chapter. It also

preys largely on the several species of grouse. The lynx will kill foxes, and it is claimed that deer and caribou are sometimes attacked.

Bobcat or Bay Lynx.—This close relative of the Canada lynx is slightly smaller than the latter, and its fur is of a dark-brown colour; it lacks the long black ear-tufts, and only the upper side of the tip of the tail is coloured black. It is confined to the east, and in Nova Scotia a distinct variety, commonly called the wildcat, occurs. In many places in Nova Scotia the wildcat is destructive to sheep, for which reason it is destroyed whenever possible. Like its near relative it is an enemy of ground-game such as grouse.

Foxes.—All the species of foxes, particularly the red fox, are destructive to our native game-birds.

Predatory Birds

The Great Horned Owl.—While most of the owls are beneficial as the destroyers of noxious rodents, such as mice and moles, the great horned owl is one of the most destructive of the large predatory birds. The various subspecies of great horned owl are found from Nova Scotia, where it is known as the "cat-owl," owing to the ear-like tufts of feathers on its head, to British Columbia, and throughout the northern forests to the limit of tree growth. Its home is the heavily forested and unsettled regions. But when its food supplies become reduced it migrates southward, and during recent years there have been large numbers of these birds killed in the most southern portions of its range. It is a great enemy of grouse and other game-birds, and is detested by the farmer on account of its destructive raids on poultry.

Goshawk.—This hawk is undoubtedly the greatest destroyer of game-birds of all the species of hawks, most of

which are either entirely or partially beneficial. In Nova Scotia it is the commonest species of hawk, and it ranges across Canada to British Columbia, where it is represented by a Western subspecies. It normally resides in the forests and woodland, from which it makes excursions to the open country, and is especially fond of raiding the farmer's poultry-yard with destructive effect. In its normal haunts it preys upon the rabbit and grouse. When rabbits are abundant these hawks increase in numbers, but with the periodic disappearance of the rabbit they attack the grouse in greater numbers. When the latter birds are reduced in numbers through the depredations of these fierce birds, the shortage of food drives the hawks farther south, and, as was explained in discussing the scarcity of the different species of grouse in the prairies, they prove to be one of the worst enemies of our game-birds.

This species and the two species mentioned below are the chief predatory enemies of our game-birds, and, inasmuch as they destroy large numbers of game and insectivorous birds, not to mention the great destruction of poultry that they accomplish, their protection cannot be urged, and they should be treated as noxious predatory animals. It is important, however, that they should be distinguished from the many species of hawks that render considerable service to the farmer by destroying noxious rodents, such as gophers, moles, and mice, and noxious insects, such as grasshoppers.

Cooper's Hawk.—This predatory species is smaller than the goshawk, and intermediate in size between it and the sharp-shinned hawk. It is not common in eastern Canada, and is more abundant in the West; in British Columbia it is generally distributed and tolerably common in the Lower Fraser valley. It is a strong and rapid flyer, having a quick, darting flight, and its boldness makes it a serious enemy of poultry. It can be recognized by its barred tail, about as long as its body, and somewhat rounded rather

than square at the end; the wings are bluntly rounded at the end.

Sharp-shinned Hawk.—Throughout the Dominion this is one of the commonest hawks wherever there is wooded country or brush. It is smaller than the Cooper's hawk, but resembles it in flight and habits. Its tail is square at the end. It is a swift flyer and hunts keenly through the brush and along the fences, preying upon the smaller birds. Inasmuch as it is a great destroyer of insectivorous birds, its protection is not only undesirable but its destruction should be encouraged, provided care is taken to distinguish it from useful species of hawks.

CHAPTER IX

THE PERIODIC FLUCTUATIONS OF OUR FUR-BEARING ANIMALS

(CHARTS I TO V)

THROUGHOUT the animal world we find that not only is the abundance of the higher predatory animals dependent upon the abundance of the lower forms upon which they prey, or which may indirectly affect their food supply, but this dependence may result in remarkable periodic fluctuations in the numbers of the predatory forms. In the insect world this phenomenon of rise and fall in abundance is well known; a striking example occurred in 1915, when, owing to the unusual prevalence of aphids, or plant-lice, throughout Canada, wasps were extraordinarily abundant everywhere in the same region, the probable explanation being that the wasps increased abnormally owing to the presence of an unusual amount of food in the form of "honey-dew," which is excreted by the plant lice. Similarly, the abundance of certain species of our food fishes is affected by the amount of food in the shape of small crustacea, or small fishes, in the sea, such food being variable in quantity. For instance, Bullen* showed that, in the years 1903–1907, there appeared to be a direct correlation between the number of mackerel taken during May and the abundance of the small copepod crustacea.

Darwin's illustration of the relation of cats to the abundance of clover-seed is well known, but may be recalled. Red clover depends on the visits of bumble-bees for its fertilization. The abundance of bumble-bees in any district depends very largely on the number of field-mice which

* *Jour. Marine Biol. Assn.*, vol. VIII, p. 394, 1909.

feed upon the combs and nests of the bees. The number of field-mice near villages and small towns is largely dependent upon the number of cats, with the result that bumble-bees are said to be more abundant near such places, with a consequent increase in the clover crop.

When we study these phenomena as they occur in our wild life, the dependence of the larger animals upon the abundance of the smaller is very marked, and we discover the significance of the well-known periodical increase and decrease in the prevalence of many of the well-known members of our wild life.

At the bottom of the scale are the numerous species of mice and voles, which constitute the food of so many of the large and small predatory animals. The observations of Cabot* on the rise and fall in the abundance of mice, and the effect on the larger animals, are of great interest in this connection, as they were made in the same region, namely, northern Labrador and the interior of Ungava peninsula, and during consecutive years. When he first visited the region in 1903 mice were not noticeably abundant. Caribou had been abundant through the winter, and in early July passed north in large numbers, close to the coast. There were some of the large predatory birds, such as falcons. Few ptarmigan were seen. Foxes, the most important fur-bearers of the region, were fairly abundant. By 1904 there had been a noticeable increase in the numbers of mice. Hawks were more numerous. Ptarmigan were fairly numerous. Many tracks of wolves were seen, chiefly along the river banks, where mice occur. A wolverene that was killed was full of mice. Hawks and owls occurred inland. In 1905 the mice reached their maximum abundance. Cabot states: "Sometimes two at a time could be seen in the daylight. Low twigs and all small growth were riddled by them. There was a tattered aspect about the moss and

* William B. Cabot, "In Northern Labrador," Boston, 1912.

ground in many places not quite pleasant to see." Falcons were visibly more numerous and owls had increased somewhat. A bear killed on the journey was full of mice. Foxes were abundant, but caribou were still scarce. On the next visit to Labrador in the spring of 1906 the mice had disappeared with the snow. The accompanying change in the wild life was remarkable. "The falcon cliffs were deserted, coast and inland." Ptarmigan were very scarce. In the previous years these game-birds had enjoyed some respite owing to the abundance of mice, and their consequent freedom from the depredations of the predatory birds, but, with the disappearance of the mice, they were harried to death. For the first time the hunting-cry of wolves was heard at nights, as they sought the caribou in the absence of the more abundant smaller animals. As Cabot says: "The bearing of the mouse situation on the human interests of the region is easy to see. It affected all the game, food game and fur. The abundance of mice tended to build up the ptarmigan, which are of vital importance in the winter living of the Indians through the whole forested area to the Gulf. Likewise it built up the caribou herd by providing easier game than they for the wolves."

The periodic increase and decrease in the abundance of our wild life has a very important economic aspect. It not only affects the life of the Indians and other inhabitants of the north, but also affects the output of furs, the chief natural resource of the greater part of the country. The extent to which the fur trade fluctuates is strikingly shown in the fur returns from year to year. Through the kindness of Mr. W. H. Bacon, late fur commissioner of the Hudson's Bay Company, I have been able to obtain the fur returns of that company covering a long period of years, from 1821 to 1914. As this is the chief company obtaining furs in Canada, with posts distributed throughout the country, and particularly in the north, where wild-life conditions are

practically uninfluenced by the agricultural development of the country, their returns may be taken, not only as an index of the total quantity of furs of the different species of fur-bearing animals taken in Canada in any year, but also as a fair index of the relative abundance of these species. From these figures the accompanying charts have been prepared, and they illustrate very graphically the abundance from year to year of the chief species of fur-bearers and their periodic increase and decrease.*

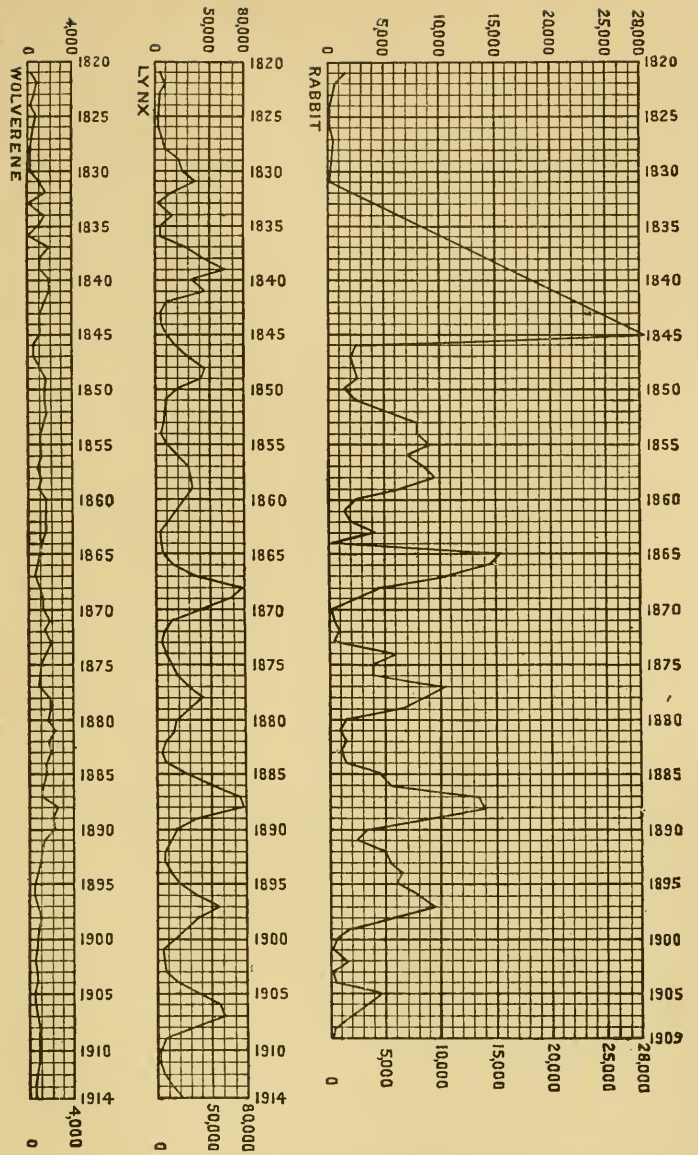
Varying Hare or Rabbit.—If we study the data respecting the increase and decrease in abundance of the common rabbit or varying hare (*Lepus americanus*), which is widely distributed throughout the country, especially in the north, we find ample confirmation of the well-known facts respecting the abundance from year to year of this common food and fur-bearing animal. Their capacity for increase in numbers is very great.

The females usually begin to breed when a year old. They bear two or three, and sometimes four to six young at a time, and are said to breed two or three times in a season, the period of gestation being about thirty days. MacFarlane states: "The litter usually consists of three or four; but when in the 'periodic' increase, females are known to have as many as six, eight, or even ten at a time, and then gradually return to three or four."

If we take the periods of maximum abundance of the rabbit, according to the Hudson's Bay Company's returns, we find they occurred in the following years:

1845, 1854, 1857, 1865, 1877, 1888, 1897, and 1905, or in other words in cycles of 9, 3, 8, 12, 11, 9, and 8, giving an average periodic cycle of 8.5 years.

* MacFarlane, in his "Mammals of the Northwest Territories" (1905), a memoir to which I make frequent reference, and E. T. Seton, in his book "The Arctic Prairies," have called attention to these fur returns and the indications they afford of the fluctuations in number of the fur-bearing animals.



PERIODIC FLUCTUATIONS OF RABBIT, LYNX, AND WOLVERENE IN CANADA

This approaches very closely the prevailing popular idea of a seven-year cycle for this animal. They are not generally equally abundant throughout the country in the same year, the abundance is usually regional in character, and the period of general abundance would cover several years. The fur returns indicate the year of the average maximum abundance. The regional character of the abundance of the rabbit will be shown from the following data of various observers, which Seton* has collected regarding the periods of increase in different regions of Manitoba.

Lake of the Woods, 1856, followed by a plague in 1857 (Hind).

Upper Assiniboine, 1857 (Hind).

Savanne Portage (70 miles west of Fort William), 1858–9 (Hind).

Portage La Loche, 1875 (J. Macoun).

Shoal Lake and Stony Mountain, 1883–4, followed by a plague in 1885 (J. H. Cadham).

Red River and Assiniboine Valley, all the poplar country in the basins of Lakes Manitoba and Winnipegosis, Pembina, Riding, Duck and Turtle Mountains, 1886–7, followed by a plague in 1887.

Shoal Lake, Manitoba, 1893–4 (W. G. Tweddell).

Central Manitoba, 1894.

In other parts of Canada, Seton records the following:

Northern British Columbia, 1872 (J. Macoun).

Mackenzie River Valley, 1903–4. Preble† also describes the enormous abundance of rabbits in this region during the same period, when, according to Seton, there were "millions in 1904, none at all in 1907."

The last period of abundance reached its climax in the Northwest in 1914. When I visited the Rocky Mountains

* "Life Histories of Northern Mammals," vol. I, pp. 640–641, 1909.

† E. A. Preble, "A Biological Investigation of the Athabaska–Mackenzie Region," *North American Fauna*, No. 27, Washington, 1908.

region of northern Alberta, in 1915, signs of the recent abundance of rabbits were everywhere. For miles along the trails the young growth of poplar had been barked and girdled by the hordes of rabbits during the previous winter. But hardly a rabbit was to be seen; they had almost completely disappeared.

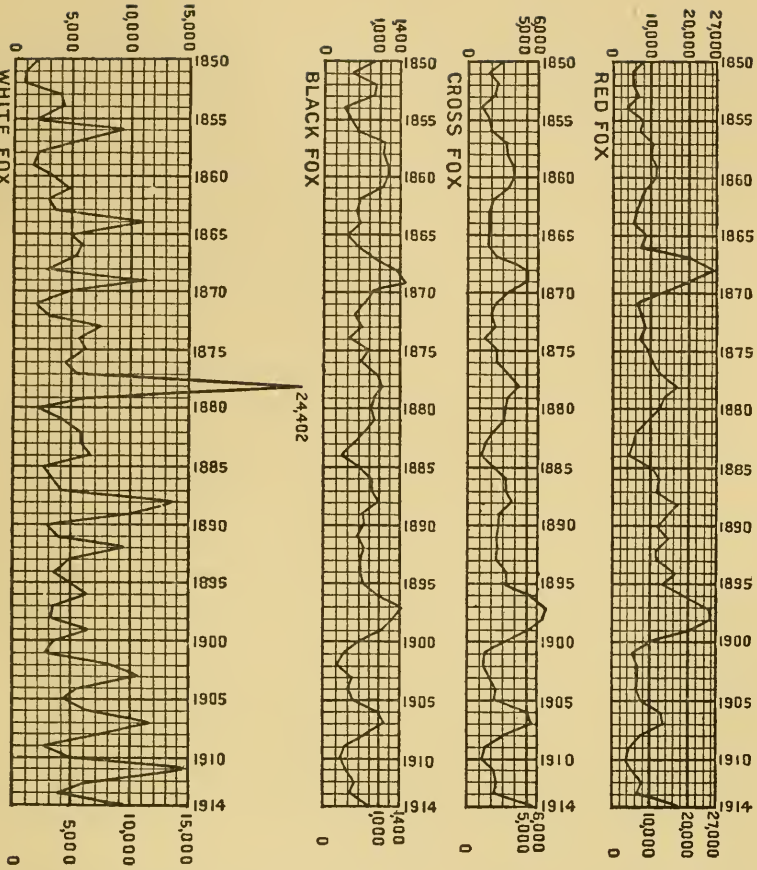
The cause of the sudden plague which kills off the rabbits when they reach their greatest abundance so that the whole countryside is overrun with them is probably of a multiple nature. The chief factor is undoubtedly overcrowding. This results in an epidemic of various parasitic diseases to which rabbits are susceptible, particularly one of bacterial origin, which speedily spread throughout the rabbit population of the affected territory.

Constituting as it does the chief food of many of the larger fur-bearing animals, such as lynx, fox, and wolf, the rabbit is one of the most important factors in determining the abundance of these animals.

Lynx.—The lynx is primarily dependent upon the rabbit as a source of food, although it also devours mice, grouse, ducks, stranded fish, young deer, or sheep. Its periods of abundance, therefore, correspond with those of the rabbit. Preble states that the winter of 1903–04 was remarkable for the abundance of lynxes throughout the upper Mackenzie region, this abundance of lynxes being accounted for by the enormous numbers of rabbits in the same region at that time. Following the last outbreak of rabbits to which I have referred, lynxes were very abundant, according to the reports that I have received, during the winters of 1914 and 1915. When the rabbits had disappeared there was a remarkable southern migration of lynxes throughout the northwest, and, during the winters of 1916 and 1917, they were taken in districts in the Prairie Provinces, whither they had migrated in search of food in more southerly localities than they have been recorded as visiting for many

years. Consequently enormous numbers of them have been killed during the last few years, and this no doubt accounts for the greater adoption of the lynx as a fur since 1916.

The regularity of the periodic increase of the lynx is most strikingly shown in the accompanying chart of the fur returns of the Hudson's Bay Company. The first year of abundance, according to these records, occurred in 1831. After that we find the following years of maximum abundance: 1839, 1848, 1859, 1868, 1878, 1888, 1897, 1906. Personal records indicate that 1916 was the last year of maximum abundance. The cycles, therefore, occurred in periods of 8, 9, 11, 9, 10, 10, 9, 9, and 10 years, giving an average periodic cycle of 9.5 years. It will be noted, when these years of maximum abundance are compared with those of the rabbit, that the lynx becomes most abundant, or rather the greatest number were caught, during the year of maximum rabbit abundance to three and four years later. This is what one would expect. The capture of large numbers of lynx during the two or three years after the disappearance of the rabbits is accounted for by the ease with which these animals, greatly increased in numbers on account of the period of rabbit abundance, can be captured in snares owing to the absence of their chief article of food. It should be pointed out that a year of greatest abundance, according to the fur returns, would probably follow a year of greater abundance than the fur returns actually show, owing to the fact that when the natural food, rabbits or mice, is most abundant, the animals are harder to trap than when these food animals have suddenly disappeared. The decrease in the number of lynx after a period of abundance is no doubt due to the disappearance of the rabbit. This rule applies to all predatory animals; their abundance or scarcity is governed directly by the available food supply, whether the animal be a predacious insect or a predacious mammal.



PERIODIC FLUCTUATION OF RED, CROSS, BLACK, AND WHITE FOX

Foxes.—The red fox and its colour phases, cross fox, black fox, and silver fox, exhibit marked periodic cycles, although they are not so pronounced as those of the lynx. This is probably accounted for by the fact that, while the fox feeds upon the rabbit, especially when the latter animal is abundant, it also feeds largely on mice or voles, supplementing this diet with game-birds of various kinds. If we had records of the years of mouse abundance we should probably find, judging from the field observations of Cabot, that have already been given, Preble, and others, that there was a correlation between the abundant years of mice and the abundance of foxes.

The fluctuations in the numbers of foxes is well known to trappers and traders. The period of comparative abundance may extend over a greater number of years than is the case with the lynx; this is indicated in the diagrams by the fact that the difference in numbers between the years of abundance and the years of scarcity is not so great in the case of the fox as in the case of the lynx, and the reason is probably to be found in the fact that the fox is not so dependent upon a rabbit diet.

As the three varieties of foxes—red, cross, and black—have similar feeding-habits and inhabit the same territories, so far as the forested regions of Canada are concerned, it would be natural to assume that their fluctuations in numbers would closely correspond. The Hudson's Bay Company's returns show that this is the case, as will be seen by the diagram. The years of maximum abundance were as follows:

Red fox: 1859, 1868, 1878, 1888, 1898, 1907.
Cross fox: 1859–1860, 1868–9, 1878, 1888, 1897, 1907.
Black fox: 1859–1860, 1869, 1878, 1888, 1897, 1907.

The cycles, therefore, appeared in the following periods of years:

Red fox: 9, 10, 10, 10, 9, giving an average periodic cycle of 9.6 years.

Cross fox: 9, 9, 10, 9, 10, giving an average periodic cycle of 9.4 years.

Black fox: 10, 9, 10, 9, 10, giving an average periodic cycle of 9.6 years.

By comparing these years with the years of maximum abundance of lynx and rabbit, it will be found that they coincide fairly closely.

The white arctic fox and its colour phase the blue fox inhabit the northern Barren Grounds and the islands of the Arctic Sea in the summer. In the winter many of them wander southward in search of food. This species is reported to make caches of food for winter consumption. MacFarlane states that "Captain Lockwood found several fox lairs. In one hidden rock nook he found fifty dead lemmings, in others (sand and earth covered) there were from twenty to thirty lemmings, while in a hollow he discovered a cache containing part of a polar hare and the wings of a young brent goose and the usual lemming. The lairs appeared to be occupied from year to year."

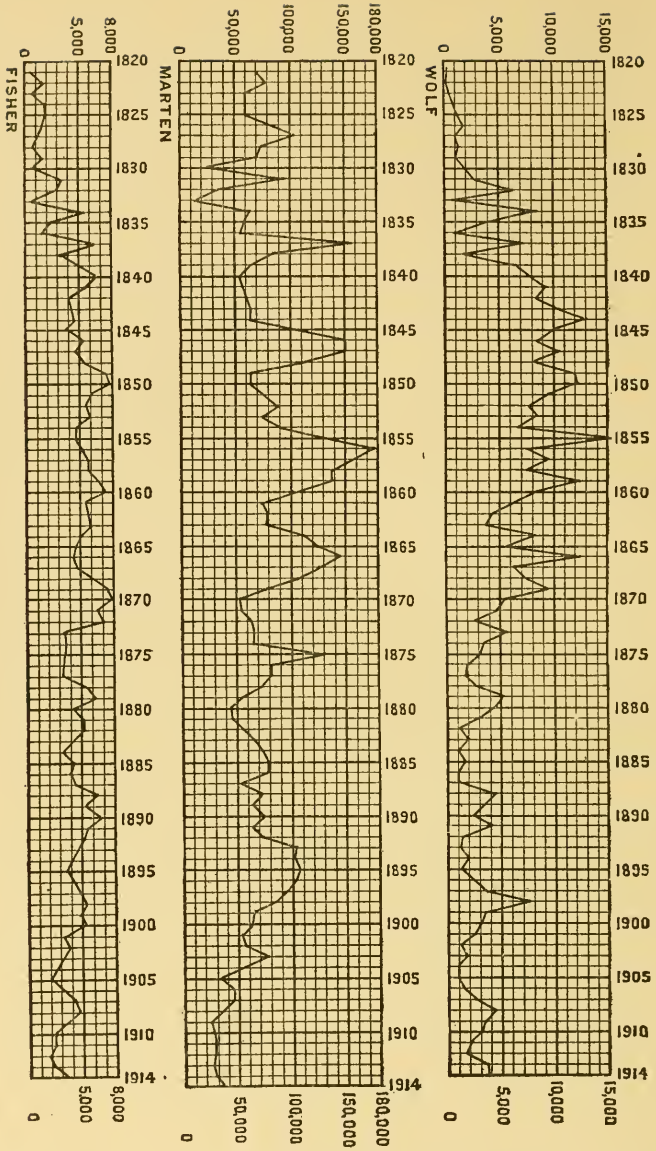
The numbers appear to fluctuate very considerably over shorter periods than is the case with the more southerly red fox and its colour phases. The Hudson's Bay Company's returns give the following years of maximum abundance:

1856, 1861, 1864, 1869, 1873, 1878, 1884, 1888, 1892, 1896, 1899, 1903, 1907, 1911.

The periodic cycles accordingly covered the following number of years:

5, 3, 5, 4, 5, 6, 4, 4, 4, 3, 4, 4, 4.

The average periodical cycle occurred in 4.2 years; 4 years was the actual length of the periodic cycle in the majority of the periods.



PERIODIC FLUCTUATIONS OF WOLF, MARTEN, AND FISHER IN CANADA

The periods of maximum abundance of the blue phase of the arctic fox correspond in almost every case with those of the white phase, so no special reference to these is necessary.

Wolves.—When the fluctuations in numbers of the larger predatory animals, such as the wolf, are studied it is found that they do not show a very regular or marked periodicity. This is no doubt accounted for by the wide range of their food, the grey wolf feeding on all forms of herbivorous animals, from a mouse to a moose, and the prairie wolf or coyote being a very general feeder, including in its diet not only larger animals such as antelope or sheep, but even insects such as locusts, and also berries. When mice or rabbits are plentiful wolves will take their share of such abundant food, but the fact that they can also satisfy their hunger with deer, caribou, or moose prevents any marked decrease in their numbers when the smaller rodents are killed off. In fact, if we examine the diagrams of rabbit and wolf returns of the Hudson's Bay Company (the wolf returns include both grey wolf and coyote) we shall find that in a number of instances the greatest number of wolves were taken in years of rabbit scarcity, and when rabbits were at their maximum the wolf returns were low. The greater difficulty of trapping wolves during periods of rabbit abundance may have something to do with this condition of affairs, but it is in striking contrast to the cases of the lesser carnivorous fur-bearers, the lynx and red foxes. In the early days when the buffalo roamed the prairies the wolves found food in plenty, and the returns from about 1840 onwards until the buffalo began to decrease in numbers showed no great increase or decrease. But when the buffalo was gradually exterminated the numbers of wolves fell to a low level, and since 1879 we find a slight, though nevertheless noticeable, periodical increase every ten years, the years of maximum abundance being 1888, 1898, and 1908.

While the difference between maximum and minimum abundance does not appear to be great, it is not unlikely that there is a distinct natural periodic cycle in the abundance of wolves.

Marten.—After the lynx the marten shows the most pronounced periodic fluctuations of all our native mammals. MacFarlane states: "This is probably the most constant of the 'periodic' fur-bearing animals, whose presence in considerable numbers is very largely dependent upon a great abundance of hares or rabbits, though mice also form an important item of marten diet. . . . In years of plenty, the marten is very numerous throughout the entire northern forest region; but it is not uniformly so at the same time in every section of the country all over the immense territories covered by the Hudson's Bay Company's trading operations. When it is abundant or scarce, say in the northern and western departments, it will generally be found that there is an important and corresponding increase or decrease in the southern and Montreal departments. The natives maintain that lynxes and martens migrate from the north and west to the east and south, and that when they have attained their highest in numbers for several seasons the great bulk (no section is ever totally devoid of martens) of those who escape capture resume the return march until the next period of protracted migration. It must be admitted that many old fur traders have come to entertain similar views from their own personal experience and observation. Of course there are post, district and departmental fluctuations in annual results, caused by local epidemics among the hunters and other relative reasons." That the migration theory is widely held by fur traders is further shown by the statement of Mr. T. K. MacDonald of Winnipeg, after thirty-five years' experience as a chief trader of the Hudson's Bay Company, quoted by Seton.*

*"Life-Histories of Northern Mammals," vol. II, p. 907.

He says: "I think there is sufficient proof that they do migrate. A question annually put to the Indians returned from the woods in summer or fall was, 'What signs of marten have you seen?' and where few of these animals may have been seen in the previous winter, I would be told 'They are travelling north, south, east or west,' as the case might be, and so definite was the knowledge that these Indians would go that winter to head off the wanderers, and they never failed to come in contact with them. These movements of large bodies of the marten go on in summer till the severe weather sets in, beginning again in March and continuing, so far as the males are concerned, till such time as the snow is not fit to travel on; and then on again during the summer. It is accepted beyond cavil by all northerners—that is, Hudson's Bay hunters—that the hare, lynx, and marten do migrate, and the fluctuation in their numbers is not considered to be caused by epidemics, save in the case of the hare. The rabbit is always numerous where lynx and marten are plentiful, and it is looked upon as a *sine qua non* by hunters and traders that it is the following up the rabbit and hare that causes the migrations—that the migration is, in fact, quest of food."

That the migration of the marten and of the lynx is caused by the quest of food is a fact that cannot be controverted; the need of food is the explanation of the migratory movements of most animals, whether they occur among the insects, fishes, birds, or mammals. After the disappearance of rabbits in the northern woods the lynx and marten, increased in numbers, seek food elsewhere. Likewise the predatory birds such as hawks and owls migrate southward. But it is important that this migratory tendency should not be confused with the phenomenon of the periodic fluctuation. Migration is one of the earliest and most popular explanations of the disappearance of a species of animals, but like many popular ideas it is not founded on fact. That

migration is not a cause of the periodic fluctuation is proved by a study of the total fur returns for the whole territory covered by the Hudson's Bay Company. These figures show that while local migratory movements may occur, the periodic fluctuations are general for the entire territory, and occur with remarkable regularity.

According to the fur returns of the Hudson's Bay Company the years in which marten was most abundant were:

1827, 1837, 1846–47, 1856, 1866, 1875, 1886, 1895, 1903.

The periodic fluctuations occurred in cycles of

10, 9, 10, 10, 9, 11, 9 and 8 years,

giving an average periodic cycle of 9.5 years.

If we compare the years of maximum abundance of the marten with those of the rabbit we find that the years of maximum marten abundance in 1846, 1856, and 1866 occurred one year after the maximum rabbit abundance, the years of maximum abundance in 1875, 1886, 1895, and 1903 preceded by two years the years of maximum rabbit abundance, although they occurred during the period when rabbits in the aggregate were on the increase, and had almost attained the maximum.

A study of the chart illustrating the fluctuations of marten reveals another interesting feature, namely, the absence from about 1875 onwards of a very marked regularity of the curves of increase and decrease, such as occurred previous to that year. This, I believe, is accounted for by the introduction of artificial factors of various kinds which affect the marten population in different parts of the country, and I am inclined to believe that the greater destruction of the forests by fire and other causes, which has undoubtedly occurred since 1875, has been mainly responsible for this very noticeable change in the fluctuation of this species of fur-bearer.

The marten not only feeds upon the rabbit but it also feeds extensively on mice, and the fluctuations in the abundance of the latter animals would no doubt influence the abundance of the marten. In addition its omnivorous diet includes other small rodents, birds and their eggs, insects, frogs, and such vegetable products as nuts and berries. But its chief diet would appear to consist of rabbits, mice, and birds.

Fisher.—The largest of our martens, namely, the fisher, is not abundant in any part of its range, which extends throughout our northern forests, and during the last fifty years the number of fisher taken annually is little more than half the number taken in years previous. Like its smaller relative the marten, the fisher shows marked periodic fluctuations in numbers, as will be seen from the accompanying chart of the returns of the Hudson's Bay Company. The absence of a very marked difference in numbers between the years of maximum and minimum abundance is probably due to the fact that fisher is not at any time so abundant as other animals which display such a marked difference between the years of maximum and minimum abundance.

The records show that the years of maximum abundance of the fisher were:

1840, 1850, 1860, 1870, 1879, 1890, 1898, 1908.

The extraordinary regularity of the periodic fluctuations which occurred in cycles of 10, 10, 10, 9, 11, 8, and 10 years is very striking in this animal, which has an average periodic cycle of 9.7 years. The slight deviation from the regular ten-year cycle from 1870 onwards, is probably due to disturbances in the country of its environment.

It is of interest to note that the periodic cycles of the fisher, while remarkably regular, are apparently independent of the periodic increases of the rabbit, with the increases

of which the numbers of the marten are, to a large extent, correlated. This would indicate that a predatory animal such as the fisher, which feeds on all kinds of mammals, including the porcupine, birds and their eggs, fish, frogs, and wild fruits, is subject to periodic fluctuations independent of the fluctuations of any one kind of diet.

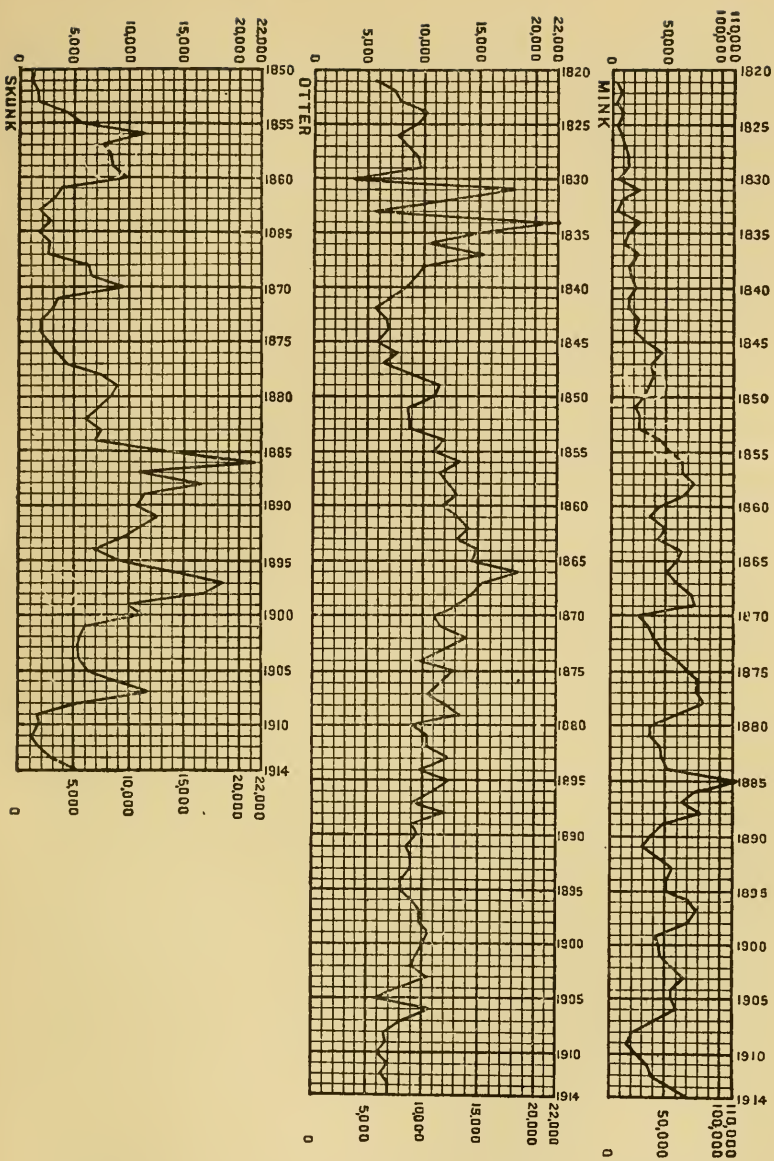
Mink.—The mink is one of our commonest fur-bearing animals, and a study of the Hudson's Bay Company's fur returns shows that it is not only subject to fairly regular periodic fluctuations, but that there has not been any marked diminution in their numbers. The years of maximum abundance were:

1846, 1858, 1869, 1878, 1885, 1897, 1903, and probably 1914.

The periodic fluctuations occurred, therefore, in cycles of 12, 11, 9, 7, 12, 6, and 11 years, giving an average periodic cycle of 9.7 years. While the chart shows a fairly regular aggregate increase, the years of maximum abundance lack the precise regularity that we have seen in many of the animals already discussed.

The food of the mink consists primarily of fish, muskrat, and rabbit. We know very little about the fluctuations of the fish portion of the diet, but a comparison of the periods of greater abundance shows some correlation with the years of abundance of rabbit.

Skunk.—The periodic fluctuations of the skunk are shown in the accompanying chart, and, while the cycles are not regular throughout, they indicate that this animal is subject to very distinct periodic fluctuations in numbers. Feeding mainly on an insect diet composed chiefly of grasshoppers during the summer months, supplemented by a diet of mice, snakes, and other small animals during the rest of the year, the diet of the skunk is of too general a character to permit the correlation of its abundance with any particular class of diet.



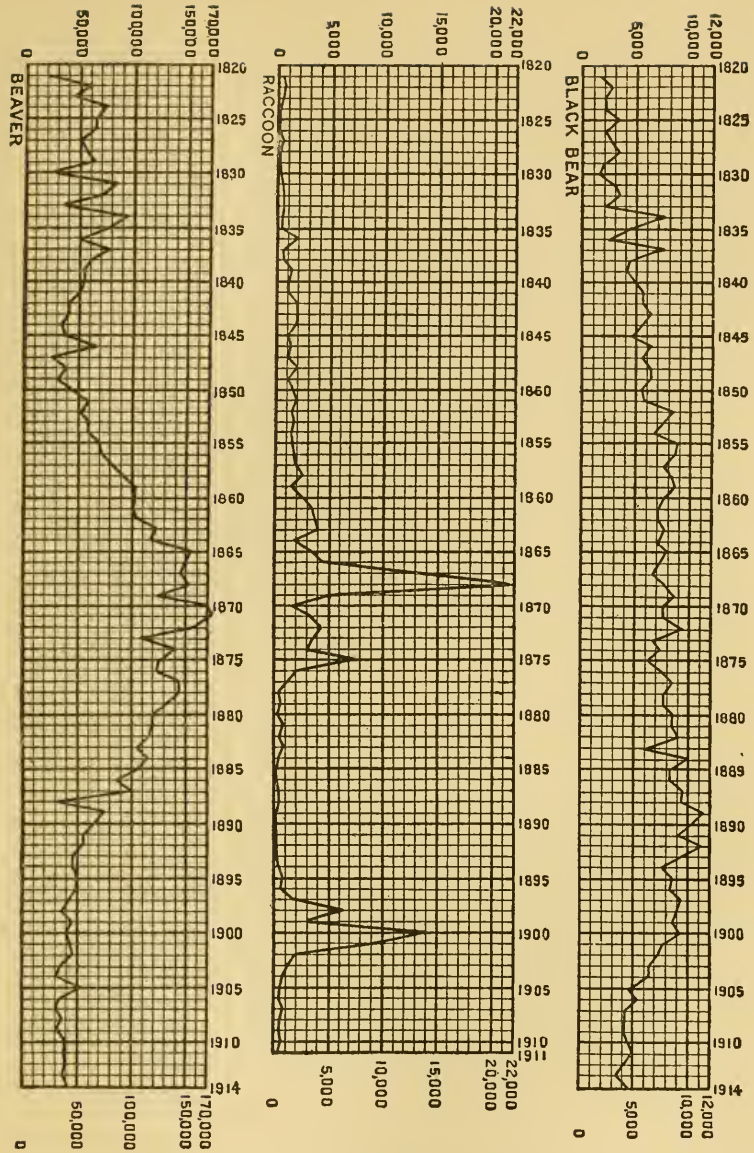
PERIODIC FLUCTUATIONS OF MINK, OTTER, AND SKUNK

Muskrat.—The muskrat appears to be subject to periodic fluctuations, but the conditions which affect the abundance of this animal would tend to affect the regularity of such fluctuations. Excessively wet seasons would cause unusual flooding of the marshes; or an extremely dry season, especially if severe frost followed, would cause wide-spread mortality among the muskrats, thus affecting their subsequent abundance.

When we examine the fluctuations of such animals as the wolverene, the black bear, the raccoon, the otter, and the beaver, we find that there are no distinct fluctuations shown by these animals. There are fluctuations, it is true, but they are irregular in character and not sufficiently precise to warrant our regarding them as being of a periodic nature.

Conclusions.—From the foregoing discussion it will be seen that we may divide the animals considered into three main groups. First, the herbivorous rodents such as mice and rabbits, which are very prolific and increase in numbers until they reach an abundance which causes overcrowding, when an epidemic of disease almost wipes them out and their numbers rapidly decrease to a minimum. Second, we have the numerous predatory animals which depend for their subsistence either directly or indirectly upon the mice and rabbits. These animals exhibit fairly regular periodic fluctuations in numbers, their abundance being correlated with the abundance of the animals upon which they feed, although, as we pointed out in the case of the fisher, there may be a distinct periodic fluctuation which does not appear to be directly related to the fluctuation in the numbers of any particular food animal. Finally, we have the animals that feed on a mixed or exclusive diet of insects, vegetable products, fish, or miscellaneous diet, that do not show any marked periodic fluctuations.

The economic value of this study in enabling us to pre-



PERIODIC FLUCTUATIONS OF BLACK BEAR, RACCOON, AND BEAVER

dict to a large extent the years of abundance of many of our important fur-bearing animals is sufficient to warrant a more careful and intensive study of these phenomena and the underlying causes. Is the decrease in abundance due to starvation, owing to the disappearance of the main article of diet, or does a decrease in the food supply affect the fertility of the predatory species? According to MacFarlane, the females are said to be more prolific when the numbers of the animals constituting the main food are on the increase. Does the overfeeding consequent upon the great abundance of food affect, in an adverse manner, the reproductive powers of the predatory species? All these are problems which demand further close study in the field. It is hoped that such studies, extending over a number of years, may be undertaken by competent investigators in the future, as such a knowledge of the causes of these fluctuations is essential to an adequate understanding of a subject having economic possibilities of a very high order.

CHAPTER X

RESERVES FOR GAME AND WILD LIFE IN CANADA

Under the peculiar conditions that exist on the North American continent, where the opening up of enormous areas of land by agricultural development, the penetration of virgin forest by railroads, lumbermen, and prospectors, and the reclamation of the wilderness have led to widespread destruction of the haunts of our wild life, with a consequent disappearance of the greater portion of it, other measures than the promulgation of game laws, which at the best are difficult to enforce completely, are necessary to insure the preservation of what wild life remains. Of such protective measures by far the most important is the establishment of wild-life reserves, refuges, or sanctuaries in which the native mammals and birds are protected. Such wild-life reserves should include a sufficient area to provide ample natural summer and winter range for the wild life that they are intended to protect. They should be, and as a rule are, unsuitable for agricultural development. Nor should they include mining or other commercial properties that are likely to interfere with their purpose. So far as is possible the boundaries of such reserves should be well defined, and the necessary steps should be taken to secure within the reserve areas the required protection to the wild life they contain, and all protective measures should be rigidly enforced.

THE NATIONAL PARKS

We have reason to be proud of the withdrawal from settlement and establishment by the Dominion Government of extensive tracts of land as national parks, for the purpose,

not only of preserving areas of incomparably magnificent scenery in which recreation may be sought by our people, but also of protecting the wild life that such areas contain. In most cases the double function is combined; in other cases areas have been reserved for the sole purpose of protecting our wild life.

As the Dominion Government only controls the crown-lands in the provinces of Manitoba, Saskatchewan, and Alberta, and the areas known as the "Railway Belt" and "Peace River Block" in British Columbia, the Dominion parks are restricted to such provinces. In fact, these parks are mainly in the Rocky Mountain region of Alberta, the management of the wild-life reserves in the greater portion of these western provinces having been left to the provincial governments, as will be shown subsequently. The Dominion parks are administered by the Parks branch of the Department of the Interior, under the direction of the Commissioner of Dominion Parks.

All the Dominion Parks are absolute preserves for wild life, hunting being strictly prohibited within their borders, and fishing is allowed under special regulations (see p. 275).

Jasper Park.—Jasper Park is the largest of the Dominion parks. It was established by Order in Council of September 14, 1907, and comprises an area of approximately 4,400 square miles. Within its confines are to be found magnificent ranges of mountains and incomparable peaks, one of the most beautiful of which is Mount Edith Cavell (11,033 feet), which was named in honour of that brave English nurse who died a martyr to German brutality, of which this mountain will be a lasting reminder. The park affords unexcelled and extensive natural range for practically all the big-game animals. Mountain sheep and goats are increasing in numbers, grizzly and black bears are not uncommon, and will multiply with the absolute protection they now enjoy. Moose were abundant before the advent of the

two transcontinental railroads which traverse the park, and, although large numbers were killed during the construction of these railroads, they will undoubtedly increase. Wapiti or elk were formerly found in the wooded valleys, and it is hoped that on account of their protection and increase in the region south of the park they will repopulate their former range to the north. Deer and beaver are increasing in abundance. Caribou may be expected to benefit from the protection now given to the area which includes and adjoins excellent caribou range, including the chief haunts of the black mountain caribou (p. 63). Wild fowl also occur in large numbers, and excellent breeding-places are afforded by the extensive marshes.

We may confidently look forward to the time when this great area will be one of the best-stocked wild-life reserves on the North American continent, and a source of pride and pleasure to the tired city-dwellers, who visit it for recreation and to study our wild life under natural conditions.

The Rocky Mountains Park.—This is the oldest of the Dominion Parks. It was established in 1887, two years after the completion of the Canadian Pacific Railway. It embraces an area of 2,751 square miles, and includes some of the finest mountain, forest, and lake scenery in the Rocky Mountains. On its mountain ranges mountain sheep and goats are increasing in numbers. So abundant are the sheep that it is no uncommon sight for visitors to see, during the summer months, a flock of over thirty ewes and lambs on one of the main automobile roads which traverse the park.

In April, 1919, the superintendent reported that on the motor road west 375 mountain sheep, 10 goats, and 16 deer were seen within ten miles of Banff. The increase of mountain sheep in this park has been very noticeable, and is indicated by the following extracts from reports made by the wardens early in 1919:

Counted fifty-two mountain sheep on top of Cuthead Mountain.

Saw seventy-one sheep and twelve deer near Massive.

Found sheep in large numbers in unusually fine condition for the time of the year.

Saw big bunch of sheep near the Three Sisters.

All wild animals are increasing. Black bears occasionally become a nuisance on account of their visits to the garbage-cans of the summer residences, and during the winter the deer overcome their natural shyness and may be seen constantly in the streets of Banff. Excellent natural paddocks have been constructed near Banff, in which buffalo, wapiti, mountain sheep, goat, and deer are confined for the benefit of those who are unable to track these animals in their natural range in the park. These paddocks at the present time* contain 8 buffalo, 10 moose, 27 wapiti, 19 Rocky Mountain sheep, and 6 Rocky Mountain goats. It is proposed to release a number of the wapiti from their commodious paddock in order that they may repopulate what formerly constituted the natural range of the wapiti. This area, together with Jasper and Waterton Lakes Parks, will serve as unrivalled breeding-ground for the big-game animals of the Rocky Mountains region, and the surplus wild-life population will afford a constant supply of big-game and fur-bearing animals for the adjacent unprotected regions. This is one of the great advantages of such natural reserves.

Waterton Lakes Park.—This is the third and most southerly of the Dominion Parks in the Rocky Mountain region of Alberta. It now includes an area of 423 square miles in the southwestern corner of the province, where it is contiguous to the Glacier National Park, which was created by the United States Government, the whole reserved area forming a magnificent scenic and wild-life reservation. It is a region of impressive mountains and lakes, with deeply

*June, 1919.

carved valleys. The names of certain of these mountains, such as Sheep and Black Bear Mountains, testify as to the fauna within the park. Rocky Mountain sheep, and black and grizzly bear, are comparatively plentiful, and both black- and white-tailed deer abound and are increasing.

The following extracts from the diaries of the wardens, early in 1919, furnish evidence of the increase that is taking place in this park as a result of protection:

> Saw between eighty and one hundred deer near Horseshoe basin.
> Two hundred deer were within a mile of Cabin all through bad weather.
> Saw seventy-five deer about two miles up Pass Creek.
> While going up Pass Creek I saw seventy goats, about sixty sheep, and between fifty and sixty deer. I also saw ten or twelve deer at the Superintendent's office; was within two or three rods of them; they are quite tame.

The acting superintendent observes in April, 1919:

> It is noted that elk are making their appearance in this district, and Warden Simpson also tells me he has observed moose tracks in here.

Elk Island Park.—About three miles from Lamont, Alberta, on the main line of the Canadian Northern Railway, a small reservation known as Elk Island Park has been established for the preservation, originally, of the wapiti or elk—but now other members of our wild life are included. The area is mostly wooded, the woods in the north end of the park being very thick, and suitable for moose and deer; in the southern section it is more rolling, less brushy, and suitable for buffalo. It contains Island Lake, a beautiful sheet of water about 1,040 acres in extent, and studded with fourteen wooded islands, on one of which a colony of cranes nest. The present estimated population (1919) of the larger animals in this park is as follows:

Buffalo	195	Wapiti	106
Moose	57	Mule deer	111

Duck and other wild fowl are abundant during the summer.

Buffalo Park, Wainwright, Alta.—In the account that has been given of the buffalo (p. 134) this park has already been described. The entire area consists of hilly and rolling country, with numerous lakes and bluffs, the largest lake being Jameson Lake. These lakes furnish splendid breeding-places for innumerable wild fowl, and when visiting the park I have been very strongly impressed with its unusual suitability as a wild-life reserve. The fact that most of the land is not adapted for agricultural development makes it all the more fitted for a reserve.

In June, 1919, the population of the large animals was as follows:

Buffalo	3,830	Mule deer	420
Moose	22	Antelope	2
Wapiti	106		

Antelope Park, at Foremost, in southern Alberta, has already been described in the account of the antelope (p. 71), of which there are now (1919) seventy-two* head in the reserve.

Yoho Park.—Yoho Park comprises an area of about 560 square miles on the western slope of the Rocky Mountains. It is divided into almost equal parts by the Kicking Horse River. Including as it does some of the most beautiful scenery to be found in the Rocky Mountain region, its chief value lies in its scenic attractions. But nevertheless it contains admirable natural feeding-grounds for the typical animals of this region.

Glacier Park.—Situated amid the snow-capped peaks of the Selkirk Mountains, Glacier Park comprises an area of about 468 square miles. Lofty mountains, deep valleys clothed with dense forests of giant cedar, Douglas fir, hem-

* In February, 1921, there were about one hundred antelope in the reserve.

lock, spruce, and cottonwood, furnish scenery of great beauty, and at the same time the wild life enjoys absolute protection.

Revelstoke Park.—In 1914 an area of ninety-five square miles north of the city of Revelstoke was set aside as a Dominion park. It includes Mount Revelstoke and other peaks, and is situated in a region noted for grizzly bear. Since its establishment the grouse have increased in abundance.

Point Pelee National Park.—Through the efforts of the Commission of Conservation and the Advisory Board on Wild Life Protection an Order in Council was passed in 1918 creating Point Pelee, Ontario, as a national park for preservation of wild life and particularly the migratory birds. In the annual report of the Commission for 1918 this park, which comprises an area of about twenty-five square miles, is described by me as follows (p. 129):

"It is a triangular point of land in Essex county, extending for about nine miles into Lake Erie and measuring about six miles across the base of the point. The peculiarities of the flora and fauna and the desirability of such a reservation are fully discussed in a memorandum submitted to the Commission by Mr. P. A. Taverner, ornithologist of the Geological Survey, in 1915 and published in the Sixth Annual Report of the Commission, pp. 304–307. Not only is it the most southerly point of Canada, geographically, and in the character of its birds, trees and plants, but it constitutes one of the concentration points in the northern and southern journeys of our migratory birds. In the spring and in the autumn, enormous numbers of birds of all species in their migratory journey to and from Canada concentrate at this point, and its reservation, therefore, would be an important factor in ensuring the protection of our migratory birds. The area includes a marsh several square miles in extent which forms a favourite resort and

breeding place for wild fowl, but excessive shooting has reduced its value as a breeding place. Pine, oaks, red cedar, black walnut, and hackberry grow in profusion on the narrow strip of land running down the west side of the point and make it a tract of singular beauty to the lover of trees and shady groves. Its scenic value, the southern nature of its birds and plant life, its importance as a main route for migratory birds and the exceptional opportunities it affords for the protection and encouragement of wild fowl, insectivorous and other birds, all combine to make it an ideal area for a national reservation."

From the foregoing account it will be seen that the Dominion National Parks comprise a total area of 8,917 square miles. In this area the wild life is afforded absolute protection. It is difficult to express in words what this means in relation to the perpetuation of our big game and fur-bearing animals, game-birds, wild fowl, and other species of our wild life, but the maintenance of such a policy is calculated to contribute more than anything else to the conservation of our wild life.

Even in those parks which have been established mainly or entirely on account of the magnificent scenic attractions within their confines, the wild life will play no small part in contributing to the beauty of such scenery, for what forest glade is not made more beautiful by the presence of a few deer or wapiti, what mountainside is not rendered more attractive to the eye by the presence of our magnificent mountain sheep or agile goat? It is the presence of mountain sheep that gives an added charm to the landscape, and the decorative value of our wild life makes a special appeal to the tired dwellers of our cities seeking refreshment in the wild solitudes of our national and provincial parks.

Speaking in Ottawa in 1913 on the subject of our national parks, His Royal Highness, the Duke of Connaught, said: "I do not think that Canada realizes what an asset the na-

tion possesses in the parks. These areas have been preserved from the vandal hand of the builder for the use and enjoyment of the public, who may take their holidays there and keep close to nature under the most comfortable conditions, amassing a store of health which will make them better able to cope with the strenuous life to which they return after their vacation."

PROVINCIAL RESERVES FOR GAME AND WILD LIFE

All the provinces of Canada with the exception of Prince Edward Island and Nova Scotia have now established game reserves for the protection of their game and fur-bearing animals and wild life generally.

New Brunswick Game Reserve.—In New Brunswick such excellent conditions existed for the creation of a game reserve in the central portion of the province, and the need of such a means of maintaining an area where absolute protection might be provided for wild life became so great, that the Commission of Conservation actively promoted the establishment of such a provincial reserve, and the proposal received the unanimous approval of the sportsmen and the strong support of the New Brunswick Guides' Association.

It is gratifying, therefore, to be able to include the province of New Brunswick among those provinces possessing game reserves, for in the spring of 1919 the New Brunswick government passed a "Game Refuge Act," providing for the setting aside of a suitable tract of land not exceeding 400 square miles, "as a refuge for game animals, birds and fish of the Province." In this provincial game reserve the law forbids trespassing, hunting, or trapping, and provision is made for the protection of the timber and the prohibition of fishing.

The tract of land selected as the New Brunswick Game

Reserve lies in the northwestern part of the county of Northumberland. It has a general width from east to west of 16 miles and from north to south it is 27 miles long. It embraces approximately 400 square miles of territory, inhabited by moose, deer, caribou, and fur-bearing animals. We hope that the provision of this reserve will assist in preventing the disappearance of the caribou from New Brunswick, an event which undoubtedly will occur within a comparatively few years unless much greater protection is afforded this animal.

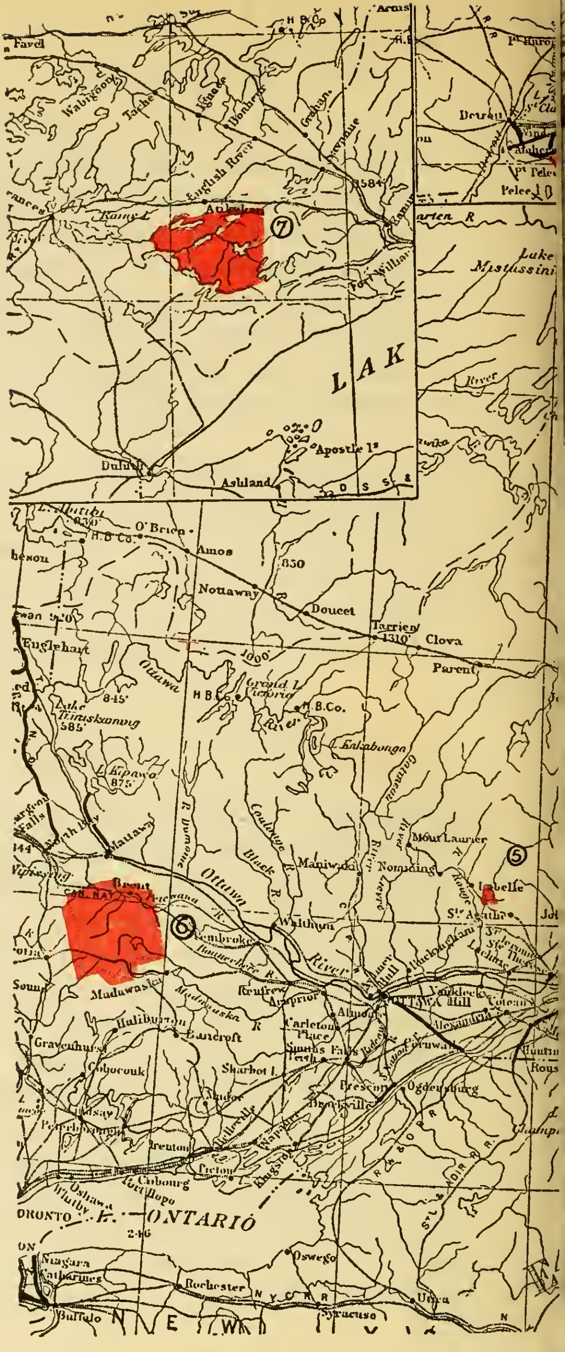
Within the reserve are a number of lakes, the largest of which are Serpentine and Mitchell Lakes, and rivers which have their origin in the reserve flow into the Tobique, Nipisiguit, and Miramichi Rivers. The protection of the headwaters of such important rivers will not be the least of the many useful functions this reserve will perform if it is effectively administered.

Quebec

Gaspesian Forest, Fish, and Game Preserve.—In the central region of the Gaspe Peninsula of Quebec an area of about 25,000 square miles was set aside by the provincial government in 1905 as a forest reservation, fish and game preserve, and public park. It includes a section of heavily timbered and hilly territory, in which numerous rivers, running north, east, and south into the Gulf of St. Lawrence, have their origin. The regulations regarding the hunting and fishing privileges are similar to those in force in the Laurentides National Park.

Trembling Mountain Park.—About seventy miles northwest of Montreal lies Trembling Mountain, the highest point in the whole Laurentian range in this part of Canada, attaining a height of 2,474 feet above sea-level, and 1,713 feet above the lake which lies at its foot. In 1894 this mountain

1. Port Joli Reserve for Wild Geese, Nova Scotia
2. New Brunswick Game Reserve (Provincial reserve; cancelled in 1920)
3. Gaspesian Forest, Fish, and Game Reserve, Quebec
4. Laurentides National Park (Provincial), Quebec
5. Trembling Mountains Park (Provincial), Quebec
6. Algonquin National Park (Provincial), Ontario
7. Quetico Forest and Game Reserve (Provincial), Ontario
8. Point Pelee National Park (Dominion), Ontario
9. Rondeau Provincial Park (Provincial), Ontario
10. Bonaventure Island and Perce Rock Bird Reserves (Dominion and Provincial)



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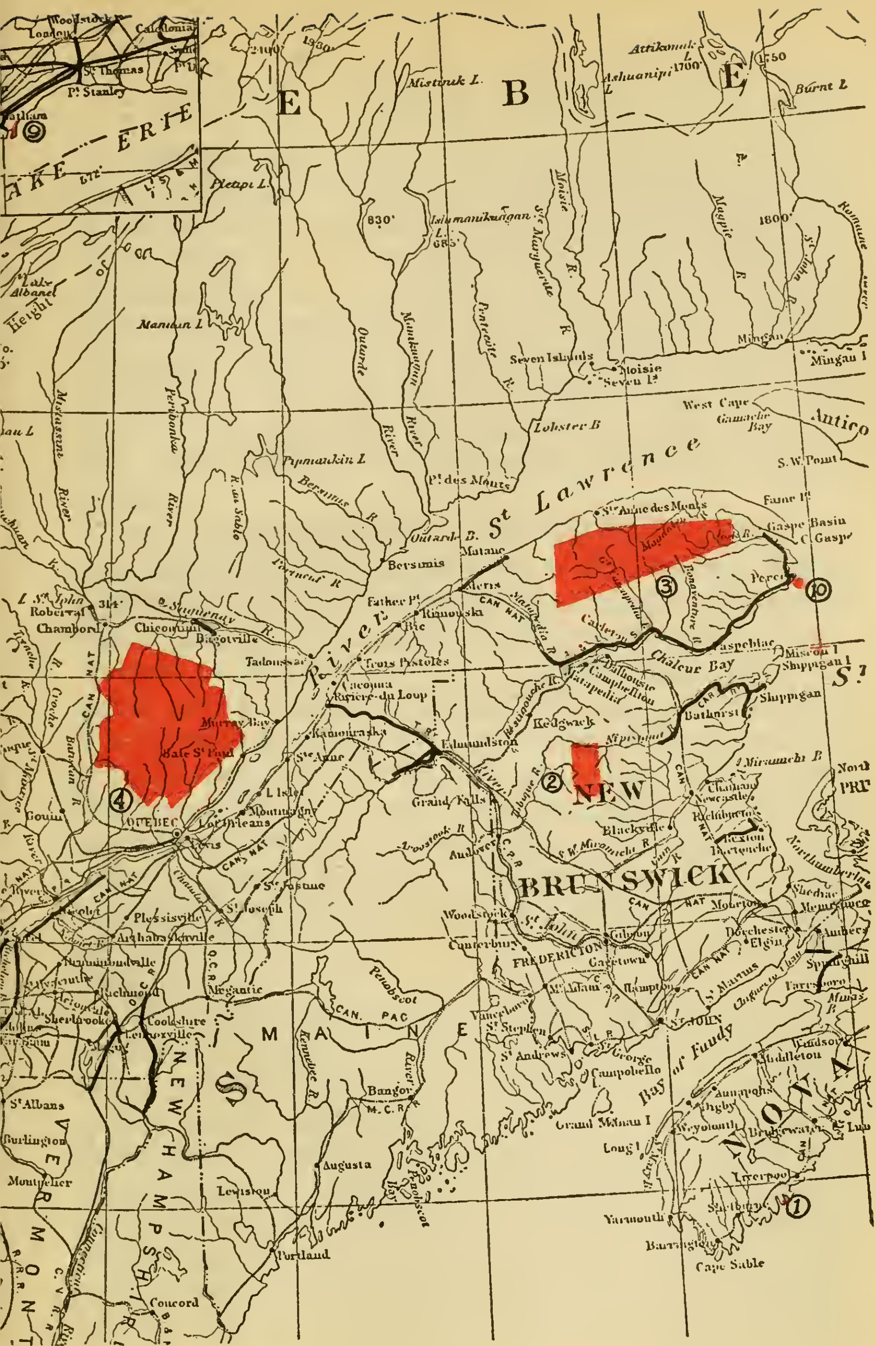


ME RESERVES IN EASTERN CANADA

and adjoining land, to the extent of 14,750 acres, or about 23 square miles, was set aside as a special forest reserve. The mountain is of great interest from a geological standpoint, being "sculptured out of a great mass of gneiss, uniform in character from base to summit" (F. D. Adams). The Indian name is *manitouge sootana*, meaning Spirits' or Devils' Mountain. Indians state that low rumbling noises frequently proceed from it, and that it has sometimes been felt to shake by those who have accidentally been upon it. The Indian belief has established its French and English names.

Laurentides National Park (*Plate XVIII*).—In 1895 an area comprising 2,531 square miles of the wild, forest-clad mountainous country north of the city of Quebec, and southeast of Lake St. John, was set aside by the provincial government as "a forest reservation, fish and game preserve, public park and pleasure ground." Subsequently the area was increased to about 3,700 square miles by the withdrawal of further land from sale or settlement. The park contains the headwaters of a number of rivers running north and south of the mountains—"the blue Laurentian hills"—which attain a height of about three thousand feet. On the west it is approached by the Lake St. John Railway, on the south by the old Jacques Cartier road, and on the east by the St. Urbain road.

The wild life in the park is abundant, and, owing to the protection it receives, it is increasing, in spite of the depredations of the wolves which, from time to time, prove a serious menace, particularly to the caribou. In November the caribou congregate in hundreds in the Grand Jardin des Ours, the largest of the moss-covered barrens in the park, embracing an area of about 100 square miles. Being timid animals and harassed by wolves, they apparently migrated to the northeast, but a few remained, so I am informed by Mr. W. C. T. Hall, the superintendent of the park, and they

are slowly increasing in numbers. The wolves appear to have migrated westward. Before the park was established moose were almost exterminated, but, owing to the increased protection given to them, they are now abundant, and it is no uncommon experience to see three or four during a day's travel in the park. The antlers of these Quebec moose are not as large as those of the New Brunswick animals, any having a spread of over fifty-five inches being considered a large head. Mr. Hall informs me that there are a few red deer, a profusion of beaver, many black bear, and a full complement of the fur-bearing animals. These facts I was able to confirm when I visited the northern region of the park in 1911. The lakes are teeming with splendid trout.

The policy adopted in administering the hunting privileges in the park is an excellent one from the point of view of conserving the wild life. On those borders of the park that are most open to the inroads of poachers, such as the eastern side, moderately sized areas are leased for five-year periods to individuals or clubs. The lessee is required to appoint a guardian approved by the department, and to have the leased area adequately and properly protected. The guardian thus becomes a useful servant of both his employer and the government. Formerly the game and fish on the eastern and western borders of the park suffered severely from the inroads of poachers, but, owing to the method of leasing areas, a series of clubs and private holdings now very effectively protect those borders. Not only has the game in the leased areas increased, but it has spread into the other areas, to the general benefit of the interior of the park.

Some years ago in certain sections of the park bears had nearly disappeared, now they are abundant; beaver were almost exterminated, now they are a nuisance in certain areas.

LAC LA PECHE, QUEBEC, SHOWING THE HEADQUARTERS AND SOUTHERN PORTION OF THE HUNTING-GROUNDS OF THE LAURENTIAN CLUB

LAURENTIDES PARK, QUEBEC. ONE OF THE ENTRANCES TO THE PARK AT THE JUNCTION OF THE JACQUES CARTIER AND CACHE RIVERS

Ontario

Algonquin Park.—This magnificent area of land covers 2,741 square miles, and was set aside as a provincial park in 1893. Within this area numerous rivers have their headwaters, including the Madawaska and Petawawa, and the whole region is densely timbered with pine, spruce, and other conifers, and such hardwoods as poplar, birch, and maple add the richness of their fall colourings to the scenery. Innumerable lakes facilitate travel by canoe, and being well stocked with fish they provide food for the traveller.

The wild life in the park is protected during the whole of the year, with the result that such animals as moose, red deer, black bear, wolf, lynx, fox, beaver, otter, fisher, marten, mink, muskrat, raccoon, skunk, porcupine, ermine, squirrels, and lesser animals are very abundant. Wolves are killed by the park rangers whenever possible, and a certain quantity of fur, principally beaver, mink, otter, etc., is taken on government account and sold in Toronto at public sale. In 1917 the government realized over $2,400 from the sale of furs. With a view to supplementing the meat supply, 650 deer were killed in 1917, weighing altogether 66,215 pounds.

The regulations respecting the park have as their special objects the prevention of fire, the maintenance of health, the protection of timber and vegetation generally, and also of fish and wild life, and the prevention of the pollution of all waters in the park. Islands and parcels of land in the park are leased for summer cottage sites and resort purposes; not more than two acres are leased to one person, but areas not exceeding five acres may be leased for summer schools and other similar purposes. The leases are for twenty-five years and are renewable. Hunting, trapping, or taking game or other animals or birds of any kind is absolutely prohibited. Wolves, bears, wolverenes, wildcats, foxes, or

hawks may be killed by special authority. Fishing is permitted under license. In so far as hunting is prohibited, the policy adopted in this park differs from that carried out in the provincial parks of Quebec, where the lessees may hunt in the areas leased and protected by them. In the case of the Ontario parks the protection is absolute, and controlled solely by the provincial government through its own park rangers; in the Quebec parks the protection of the game is carried out, as we have seen, on a co-operative basis.

Quetico Forest Reserve.—About ninety miles due west of Fort William, in the Rainy River district, an extensive tract of land adjoining the State of Minnesota was set aside as a provincial park in 1913. The park, known as the Quetico Forest Reserve, contains 1,560 square miles. On the south it is bounded by the international boundary; the western and northern boundaries include the Quetico River and Long, Pickerel, and other lakes; the east side by the Thunder Bay district. The area includes the territory known as Hunters Island. It is well timbered, and a large portion of it consists of long, sinuous lakes. Moose are specially abundant, and this area will serve as an excellent breeding-ground for moose for the territory adjoining the park. The protective policy in force in this park is similar to that of Algonquin Park; hunting is prohibited absolutely, and fishing is only permitted under license.

Rondeau Provincial Park.—On the north shore of Lake Erie in Kent County the sandy peninsula which runs out from the mainland and forms one side of Rondeau Harbour has been reserved as the Rondeau Provincial Park. It contains about 5,000 acres. About one-half of the park is under forest, and wild life, which includes deer and other animals, is protected; but muskrats, skunks, and weasels are not protected. Recommendations have been made that the muskrats in this park be protected, and, in view of their increasing value as fur-bearers, their inclusion, for a period

of years at least, among the animals enjoying protection is worthy of serious consideration.

Provincial Game Reserves in Manitoba

In Manitoba the provincial government has established game reserves on the Dominion forest reserves; in certain cases the entire forest reserves are created game reserves, but where the forest reserves are very extensive, as in the case of the Riding Mountain and Duck Lake Mountain Forest Reserves, only the central portion is set aside for the protection of wild life.

The distribution of the game reserves of Manitoba is shown in the accompanying map, and their areas are as follows:

Riding Mountain Game Reserve	.....	216	square	miles
Spruce Woods	" "	.....	108	"	"
Turtle Mountain	" "	.....	99½	"	"
Duck Mountain	" "	.....	432	"	"
Peonan Point	" "	.....	72	"	"
Red Deer Point	" "	.....	39	"	"
Doghead Point	" "	.....	225	"	"
Grindstone Point	" "	.....	42	"	"
Lake St. Martin	" "	.....	240	"	"
Reindeer Island	" "	.....	65	"	"
Cedar Lake	" "	2,978	"	"
Birch Island	" "	.....	57	"	"
Lake Winnipegosis	" "	.....	587	"	"

Altogether these game reserves comprise an area of 5,160 square miles. In all of them, with the exception of the Cedar Lake Reserve, hunting or trapping and the carrying of firearms is absolutely prohibited. In the Cedar Lake Reserve, however, only the hunting or killing of wild fowl and other game-birds is absolutely prohibited; as this reserve comprises some of the most important breeding and feeding places for many species of ducks and also geese in the whole of western Canada, its value in maintaining an abundant

supply of wild fowl in Manitoba cannot be overestimated, and the influence of the protection given to the birds in this area will by no means be confined to the province.

If we add to the area of the Cedar Lake Reserve the area of the adjoining Lake Winnipegosis Reserve, in which both game-birds and mammals are protected, we have a wild-fowl reservation of 3,565 square miles in extent, constituting, perhaps, the most important protected breeding-grounds for ducks and geese on the North American continent.

The Riding Mountain Game Reserve is one of the most important of the provincial reserves in Manitoba, as it contains the largest number of wapiti or elk to be found in any one region in Canada (see p. 28).

Provincial Game Reserves in Saskatchewan

When the provincial government of Saskatchewan first undertook the wise establishment of game reserves, legislation was passed which provided that all Dominion forest reserves automatically became game reserves. This system worked admirably until the Dominion Government set aside such extensive areas in the province as forest reserves that it soon became undesirable to continue such a policy. The game laws were accordingly amended, and the areas set aside as game reserves were revised so as to conform more nearly with the existing requirements. Certain of the former reserves were reduced in size, some were withdrawn altogether, and others were added to the number.

The following is a list of the Saskatchewan game reserves, with their areas, and their distribution is shown in the accompanying map:

Moose Mountain	Game	Reserve	150	square	miles
Cypress Hills	"	"	75	"	"
Beaver Hills	"	"	100	"	"
The Pines	"	"	160	"	"

MANITOBA

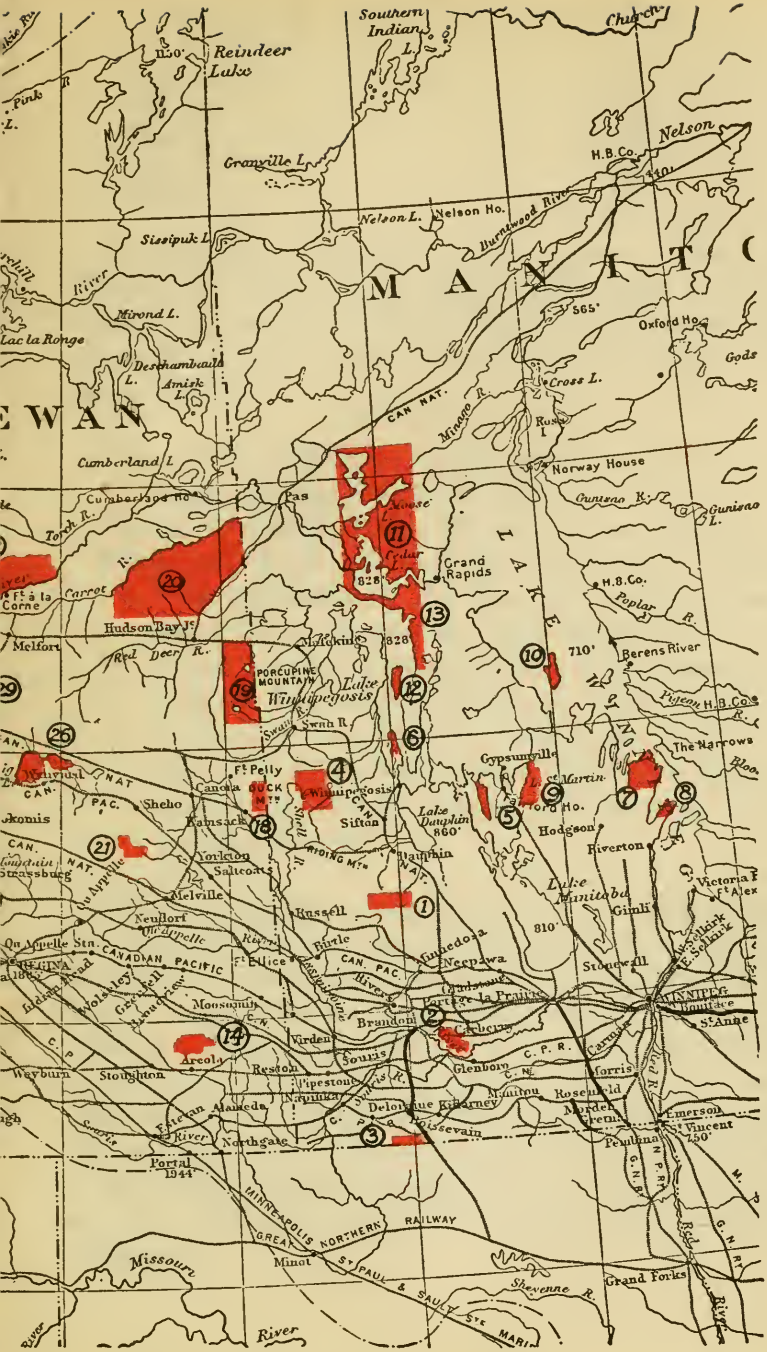
1.	Riding Mountain	Game Reserve
2.	Spruce Woods	" "
3.	Turtle Mountain	" "
4.	Duck Mountain	" "
5.	Peonan Point	" "
6.	Red Deer Point	" "
7.	Doghead Point	" "
8.	Grindstone Point	" "
9.	Lake St. Martin	" "
10.	Reindeer Island	" "
11.	Cedar Lake	" "
12.	Birch Island	" "
13.	Lake Winnipegosis	" "

SASKATCHEWAN

14.	Moose Mountain	Game Reserve
15 and 16.	Cypress Hills	" "
17.	The Pines	" "
18.	Duck Mountain	" "
19.	Porcupine	" "
20.	Pasquia	" "
21.	Beaver Hills	" "
22.	Fort-a-la-Corne	" "
23.	Big River	" "
24.	Last Mountain Lake	Bird Reserve
25.	Lake Johnston	" "
26.	Quill Lakes	" "
27.	Red Berry Lake	" "
28.	White Bear Lake	" "
29.	Basin and Leonore Lakes	" "
30.	Crane Lake	" "
31.	Chaplin Lake	" "

Dominion Bird Reserves are Nos. 24, 25, 26, 27, 28, 29, 30, 31

MAP OF GAME AND



RESERVES IN MANITOBA AND SASKATCHEWAN

Duck Mountain	Game	Reserve	80	square	miles
Porcupine	"	"	700	"	"
Pasquia	"	"	1,800	"	"
Fort-a-la-Corne	"	"	400	"	"
Big River	"	"	360	"	"

In addition to the above game reserves, which include altogether a total area of 3,825 square miles, there are a number of reserves set aside chiefly as wild-fowl reservations, whose extent cannot be so accurately defined. These are as follows:

Wascana Game Reserve.—Comprising the waters of Wascana Lake and Creek at Regina.

The Isle of Bays Reserve.—Situated in Lake Johnston.

North and South Saskatchewan Rivers Game Reserve.—This comprises all the land and lands covered by water lying between the right and left banks of the North and South Saskatchewan Rivers, respectively, between the western boundary of the province and the easterly boundary of township 49, range 22, west of the second meridian, and all land lying within 200 yards of either bank of these rivers between the aforementioned limits.

Mr. F. Bradshaw, chief game guardian of Saskatchewan, has correctly defined what the policy should be with regard to game reserves. He says: "It is not enough, however, simply to set aside vast areas for the purpose and then think there is nothing further to be done. If the reserves are to mean anything more than a mere enactment of the statutes, they should be staffed by efficient resident game guardians, whose duties should comprise not only the systematic patrol of the reserves for the enforcement of the game-laws, but also the work of destroying the vermin which preys upon the game."

Game Reserves in Alberta

In view of the fact that the Dominion Government has established national parks on a very extensive scale in Alberta, the provincial government has not undertaken the establishment of game reserves on an extensive scale.

In 1918, however, the Alberta government established as game reserves two of the Dominion Forest Reserves, namely, the Cooking Lake Forest Reserve and the Cypress Hills Forest Reserve.

Cooking Lake Forest and Game Reserve.—This reserve is situated about twenty miles east of Edmonton. It covers an area of 95.5 square miles. Immediately north of and adjoining the reserve lies the Dominion Elk Island Park, so that the combined area of game reserve is about 112 square miles. The country included in this reserve is similar on the whole to that of the Elk Island Park. The land is gently rolling, the portion to the north of Tawayik Lake being a little more hilly than the region to the south. North of this lake there is a heavy growth of poplar, which forms excellent cover for deer and moose. To the south there is a large amount of open country, with occasional areas of aspen. Willows grow along the creeks and around the shores of the lakes, which are also bordered by considerable areas of hay meadow, forming excellent pasturage. The chief lakes are Tawayik Lake, Goose Lake, and Flying-shot Lake. All these lakes constitute good breeding and feeding places for wild fowl.

Cypress Hills Forest and Game Reserve.—This reserve is situated about fifteen miles south of Maple Creek, Sask., and about twenty-five miles southeast of Medicine Hat. It is composed of several separate blocks; of the total area of 178.5 square miles, 81 square miles lie in Alberta. It is situated on a high plateau with deep river valleys and steep slopes. The soil is sandy, and the reserve is partly covered

PROVINCIAL GAME RESERVES

1. Cooking Lake Game Reserve, Alta.
2. Cypress Hills Game Reserve, Alta.
3. Elk River Reserve, B. C.
4. Yalakom Game Reserve, B. C.
5. Strathcona Park, B. C.
6. Mount Robson Park, B. C.
7. Clearwater and Smoky Rivers Game Reserve, B. C.

DOMINION PARKS

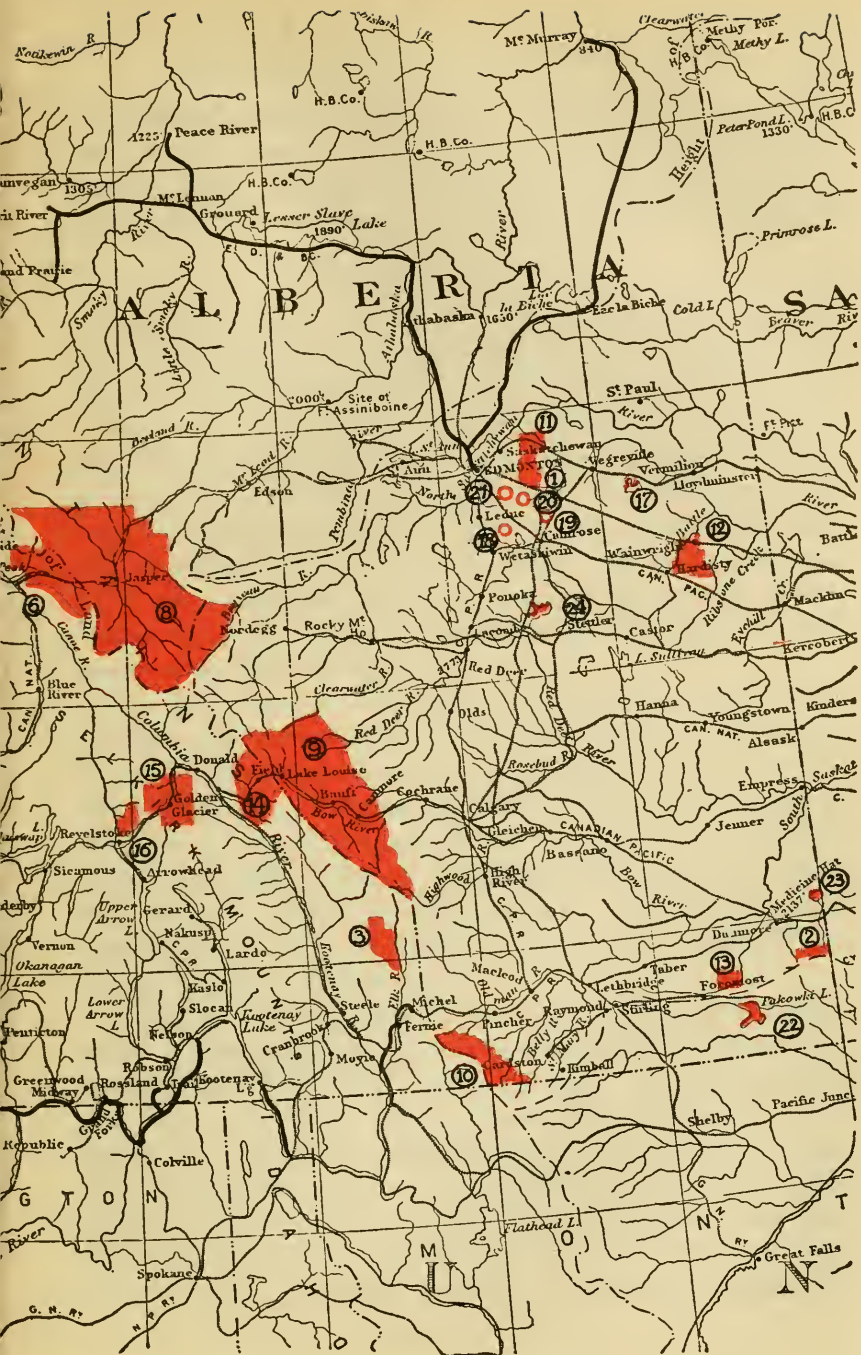
8. Jasper Park, Alta.
9. Rocky Mountains Park, Alta.
10. Waterhen Lakes Park, Alta.
11. Elk Island Park, Alta.
12. Buffalo Park, Wainwright, Alta.
13. Antelope Reserve, Foremost, Alta.
14. Yoho Park, B. C.
15. Glacier Park, B. C.
16. Revelstoke Park, B. C.

NATIONAL BIRD RESERVES IN ALBERTA

17. Birch Lake
18. Big Hay Lake
19. Miquelon Lake
20. Oliver Lake
21. Ministik Lake
22. Pakowki Lake
23. Many Island Lake (Gaskill and Greasewood Lakes)
24. Buffalo Lake.

Dominion Reserves are Nos. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24

MAP OF GAME AND



RESERVES IN ALBERTA AND BRITISH COLUMBIA

with white spruce and jack pine. Other portions are covered with poplar, and there are quite large areas of open grazing land. This reserve appears to be well adapted to the preservation of wapiti, which were formerly found there.

British Columbia

Comprising as it does one of the finest big-game territories on the North American continent, it is a hopeful sign for the future conservation of our big-game and wild-life resources that the British Columbia Government, during the past decade, has taken steps to set aside considerable tracts of undeveloped land, consisting largely of mountain and forest, as game reserves. The total area comprised in the five provincial game reserves—exclusive of the Ashnola reserve for mountain sheep—is nearly 2,867 square miles. These reserves, arranged according to the date of their reservation, are as follows:

Elk River Reserve.—This reserve, which was established in 1910, comprises an area of 234 square miles, and is situated in the southeastern corner of the province, to the west of the Elk River. It commences about fifteen miles north of Michel, on the Canadian Pacific Railway, and includes some of the finest Rocky Mountain goat and sheep country in that portion of the province. Grizzly bears and wapiti are also to be found in this area of magnificent mountain and forest scenery.

Yalakom Game Reserve.—In 1910 an area of 280 square miles, adjoining the North Fork of the Bridge River, was set aside as the Yalakom Game Reserve. The south end of the reserve is about twenty-three miles northwest of Lillooet. It comprises excellent country for goat, sheep, and deer. When the reserve was established these animals were plentiful, but since 1912 it has been estimated that they have been reduced in numbers by about 80 per cent. This reduction is ascribed partly to excessive hunting by

the Chilcotin Indians, but chiefly to the depredations of cougars, which have increased throughout that region; the sheep have been so reduced in numbers as to necessitate a close season of five years in the Lillooet region. A few years ago an endeavour was made to introduce a few wapiti into this reserve, but they were liberated on the Bridge River before the reserve was reached. Both grizzly and black bears are to be found in fair numbers in this reserve, and with adequate protection of the game and the destruction of its predatory enemies the reserve should constitute one of the finest game areas in the province.

Strathcona Park.—No more beautiful park exists in Canada than the Strathcona Park, which comprises a triangular area of 829 square miles in the centre of Vancouver Island. It includes magnificent mountains, some of which exceed 7,000 feet, flecked with glaciers and valleys of towering Douglas fir. The natural home of wapiti and deer, it was advisedly established as a game reserve in 1914, the Order in Council so creating it declaring that "no person other than park rangers, deputy game wardens and constables in the execution of their duty shall carry firearms within the limits of the said Park, and no person shall carry traps, shoot, trap or kill any animal or bird within said limits, except such persons as may be hereafter authorized to do so by the Provincial Game Warden for the purpose of killing cougar, wolves and other vermin."

Mount Robson Park.—Immediately west of and adjoining the Jasper National Park the British Columbia Government created in 1915 this park as a game reserve. It comprises an area of 640 square miles, and includes Mount Robson, 13,100 feet high. A region of high mountains and well-forested valleys, it affords an unusually good reserve for big game and other mammals and birds of that region, which have been described by Hollister and Riley, Anderson, and

Taverner in their respective accounts of the fauna published in the reports of the Alpine Club of Canada.

The Clearwater and Smoky Rivers Reserve.—This is the largest of the reserves in British Columbia, and includes an area of almost 885 square miles along the eastern side of the south fork of the Fraser River. In the Order in Council of September 2, 1912, creating this reserve, it is described as follows: "Commencing at a point at the junction of the Clearwater and the South Fork of the Fraser River; thence following the summit of the range on the west side of the Clearwater River, in a northerly direction to the headwaters of the Clearwater River; thence in an easterly direction following the summit of the range to the headwaters of the Little Smoky [Morkill] River; thence still following the summit of the range on the East side of the Little Smoky River, in a southerly direction to the South Fork of the Fraser River; thence following the South Fork of the Fraser River to the point of commencement."

Special Reserve for Mountain Sheep.—By Order in Council of November 11, 1913, certain lands in the Similkameen district, described as follows, were reserved as grazing ground for mountain sheep: "Commencing at a point being the junction of Juniper Creek and the South Fork of Ashnola River, thence north along the east bank of the said fork for a distance of one mile; thence in a southerly direction to the North Fork of Juniper Creek; thence in a westerly direction following said creek to the point of commencement."

Summary of Game Reserves in Canada

From the foregoing description of the areas set aside in Canada by the Dominion and provincial governments for the preservation of wild life, excluding the Dominion bird sanctuaries in western Canada, which are described in another chapter (see p. 235), it will be seen that altogether

30,304 square miles have been reserved for this purpose; that is, a total area exceeding the combined areas of the provinces of New Brunswick and Prince Edward Island. The following is a tabular statement of these areas:

Province	Provincial Government Reserves	Dominion Government Reserves	Total
New Brunswick.....	400 sq. miles*		400 sq. miles*
Quebec.....	5,054 " "		5,054 " "
Ontario.....	4,310 " "	25 sq. miles	4,335 " "
Manitoba.....	5,160 " "		5,160 " "
Saskatchewan.....	3,820 " "		3,820 " "
Alberta.....	176 " "	7,769 " "	7,945 " "
British Columbia....	2,867 " "	1,123 " "	3,990 " "
Total.....	.....	.....	30,704 sq. miles

* Reserve cancelled in autumn of 1920.

PROPOSED GAME RESERVE FOR NOVA SCOTIA

Notwithstanding the existence of a comparatively rich native mammalian fauna in this province, where moose, deer, bear, and the lesser fur-bearing animals continue to exist in spite of the encroachment of settlers and the destruction of the forests by the operations of the lumbermen and by fires, no steps have been taken up to the present to establish one or more provincial game reserves where *adequate* protection from killing would insure a constant surplus of game and fur-bearing animals to supply the adjacent territory and thus prevent species from decreasing to a point bordering extinction.

In Nova Scotia there are excellent tracts of land that might be set aside as game reserves, and are unsuitable for agriculture. The area best adapted for such a reserve, in my opinion, would be the tract of land in the middle of the western portion of the province which includes the region where the counties of Digby, Yarmouth, Shelburne, Queens,

and Annapolis adjoin each other, and extending eastward it would include the adjacent portions of the last two counties. From my personal knowledge of this region, which comprises burnt-over rocky barrens and stretches of hardwood and coniferous trees, and includes numerous lakes and the headwaters of many fine rivers, I feel convinced that the game and fur-bearing animals would respond quickly to the protection that such a reservation would afford.

CHAPTER XI

THE PROTECTION OF GAME AND WILD LIFE BY THE DOMINION GOVERNMENT

Owing to the fact that the protection of game and wild life in the various provinces has been undertaken by the respective provincial governments, the Dominion Government, with certain exceptions that will be mentioned, has confined its jurisdiction to the protection of the game and fur-bearing animals and other wild life in the Northwest Territories and the Yukon Territory. The exceptions are the protection of migratory birds under the Migratory Birds Convention, and the protection of the wild life in the national parks.

The Dominion legislation governing the protection of game and wild life comprises the Northwest Game Act, the Yukon Game Ordinance, the Migratory Birds Convention Act, and the Dominion Parks Act. The legislation is administered by the Minister of the Interior, and the Commissioner of Dominion Parks is charged with the enforcement of the provisions of these enactments, with the exception of the Yukon Game Ordinance, which comes under the jurisdiction of the Commissioner of the Yukon.

NORTHWEST TERRITORIES

The unorganized Northwest Territories are rich in wild life, as we have already shown, and the fur-bearing animals of the north constitute at the present time the most valuable natural resource that we are able to utilize in these vast territories. Throughout those subarctic and arctic regions our fur-bearing animals find an environment eminently suited to them, and to the production of furs of the highest grade. The fur trade of the north is not only the

chief occupation of that immense area, but it is the only means of livelihood and existence of the population. Unless the fur trade is maintained an enormous section of the Dominion would be rendered unproductive, and the native inhabitants would either starve to death or become a charge on the government. Such is the significance of our northern fur resources, as I have pointed out in another chapter. The vital importance also of the barren-ground caribou and musk-ox as sources of food and clothing for the people of the north has already been emphasized, but cannot be reiterated too often.

The protection of the game and fur-bearing animals and other wild life in the Northwest Territories is governed by the Northwest Game Act, which underwent a complete revision in 1917. For a number of years the inadequacy of the provisions of the former statute and the necessity of more effectual enforcement had become increasingly apparent to those in touch with the conditions of the wild life of the north, and familiar with the factors tending to affect adversely its conservation. In 1914 I prepared for the Commission of Conservation a memorandum regarding the necessity of amending the Northwest Game Act, 1906, having particular reference to the greater protection of the musk-ox and barren-ground caribou. A second memorandum on this subject was prepared in 1916, and, as a result of further recommendations made, the Commission at its annual meeting that year* passed a resolution urging the amendment of the Northwest Game Act, 1906, with a view to meeting the changed conditions and to securing adequate protection to the game and fur-bearing animals of the north, particularly on account of their economic importance. Soon after the creation of the Advisory Board on Wild Life Protection the revision of this act was undertaken, and a

* *Seventh Annual Report, Commission of Conservation*, 1916, pp. 32–38 and 218.

new act was drafted. This was passed by Parliament in 1917.

The most important feature of the new act and regulations passed thereunder is the licensing of the fur trade. Prior to the enactment of this legislation the fur resources of the Northwest Territories were open to the unrestricted exploitation of all comers, with the result that excessive destruction was taking place, especially by certain types of foreign trappers, who have no interest, such as that possessed by the well-known fur companies, in the future of the country. The extensive use of poison and the complete "cleaning up" of territory were methods that should be immediately checked. The only means of controlling the fur industry was by the institution of a license system, and the regulations under the Northwest Game Act provide that no person may hunt, trap, trade, or traffic in the Northwest Territories without first securing a license to do so. Native-born Indians, Eskimos, or half-breeds who are *bona fide* residents are not required, however, to obtain licenses. The new policy will also enable us to obtain reliable statistics of the fur trade in the Northwest Territories; hitherto it has been impossible to obtain such necessary information. The possession and use of poison are prohibited. The killing of female hoofed animals, such as caribou, moose, mountain sheep, and mountain goat, or the young at foot, is prohibited.

A Proposal for the National Ownership of the Fur Resources of the Northwest Territories

In an address before the Commission of Conservation in 1917 on the conservation of the fur resources of northern Canada,* I emphasized the fact that the fur trade of the Northwest Territories is not only the chief occupation of that immense area, but that it is the only means of livelihood and existence of the population, and that, unless the

* *Eighth Annual Report, Commission of Conservation*, 1917, pp. 119–122.

fur trade is maintained, an enormous part of the Dominion would be rendered unproductive and the native inhabitants would either starve to death or become a charge on the government. That, in brief, is the significance of the problem. It was also pointed out that the Danish Government administers the fur trade of Greenland as a government monopoly. State officers trade with the natives at so-called "buying places." In this manner and through their regulations regarding trapping, it is possible to exercise an amount of control that will insure the conservation of the fur resources of Greenland to a far greater extent than is otherwise possible. An important feature of this policy is also the fact that such control protects the natives from the evil effects that result from unrestricted intercourse with outside traders.

A careful consideration of the problem of our northern fur resources and the position of the native population in relation to the exploitation of such resources serves to impress one with the fact that the taking over and administration by the Dominion Government of the fur trade of the Northwest Territories would be most desirable from all points of view. The following proposal is therefore made. The Dominion Government should take over the entire control and exploitation of the fur trade and wild life resources of the Northwest Territories by enacting the necessary legislation. This would involve the purchase of such rights as the Hudson's Bay Company have in the Northwest Territories. In order to administer the monopoly it would be necessary to establish certain government posts, such as those now maintained by the Hudson's Bay Company. This would be a great advantage in securing proper and adequate government administration in the Northwest Territories, where the need of government agents to take charge of the affairs of the Indians, the enforcement of the law, the collection of customs, and oversight of other government activities

in these territories is becoming increasingly felt, and will undoubtedly become greater with their development. These government agents would perform the work now carried on by the officers of the fur companies and the duties of magistrates, etc. They would be responsible for the proper conduct of the fur trade, the care of the natives, and the enforcement of law.

If such a policy were adopted it would accomplish the following ends. A source of revenue would be created of no small value, even after the expenses of administration were paid, and it is proper that the profits accruing from the exploitation of the fur resources of these territories should go into the national exchequer. It would be the most effective method of conserving the fur resources and wild life of the Northwest Territories, as the enforcement of the law and the adoption of any necessary restrictive measures could be directly supervised. It would afford a means of attending to the requirements of the natives who stand in need of more immediate supervision, which is difficult to give at the present time. The natives, both Indian and Eskimo, would be protected to a greater degree than at present from the influence and exploitation of unscrupulous traders, which would be an advantage from the standpoint of morals and health.

The nationalization of such natural resources as forests has proved in Europe to be the most successful means of conserving such resources, and at the same time this policy has furnished a valuable source of national revenue. There is no good reason why such a policy should not be adopted in the case of our northern fur resources. The thoughtful consideration of this purpose is therefore respectfully urged.

THE YUKON TERRITORY

The game and fur-bearing animals of the Yukon Territory are protected under the Yukon Game Ordinance, which

is administered by the Commissioner of the Yukon. Its enforcement is largely in the hands of the members of the Royal Northwest Mounted Police,* who are *ex officio* game wardens. The close seasons may be changed by a resolution of the Territorial Council.

The ordinance prohibits the use of poison. In order to prevent waste of meat a heavy penalty is provided should anyone, killing game, fail to use the meat personally for food, or cause it to be used for food, or to be sold within the territory for that purpose. Traders who purchase meat of game animals are required to keep full data regarding their purchases.

Owing to the great difficulty of taking supplies into certain sections of the territory, the Commissioner may set aside any portion of it from the operation of the ordinance for such period of time as he may deem desirable, in order to provide sustenance for isolated camps, and when any locality is so set aside the Commissioner may license one or more hunters to hunt for such district under certain restrictions. One of the chief reasons for the disappearance of game from many regions has been the fact that mining and other camps have subsisted wholly, or almost wholly, on the game in the surrounding district. This policy has been carried out in regions where the bringing in of other supplies is possible. The power of suspending the operation of the game law in exceptional cases is one that should be exercised with the greatest caution, and its abuse should be safeguarded by every possible means.

The killing of game by Indians in the Yukon, particularly moose, for the purposes of sale to traders, is a practice that should be suppressed immediately. It is unwarranted; it incites a class of men, all too eager to kill everything in sight, to kill to the limit; and its continuance will absolutely deplete the supply of moose and other game animals.

* Now the Royal Canadian Mounted Police.

Apart from the fact that certain parts of the Yukon Territory contain some of the finest moose in the Dominion, the Territory cannot afford to have its game resources unnecessarily wiped out in such a manner. The situation demands immediate and stern action before it is too late to prevent the inevitable consequences.

THE MIGRATORY BIRDS CONVENTION

For many years the numbers of our migratory birds, such as ducks, geese, insectivorous birds, and shore-birds, which class includes the plovers, sandpipers, snipe, woodcock, etc., have been decreasing. This decrease is a matter of common knowledge and observation throughout the Dominion. Certain of these migratory birds, such as the Eskimo curlew, which formerly existed in enormous numbers and was killed for the market, the Labrador duck, the passenger pigeon, and the great auk have now become extinct. Others, such as the whooping crane and the wood duck, the most beautiful of our native ducks, have become so reduced in numbers as to render their continued existence without further protection a matter of doubt.

From a national standpoint the prospect of this continued decrease involved serious economic consideration. Leaving out of account the value from an æsthetic point of view of this portion of our Canadian wild life, great as that is, and regarding it as an economic asset to the country, we were faced with the gradual reduction of our migratory wild fowl, whose value as food and as means of securing recreation is inestimable, and of our insectivorous birds, which are of even greater importance to the welfare of our agricultural interests.

Insectivorous birds constitute one of the chief natural agencies controlling insect pests affecting field crops, orchards, and forests. In field crops alone the annual loss

in Canada due to the depredations of insect pests is, on a conservative estimate, not less than $125,000,000. And, with the development of the country, the damage caused by insect pests is increasing, while the numbers of insectivorous birds have been decreasing.

The chief causes of this decrease in the numbers of our migratory birds are as follows: Canada constitutes the chief breeding-place for the greater number of these birds. With the settlement of the country the breeding-places of many species have been destroyed. The clearing of the land has involved the clearing of the nesting-sites of insectivorous birds; the draining of marshy areas and the settlement of the prairies have driven wild fowl from their former breeding and feeding places. Such causes are, therefore, unavoidable to a large extent. On the other hand, while many of the provinces have excellent laws governing the protection of game, non-game, and insectivorous birds, it has not always been possible to give these birds adequate protection. The increase in the number of persons who carry guns, and the improvement of modern sporting-guns have had their effect on the abundance of wild fowl.

Even with the strictest enforcement of protective laws Canadians would have been unable to prevent the continued decrease of migratory birds unless the requisite protection were given to such birds during the time that they are in United States territory. In other words, our migratory birds cannot be adequately protected from continued decrease without co-operative protection in Canada and the United States.

It is a well-known fact that while some of the States of the Union had excellent laws, which they enforced, others failed to protect their birds. In some States the shooting of wild fowl in the spring was permitted; this involved the killing of birds, usually mated at that time of the year, on their way to their breeding-grounds in the north. This discour-

aged many Canadians, who naturally asked why they should protect their wild fowl for the market gunners of the south. The existence of such market gunners, who annually killed enormous quantities of Canadian-bred ducks and geese for the markets of the big cities in the United States, constituted one of the greatest causes of reduction and one of the chief obstacles to any rational attempt to prevent such reduction and to maintain our stock of wild fowl. Not only were game-birds affected, but insectivorous birds were likewise killed by thousands during their winter sojourn in the south; this destruction has been particularly serious in the case of the robin, one of our important cutworm destroyers.

As a result of the efforts of sportsmen, game-protective associations and other organizations interested in the conservation of the wild fowl and other migratory birds in the United States, the Federal Migratory Bird Law was enacted in 1913 for the purpose of securing more adequate protection for migratory birds which, by reason of their migratory habits, could not be successfully protected by the efforts of individual States so long as other States were derelict in the matter. The objects of the Federal regulations were to reduce the open seasons, which varied greatly in different States; to secure a more uniform open season, not exceeding three and one-half months, fixed in accordance with local conditions, so that the sportsmen would have shooting at the best time of the year; and to prevent the shooting of migratory birds in the spring. A close season for a period of years was given to certain birds, particularly shore-birds, and the shooting of insectivorous birds was entirely forbidden. The majority of the States amended their laws to conform with the Federal regulations, and, although certain States, in which the influence of the market hunter and gunners with no thought of the future appeared to predominate, objected to Federal interference, the outcome of

Photographs by R. M. Anderson

WESTERN BIRD RESERVES

1. Flock of Bonaparte's Gulls on middle Miquelon Lake, Alberta
2. Whistling Swans rising from water on Lake Johnstone, Saskatchewan
3. Southwest end of Ministik Lake, Alberta

this increased protection and elimination of spring shooting has been a noticeable increase in the numbers of wild fowl. This increase has also been observed by Canadian sportsmen.

The results of the Federal Migratory Bird Law in the United States indicated the possibilities and served to emphasize strongly the need of international co-operation between Canada and the United States in the protection of those species of birds which migrate from one country to the other.

The importance of international co-operation in this matter had been realized for a number of years, but no official action was taken until the United States Senate adopted a resolution, on July 7, 1913, requesting the President to propose to the governments of other countries the negotiation of a convention for the protection of migratory birds. This resolution was not acted upon until the following year. In the meantime several organizations and individuals in Canada and the United States took steps to further the proposal for international action. On December 10, 1913, at the instance of the Department of Colonization, Mines, and Fisheries of the Province of Quebec, Mr. H. R. Charlton, of Montreal, introduced the subject of the proposed convention at the annual meeting of the North American Fish and Game Protective Association at Ottawa, and moved the following resolution, which was adopted:

> That the executive committee be requested to place itself in communication with the various provincial governments of Canada to urge upon them the importance of soliciting the good offices of the Dominion Government in obtaining the negotiation of a convention or treaty between Great Britain and the United States, looking to the more efficient protection of migratory birds, now threatened with extinction, and following as much as possible the lines laid down in the accompanying suggested draft.

In January, 1914, the question of international co-operation was informally discussed by the writer with the Biological

Survey of the United States Department of Agriculture. Later in the same month the subject was discussed in Ottawa at the annual meeting of the Commission of Conservation, and the following resolution was passed by the commission:

> *Resolved*, That the provincial governments of Canada be urged to solicit the good offices of the Dominion Government in obtaining the negotiation of a convention for a treaty between Great Britain and the United States, for the purpose of securing more effective protection for the birds which pass from one country to another.

The Dominion Parks Branch of the Department of the Interior also interested itself in furthering this measure.

In the following month (February, 1914) the United States Government submitted to the Canadian Government for its consideration the draft of a convention between Great Britain and the United States for the protection of migratory birds in the United States and Canada. The draft of the proposed convention was submitted to the several provincial governments for their views, as the question was of provincial concern. The provincial governments unanimously approved of the principle of the convention. As objections that were not considered to be insuperable were raised by only two of the provinces, and, as the Departments of Agriculture and of the Interior, and the Commission of Conservation strongly concurred in the opinion that the protection of these birds, as provided under the proposed convention, particularly on economic grounds, was most desirable, an Order in Council was passed on May 31, 1915, stating that the Canadian Government was favourably disposed to the conclusion of the proposed treaty. With a view to securing the settlement of our objections to certain provisions of the treaty further negotiations were undertaken in Washington early in 1916, as a result of which all the objections raised were completely met, with the excep-

tion of one that would have affected the vital principle of the proposed treaty, namely, the elimination of spring shooting. Accordingly, a revised draft convention embodying the changes which had been made to meet the objections raised by the provincial governments, together with certain other improvements, was prepared and submitted to the Canadian Government in March, 1916. After further consideration of this revised draft by the government an Order in Council was passed on June 29, 1916, stating that "Canada is prepared to agree to the conclusion of the convention" conditional to the adoption of certain other amendments which had been agreed to as a result of informal negotiations.

The treaty was signed in Washington on August 16, 1916, by His Majesty's Ambassador, Sir Cecil Spring-Rice, G. C. V. O., and the Secretary of State of the United States, Mr. Robert Lansing. On the unanimous vote of the Committee on Foreign Relations it was ratified by the Senate of the United States on August 29, 1916.

The full text of the convention is set forth in the schedule of the Migratory Birds Convention Act.

In the fulfilment of the agreement made in Article VIII of the convention the Migratory Birds Convention Act was passed at the next session of Parliament following its ratification, and was assented to on August 29, 1917.

It will be seen that the most important provision in the convention is Article II, providing for: (1) a close season on migratory game-birds from March 10 to September 1, with the exception given; (2) an open season of three and one-half months; and (3) a close season throughout the year on insectivorous birds. The open season of three and one-half months may be fixed anywhere between September 1 and March 10, to suit the local conditions. The restriction of the open season on wild fowl to three and one-half months will involve in some provinces a shortening of the present

open season, but in view of the objects of the treaty and the experience that such restriction in the United States is increasing the supply of birds, this change will undoubtedly meet with the support of sportsmen desirous of preventing the continued decrease in the numbers of wild fowl.

The conclusion of this convention constitutes the most important and far-reaching measure ever taken in the history of bird protection. Some years ago efforts were made to secure the international protection of birds in Europe, but, while the general movement towards better protection for insectivorous birds was thereby furthered, the requisite co-operation on the part of all the countries interested was hampered by inactivity on the part of some of the governments and a considerable diversity of interests and opinion. Fortunately many of these difficulties do not exist in North America, and in the United States and Canada there is an ever-growing sentiment in favour of preserving what is left of our former wealth of wild life which has been so seriously depleted by improvidence in the past. This international measure will affect over one thousand species and subspecies of birds from the Gulf of Mexico to the North Pole, and we may confidently look forward not merely to a cessation of the decrease but to an increase of our migratory birds, which are so valuable a national asset.

The following is the text of the Migratory Birds Convention:

Whereas many species of birds in the course of their annual migrations traverse certain parts of the Dominion of Canada and the United States; and

Whereas many of these species are of great value as a source of food or in destroying insects which are injurious to forests and forage plants on the public domain, as well as to agricultural crops, in both Canada and the United States, but are nevertheless in danger of extermination through lack of adequate protection during the nesting season or while on their way to and from their breeding grounds;

His Majesty the King of the United Kingdom of Great Britain and

Ireland and of the British Dominions Beyond the Seas, Emperor of India, and the United States of America, being desirous of saving from indiscriminate slaughter and of insuring the preservation of such migratory birds as are either useful to man or are harmless, have resolved to adopt some uniform system of protection which shall effectively accomplish such objects, and to the end of concluding a convention for this purpose have appointed as their respective plenipotentiaries:

His Britannic Majesty, the Right Honourable Sir Cecil Arthur Spring-Rice, G.C.V.O., K.C.M.G., etc., His Majesty's ambassador extraordinary and plenipotentiary at Washington; and

The President of the United States of America, Robert Lansing, Secretary of State of the United States;

Who, after having communicated to each other their respective full powers which were found to be in due and proper form, have agreed to and adopted the following articles:—

Article I

The High Contracting Powers declare that the migratory birds included in the terms of this Convention shall be as follows:—

1. Migratory Game Birds:—

(*a*) Anatidæ or waterfowl, including brant, wild ducks, geese, and swans.

(*b*) Gruidæ or cranes, including little brown, sandhill, and whooping cranes.

(*c*) Rallidæ or rails, including coots, gallinules and sora and other rails.

(*d*) Limicolæ or shorebirds, including avocets, curlew, dowitchers, godwits, knots, oyster catchers, phalaropes, plovers, sandpipers, snipe, stilts, surf birds, turnstones, willet, woodcock, and yellowlegs.

(*e*) Columbidæ or pigeons, including doves and wild pigeons.

2. Migratory Insectivorous Birds: Bobolinks, catbirds, chickadees, cuckoos, flickers, flycatchers, grosbeaks, humming birds, kinglets, martins, meadowlarks, nighthawks or bull bats, nut-hatches, orioles, robins, shrikes, swallows, swifts, tanagers, titmice, thrushes, vireos, warblers, waxwings, whippoorwills, woodpeckers, and wrens, and all other perching birds which feed entirely or chiefly on insects.

3. Other Migratory Nongame Birds: Auks, auklets, bitterns, fulmars, gannets, grebes, guillemots, gulls, herons, jaegers, loons, murres, petrels, puffins, shearwaters, and terns.

Article II

The High Contracting Powers agree that, as an effective means of preserving migratory birds, there shall be established the following close

seasons during which no hunting shall be done except for scientific or propagating purposes under permits issued by proper authorities.

1. The close season on migratory game birds shall be between 10th March and 1st September, except that the close of the season on the limicolæ or shorebirds in the Maritime Provinces of Canada and in those States of the United States bordering on the Atlantic Ocean which are situated wholly or in part north of Chesapeake Bay shall be between 1st February and 15th August, and that Indians may take at any time scoters for food but not for sale. The season for hunting shall be further restricted to such period not exceeding three and one-half months as the High Contracting Powers may severally deem appropriate and define by law or regulation.

2. The close season on migratory insectivorous birds shall continue throughout the year.

3. The close season on other migratory nongame birds shall continue throughout the year, except that Eskimos and Indians may take at any season auks, auklets, guillemots, murres and puffins, and their eggs for food and their skins for clothing, but the birds and eggs so taken shall not be sold or offered for sale.

Article III

The High Contracting Powers agree that during the period of ten years next following the going into effect of this Convention, there shall be a continuous close season on the following migratory game birds, to wit:

Band-tailed pigeons, little brown, sandhill and whooping cranes, swans, curlew and all shorebirds (except the black-breasted and golden plover, Wilson or jack snipe, woodcock, and the greater and lesser yellowlegs); provided that during such ten years the close seasons on cranes, swans and curlew in the province of British Columbia shall be made by the proper authorities of that province within the general dates and limitations elsewhere prescribed in this Convention for the respective groups to which these birds belong.

Article IV

The High Contracting Powers agree that special protection shall be given the wood-duck and the eider-duck either (1) by a close season extending over a period of at least five years, or (2) by the establishment of refuges, or (3) by such other regulations as may be deemed appropriate.

Article V

The taking of nests or eggs of migratory game or insectivorous or nongame birds shall be prohibited, except for scientific or propagating

purposes under such laws or regulations as the High Contracting Powers may severally deem appropriate.

Article VI

The High Contracting Powers agree that the shipment or export of migratory birds or their eggs from any State or Province, during the continuance of the close season in such State or Province, shall be prohibited except for scientific or propagating purposes, and the international traffic in any birds or eggs at such time captured, killed, taken, or shipped at any time contrary to the laws of the State or Province in which the same were captured, killed, taken, or shipped shall be likewise prohibited. Every package containing migratory birds or any parts thereof or any eggs of migratory birds transported, or offered for transportation from the Dominion of Canada into the United States or from the United States into the Dominion of Canada, shall have the name and address of the shipper and an accurate statement of the contents clearly marked on the outside of such package.

Article VII

Permits to kill any of the above-named birds which, under extraordinary conditions, may become seriously injurious to the agricultural or other interests in any particular community, may be issued by the proper authorities of the High Contracting Powers under suitable regulations prescribed therefor by them respectively, but such permits shall lapse or may be cancelled, at any time when, in the opinion of said authorities, the particular exigency has passed, and no birds killed under this article shall be shipped, sold, or offered for sale.

Article VIII

The High Contracting Powers agree themselves to take, or propose to their respective appropriate law-making bodies, the necessary measures for insuring the execution of the present Convention.

Article IX

The present Convention shall be ratified by His Britannic Majesty and by the President of the United States of America, by and with the advice and consent of the Senate thereof. The ratifications shall be exchanged at Washington as soon as possible and the Convention shall take effect on the date of the exchange of the ratifications. It shall remain in force for fifteen years, and in the event of neither of the High

Contracting Powers having given notification, twelve months before the expiration of said period of fifteen years, of its intention of terminating its operation, the Convention shall continue to remain in force for one year and so on from year to year.

In faith whereof, the respective Plenipotentiaries have signed the present Convention in duplicate and have hereunto affixed their seals.

Done at Washington this sixteenth day of August, 1916.

(L.S.) CECIL SPRING-RICE.
(L.S.) ROBERT LANSING.

The regulations under the Migratory Birds Convention Act were passed by Order in Council on April 23, 1918, and the following open seasons for migratory game-birds in Canada were provided under Section 2 of these regulations:

	Ducks, Geese, Brant, and Rails	Black-breasted and Golden Plover, and Greater and Lesser Yellow-legs	Woodcock and Wilson or Jack Snipe
Prince Edward Island.	Sept. 1–Dec. 14	Aug. 15–Nov. 30	Sept. 15–Nov. 30
Nova Scotia	Sept. 15–Dec. 31	Aug. 15–Nov. 30	Sept. 1–Dec. 14
New Brunswick	Sept. 15–Dec. 14	Aug. 15–Nov. 30	Sept. 15–Nov. 30
Quebec	Sept. 1–Dec. 14	Sept. 1–Dec. 14	Aug. 15–Nov. 30 Sept. 1–Dec. 14
Ontario	Sept. 1–Dec. 14	Sept. 1–Dec. 14	Oct. 15–Nov. 14
Manitoba	Sept. 15–Nov. 30	Sept. 15–Nov. 30	Sept. 15–Nov. 30
Saskatchewan	Sept. 15–Dec. 31	Sept. 15–Dec. 31	Sept. 15–Dec. 31
Alberta	Sept. 1–Dec. 14	Sept. 1–Dec. 14	Sept. 1–Dec. 14
British Columbia, north	Sept. 1–Dec. 14	Sept. 1–Dec. 14	Sept. 1–Dec. 14
British Columbia, southeast	Sept. 15–Dec. 31	Sept. 15–Dec. 31	Sept. 15–Dec. 31
British Columbia, southwest	Oct. 1–Jan. 14	Oct. 1–Jan. 14	Oct. 1–Jan. 14
Northwest Territories.	Sept. 1–Dec. 14	Sept. 1–Dec. 14	Sept. 1–Dec. 14
Yukon	Sept. 1–Dec. 14	Sept. 1–Dec. 14	Sept. 1–Dec. 14

Most of the provinces have now amended their game laws in order that the sections relating to the protection of migratory birds may conform to the provisions of the Convention. By so doing it will be possible for the provincial governments to enforce the provisions of the Convention within their respective territories.

DOMINION PARKS ACT

As one of the main objects of the Canadian National Parks is to conserve the native mammals and birds, stringent regulations are in force to prevent the hunting, capture, destruction, or molestation in any way of the wild life in the national parks, which have been described in another chapter (pp. 235–243).

These regulations make it illegal to:

1. Chase, harass or pursue, hunt, shoot at, trap, take, wound, kill, capture, or destroy any game—which term includes all mammals or birds within any national park.
2. Have in possession, except as specially provided, any game, or parts thereof, killed or procured within a national park.
3. Use poison, poisonous substances, or gas for taking, injuring, or destroying game in a national park.
4. Sell within a national park guns or other weapons used for the destruction of game without a permit.
5. Carry guns or firearms of any description within a national park, except by an officer of the park, unless such guns shall have been sealed by the superintendent of the park or a duly authorized official. Any unsealed gun or firearm found in a national park is subject to forfeiture.
6. Allow dogs to run unleashed in a national park.

In addition, the regulations provide for the following:

1. The forfeiture of the outfits of all persons convicted of illegally hunting or killing any game or having illegal possession of game within a national park. (The significance of this penalty was realized by a party of hunters who were proved a few years ago

to have killed game within the borders of one of the national parks, and their outfits, which included a considerable number of pack-horses, were confiscated.)

2. The search by a game warden of outfits, premises, tents, vehicles, or vessels for poison.
3. The capture or destruction by game wardens or officers under the parks administration of predatory or dangerous animals or noxious birds.
4. The capture or killing under proper authority of game for scientific or propagating purposes.
5. The destruction of cats, which are not allowed within the confines of a national park.
6. The registration by all guides travelling through a national park of full details regarding any hunting party travelling through such a park, and registration by the persons hunting. Such registration includes the names and addresses, date of departure and proposed duration of stay in the park, list of firearms carried and route to be travelled. (This requirement is enforced, owing to the fact that many parties of hunters choose as the point of departure such places as Banff and Jasper, where they outfit for hunting-grounds outside the boundaries of such national parks.)

It is satisfactory to be able to record that the foregoing regulations are very strictly enforced in the national parks, to the great benefit of the wild life within the parks.

CHAPTER XII

A REVIEW OF PROVINCIAL GAME LEGISLATION

All the provinces of Canada have undertaken the protection of game and wild life, and have passed legislation for that purpose. In most cases the game laws are framed wisely and enforced effectively; in certain cases the administration of the game laws is not in accordance with the needs of the situation. Too often in the past political or other considerations have influenced the selection of game officers, and have prevented the impartial administration of game laws; there has been too great a desire to protect local politics rather than local game, with a disastrous effect on the latter. The protection of game and wild life demands the appointment of qualified officers and the administration of game laws without fear or favour. The coexistence of game with large populations in older countries, such as England, Scotland, and other European countries, has been due, not only to propagation of game, but to impartial administration of game laws and their strict observance by all.

Our game resources will never benefit to the extent that is necessary, and is intended by our game laws, until the administration of all game laws is completely freed from political influence or interference, and there are sufficient qualified and conscientious game wardens to meet the requirements of all parts of the Dominion. Fortunately, there has been marked and encouraging progress in this direction in recent years, and, as the needs are more widely appreciated, we may expect in Canada game laws and a standard of administration that will not be surpassed in any other

country. With game and wild-life resources unequalled by any other country in the world, it is surely incumbent upon us to secure and maintain the highest standard in wise protective policies and their enforcement. Always it should be remembered that the primary object of game legislation is to protect the interests of the game and not those of the persons who desire to exploit such resources. Of all our resources, the game, fur-bearing, and other animals are most easily destroyed, and they cannot be restored under modern conditions; it is necessary therefore that special care should be devoted to their wise protection, and that the issuing of hunting-licenses and the collection of fees should not constitute the main functions of game officers.

In the following review of provincial game legislation and its administration, an effort is made to indicate in what directions the game laws of the various provinces and their administration may be improved, with a view to securing better conservation of the animals that these laws are designed to protect.

Prince Edward Island.—The Game Act of 1906, with subsequent amendments, provides for the appointment of a game inspector for the enforcement of the act, the provisions of which are also enforced by the provincial constables, policemen, and market clerks. The members of the Prince Edward Island Fish and Game Association are appointed honorary game wardens. For some time the position of game inspector has been vacant, and we cannot but feel that the lack of such an officer will result in a laxity in the enforcement of the provisions of the provincial game act. Bag limits should be provided in the case of game-birds.

The sale of game-birds during the open season and the use of automatic and pump guns are wisely forbidden.

Nova Scotia.—The Game Act of 1912, with subsequent amendments, is administered by a chief game commissioner and two associate commissioners, who are empowered to

appoint game wardens and district game inspectors. Registered guides and chief forest rangers are *ex officio* game wardens.

There appears to be an insufficient number of game wardens in the province, and a consequent failure to enforce fully the provisions of the game act. The sale of deer, caribou, and certain protected game-birds is prohibited, but such prohibition should also include moose and wild fowl.

We would also urge the indefinite continuation of the close season on cow moose and caribou, as it is certain that without such means of increasing its abundance the caribou will become a thing of the past in Nova Scotia. The desirability of establishing one or more game reserves in Nova Scotia has already been pointed out (see p. 256).

New Brunswick.—The Game Act of 1909, with later amendments, is administered by the Minister of Lands and Mines. As a result of recent reorganization the protection of game has been combined with the forestry work, and the provincial forester is in charge of both services with a chief game guardian to superintend the enforcement of the game laws. The duties of game warden and forest ranger are combined, and there are many obvious advantages to such an arrangement. The number of *ex officio* game wardens has been greatly increased. An applicant for a game license is now required to take an oath that he will observe the game laws. This requirement should be more widely adopted; it will help to eliminate the "unfit" hunter.

Two steps taken by the Province of New Brunswick in 1918 are highly commendable. In the first place, the policy of appointing game wardens by a qualifying examination has been adopted in place of the patronage system. Such a method of securing efficient and qualified officers cannot be too highly praised, and its adoption by other governments would do more than anything else to bring about an effective conservation of our game animals. The second wise

policy is the prohibition of the sale of protected game, but we regret the retrograde action of the New Brunswick government in repealing the no-sale of game regulation after it had been in effect for one season (1918–1919). This question is discussed elsewhere (see p. 333).

A bounty of twenty-five cents is paid for hawks and owls. While the destruction of the great horned owl and certain hawks, such as the goshawk and sharp-shinned hawk, should be encouraged, the destruction of all owls and hawks that such a bounty encourages is very unwise, and an amendment of this provision is recommended.

Owing to the scarcity of caribou in New Brunswick a close season has been established until 1921, and it will probably prove desirable to extend this close season for a further period of years.

Quebec.—The Minister of Colonization, Mines, and Fisheries administers the Quebec game laws. The Department of Game and Fisheries realizes the importance to the province of its game resources, which are being protected by a force of zealous wardens, who are apparently administering impartially the game laws.

Until recently Quebec was the only province in which a close season was established for black bear. This has no doubt been responsible for the fact that there is no scarcity of this valuable fur-bearer in Quebec. The prohibition of the sale of all protected game, the reduction in the number of caribou that may be killed, and the institution of bag limits on wild fowl are measures that are to be strongly recommended.

We would also suggest the protection of those species of owls and hawks that are known to be beneficial as destroyers of noxious rodents, etc.

In the regulation of the fur trade the Province of Quebec has made a noteworthy advance, and the enforcement of the measures now in effect will undoubtedly insure the con-

servation of one of the most valuable natural resources and economic assets in the province.

Ontario.—A few years ago the Ontario government created a special Department of Game and Fisheries, with a deputy minister in charge to administer the Ontario Game and Fisheries Act. The Minister of Public Works and Highways administers the department. The organization for the enforcement of the provisions of the act consists of a deputy minister, a superintendent, inspectors (not exceeding three in number), wardens who have districts, and overseers who have the authority of constables under the act.

The greatest need in Ontario is the prohibition of the sale of all protected game, which is discussed elsewhere (p. 331). In view of the fact that there are not, so far as our records show, any wild turkeys in Ontario, this bird might advisedly be placed in the category of extinct game-birds, and given at least a permanent close season instead of an open season of a fortnight as at present! The absolute close season on quail should be maintained (see p. 160). It would also be in the interests of the wild fowl, such as ducks and geese, to establish a daily limit in addition to a seasonal bag limit.

Manitoba.—The Game Protection Act of Manitoba is administered by the Minister of Agriculture, the provisions of the act being enforced by the chief game guardians, with the assistance of local game guardians.

The Manitoba government wisely prohibits the sale of all protected game, and has recently given the wapiti or elk a permanent close season. In view of the fact that antelope no longer occur in Manitoba, and are permanently protected in Saskatchewan and Alberta, where the few that remain are now to be found, the provision of an open season of three weeks for antelope in Manitoba should be repealed. A bag limit of forty ducks per day in October and November, without a seasonal bag limit, appears to us to be too large at the present time.

Saskatchewan.—The Game Act of Saskatchewan is administered by the Minister of Agriculture, and the provisions of the act are enforced by a provincial game guardian, with the assistance of local game guardians and honorary guardians.

One of the chief needs of Saskatchewan appears to be the organization of a staff of paid and qualified district game guardians, as the present system fails to meet adequately the requirements of the situation, and throws too much responsibility on the provincial game guardians for the proper enforcement of the provisions of the Game Act.

In all the Prairie Provinces the Royal Northwest Mounted Police, as *ex officio* game wardens, have greatly assisted in the enforcement of the provincial game acts, and perhaps this fact has been partially responsible for the failure on the part of the governments concerned to organize adequate field staffs for game protection.

It is gratifying to record that the efforts that have been made to secure a permanent close season on wapiti or elk have now proved successful. The Province of Saskatchewan is to be congratulated as one of the first provinces in Canada to prohibit the sale of protected game. As Bulletin No. 49 of the Saskatchewan Department of Agriculture, giving a synopsis of the game laws, states: "A game butcher or market hunter is an undesirable citizen and should be treated as such."

We would recommend that the close season on sage grouse be made indefinite, in view of the very restricted range of this bird in Canada and the fact that it is not likely to become abundant.

As a means of preventing accidents, hunters of big game in Saskatchewan are required, as also in Manitoba, to wear white outer suit and cap. Such a distinguishing costume might advisedly be adopted in other provinces.

Alberta.—As in the other Prairie Provinces the Game Act

is administered by the Minister of Agriculture, and the provisions of the act are enforced by a chief game guardian.

The most necessary amendment that is required in the Alberta Game Act is the repeal of those provisions which legalize market hunting, and the prohibition of the sale of game. The existence in this act of an interpretation clause which states that: "The term 'market hunter' shall mean any person who hunts or shoots game for gain or profit," and the legalizing of such hunting for monetary gain by the purchase of a market hunter's license for five dollars, are not in keeping with the principles of game protection of to-day, when all authorities are agreed that the market hunter is a menace to what remains of our game resources. We would urge the Alberta Government to remove from an excellent game act that which tends, more than anything else, to defeat the objects of such legislation.

The number of mountain sheep and goat in Alberta would undoubtedly increase if the bag limit were reduced to one sheep and one goat, and if the laws were enforced in the case of Indians, who have been chiefly responsible for the reduction that has taken place in the number of these animals, which are a great asset to the province.

British Columbia.—In 1918 the game-protection service in British Columbia was completely reorganized by the establishment of a Provincial Game Conservation Board, consisting of members appointed by the Lieutenant-Governor in Council, which board is charged with the administration of the Game Act. It has been decided to entrust to the provincial police, who will be *ex officio* game guardians, the enforcement of the provisions of the Game Act, and the chief of the provincial police is chief game warden. A number of the experienced game wardens are retained.

The game legislation of British Columbia differs from that of the rest of the provinces by reason of the fact that the open seasons are fixed by the Lieutenant-Governor in Coun-

cil, and not by the provincial legislature. A similar policy is followed in the case of the legislation enacted by the Dominion Government for the protection of migratory birds and of game in the Northwest Territories. The method of fixing open seasons, etc., by Order in Council, has great advantages over the method generally in vogue of accomplishing this by amendments to the Game Act. Such amendments can only be made when the legislature is in session, and not infrequently it is of great importance to make a change in an open season without the delay necessitated by a postponement of such action until the legislature meets. The claim sometimes made that delegation of these powers to the Lieutenant-Governor in Council is likely to be abused has not been borne out in practice; on the contrary, it has been found that the needs of the situations that arise from time to time in wild-life protection can be more opportunely met by such a policy, which is to be strongly recommended on that account.

A number of important restrictions have recently been placed on the killing of big game. The bag limit on moose has been reduced from two to one, on caribou from three to two, and on mountain goat from three to two. These were necessary and wise reductions and, with the other restrictions on big-game hunting that have been made, they undoubtedly will be a means of conserving some of our finest big game, for which the province is justly famous. In fact, there is no better big-game region on the North American continent than the Cassiar region of British Columbia.

In 1918, for the first time, a close season was established on bear, which now may be killed only from October 1 to June 30. It would be very desirable to proceed further and amend the Game Act for the purpose of establishing a bag limit on grizzly bears. Grizzlies are not so abundant now as to permit their unlimited destruction.

The sale of all protected game is advisedly prohibited

throughout the province, with the following exceptions, namely: moose and caribou (bulls over one year of age only) may be sold in the northern districts—Atlin, Prince George, Omineca, and Cariboo—from October 1 to December 15, and bear throughout the province from October 1 to June 30.

CHAPTER XIII

INDIVIDUAL AND COMMUNITY EFFORT IN THE CONSERVATION OF WILD LIFE

The conservation of our wild life, from the largest of our big game to the smallest of our insectivorous birds, can only be achieved when a wider interest in the subject is created in the minds of the majority of our citizens. Our responsibilities in this matter have been indicated in a previous chapter. At the present time we depend almost entirely upon the enforcement of our game laws for the attainment of our ends. Wise game laws will do much for the protection of our wild life, particularly in the direction of checking the destructive tendencies of the market hunter and game-hog; but the proper enforcement of such laws can only be effected if the will of the people at large is behind them, and in order to secure such popular support there must be carried out a policy of education among young and old.

Education

Educational propaganda on this subject should be more easy of execution than that covering the conservation of any other resource, for this reason: no subject is more appealing to young people and to older people, whatever their vocations, than that of wild life. Further, there is an encouraging growth in the demand for information on this subject, and the increasing number of "nature" books is an indication of that demand. No subject appeals more to the average child than natural history, and the ever-growing num-

ber of our citizens who nowadays find their recreation in field and forest has naturally led to a desire for information regarding all the forms of wild life that constitute one of the great attractions of our countryside. Advantage should therefore be taken of these favourable circumstances.

In our schools instruction in natural history is advisedly receiving greater attention. The subject is so fundamental to a proper conception of the world wherein we live, and is so valuable as a means of conveying information on biological problems, particularly in relation to health, that it should be given a prominent place in every educational curriculum. If it were given, as it should be given, a place in a child's instruction equal in importance to what are now considered the primary essentials in education, a broader, more humane, and more sympathetic mental attitude would ensue. What knowledge can be of greater interest and value than a knowledge of the world around us and of our fellow creatures?

At the end of an heroic journey, awaiting death, that most gallant and brave of British explorers, Captain R. F. Scott, in his last letter to his wife, wrote these memorable words regarding the education of his little son Peter: "Make the boy interested in natural history if you can; it is better than games; they encourage it at some schools. I know you will keep him in the open air." What greater testimony could we have?

If natural history were taught in all our schools, and children were thus trained to understand and appreciate the meaning of our wild life, its conservation would be insured. A great responsibility, therefore, rests upon the shoulders of our educational authorities, and we fervently hope that they will not be negligent in their attention to the needs of the situation.

One of the most potent organizations that, properly directed, may be utilized in our educational propaganda, is the Boy Scouts. The far-sighted organizer of this world-

wide association of boyhood, himself a hunter and lover of open-air pursuits, realized the moral and educational value of the open air and a knowledge of woodcraft and wild life as one of the essentials of this system of training. It is impossible to conceive a greater opportunity than that afforded by this organization for creating a vast army of protectors of our wild life. We would urge those in charge of this valuable work to lay special stress upon the significance of our wild life, its rational use and proper conservation; by so doing a work of inestimable value will be accomplished.

The press of this country has repeatedly shown its interest in this subject. But it can render far greater assistance than it has afforded up to the present by taking every opportunity to lead public opinion in regard to the necessity of conserving our wild life. It is not sufficient to chronicle events, but in season and out of season the press should promote the conservation of our wild life and censure such acts and movements as tend to affect its interests adversely.

One of the most valuable educational agencies of to-day is the moving picture, and its influence is increasing. A few years ago I was informed that educational films were not popular, and that it was necessary to cater to public opinion. Fortunately, this does not appear to be true to-day. The makers of films have realized the interest that the general public takes in films depicting wild-life subjects, and there are a large number of such films now in circulation. Their preparation should be encouraged and assisted to the fullest extent possible. No better means exists for placing before the people the wealth of our wild life, and the necessity of conserving it for the enjoyment of the people of to-day and in the future. Scenes depicting the killing of big game and other animals should be avoided, on account of their undesirable effect, although hunting scenes may be so illustrated and described as to demonstrate the recreative value of wild life to the people of our cities.

From photographs by P. A. Taverner. Courtesy of the Geological Survey

Reproduced by courtesy of the Museum

1. Dead Gannets on beach near Percé, Gaspe, Quebec, where they have been washed up after being shot. Such destruction as this was one of the reasons for the establishment of this reserve
2. Gannets nesting on the cliffs of Bonaventure Island, Gaspe
3. Sea-bird group in American Museum of Natural History, representing a section of Bird Rock in the Gulf of Saint Lawrence

Private Wild-Life Sanctuaries and Game Reserves

We have, fortunately, in Canada many examples of what can be accomplished by individual effort to preserve the wild life in a limited area. The value of such instances cannot be overestimated, both on account of the examples they offer of what can be achieved by individuals and their effect on the abundance of the wild life of the neighbourhood.

Mention has been made in previous chapters of instances of individual effort, such as the work of Mr. Jack Miner, in creating a wild-life sanctuary, particularly for wild fowl, near Kingsville, Ont., and of the fifteen-acre game preserve of Mr. Reuben Lloyd, a farmer at Davidson, Sask. In Ontario the Provincial Government has taken the commendable step of encouraging the establishment of wild-life preserves by individuals, and, in addition to the "Miner Sanctuary," it has recently set aside the "Peasemarsh Farm," on the shore of Georgian Bay in the county of Grey, as a bird sanctuary, at the request of the owner, Miss E. L. Marsh. We hope this example will be widely followed in other parts of the country, for nothing gives the owner so much real pleasure as the possession of a tract of land, however small it may be, in which the wild life is protected, not only from human enemies but from predatory animals, and particularly cats, the most destructive of the alien enemies of our native birds.

The owner of a private wild-life sanctuary soon gains the confidence of the creatures that enjoy his protection. Daily his enjoyment of such a sanctuary increases, as his knowledge of the wild life that he is protecting grows and as new members respond to his encouragement. The changing of the seasons is followed by changes in his wild-life community. There is a never-ending stream of new pleasures that can come only to those who are fortunate enough to possess

an area of suitable land and wise enough to assume the guardianship of the wild life that it harbours or is capable of harbouring, if protection is given by such means as may be necessary.

The abundance of game in many European countries, frequently in regions devoted to agriculture and well populated, is due in no small measure to the existence of game preserves and the careful protection of the game, in addition to its propagation and the destruction of its enemies. In Canada the absence of large estates and the ownership of the land by those who cultivate it place the responsibility in the matter of protecting the wild life on the farms largely upon the farmer in the agricultural districts.

Farmers and Game Protection.—A number of our game laws protect cultivated, cleared, or enclosed farm lands from trespass, the permission of the owner being required in order to hunt or shoot over such land. This is a just and necessary recognition of the rights of the owner to the wild life on his own land and to protection against damage to his crops and property. Much ill feeling has been aroused between farmers and hunters from the cities, owing to the failure of the latter to recognize the rights of the former, even though they be not legal rights, and to avoid inflicting damage to growing crops or other property. The creation of a hostile attitude of mind on the part of a farmer towards sportsmen, through the thoughtlessness or wilful behaviour of the latter, is liable to react on the protection of the wild life, as a farmer will be less disposed to undertake protective measures, particularly in regard to game animals, if his efforts are likely to lead to increased annoyance to himself and greater damage to his property. It is essential, therefore, that sportsmen and others interested in the conservation of wild life should respect the rights and interests of farmers in the wild life and game on their farms, whether their rights are established by provincial law or not.

A sympathetic attitude on the part of farmers throughout Canada towards the conservation of wild life would be more effectual than any other factor in promoting this object. Comparatively few farmers, however, appreciate the advantages which accrue from the protection and encouragement of wild life on their own properties. The economic importance of protecting insectivorous birds on our farms has already been emphasized in a previous chapter. To the farmer the presence of a supply of game on his farm means an addition to his meat supply. Further, if he undertakes to propagate game on his farm, he would, in many cases, obtain higher prices for such game than for the domestic poultry; game propagation, however, is a special subject in itself, and should not be undertaken without some knowledge of the subject, or loss and disappointment will follow instead of profit and enjoyment. The protection of game and wild life on the farm requires neither special knowledge nor great expense. The essentials are: (1) a well-defined boundary with appropriate notices at intervals for the public; (2) plenty of cover; (3) the destruction of predatory mammals and birds; (4) as abundant a supply of water as can be provided; and (5) a little food during inclement weather.

Until the pleasures of wild life protection are enjoyed and its benefits appreciated by farmers, it is impossible for them to realize how the attraction of the farm and of farm life can be increased for them and their families. Such an added interest to the life of the farms in many parts of Canada would help to retain some portion of the youth that now finds farm life too uninteresting, and migrates to the cities, thus reducing our agricultural population and food production; this is not a hypothetical opinion but is based on experience.

Clubs.—In an account of his hunting experience in Quebec a few years ago, the late Colonel Theodore Roosevelt wrote:

"In addition to the game laws, a large part is played in Canadian game preservation by the hunting and fishing clubs. These clubs have policed and now police many thousands of square miles of wilderness, worthless for agriculture, and, in consequence of this policing, the wild creatures of the wilderness have thriven and in some cases have multiplied to an extraordinary degree on these club lands."

An account has already been given of the manner in which the co-operation of sportsmen is secured in the protection of the wild life in the Laurentides Park, in Quebec, to which the foregoing observation, no doubt, has particular reference. In other parts of Quebec also game protection has been undertaken by individuals and clubs as a result of the provision that is made in the Quebec Game Laws for such projects. The Quebec Government is empowered to establish "hunting territories," which may not exceed 200 square miles, in public lands remote from settlements. These hunting territories may be leased either by auction or private agreement to one or more persons for not more than ten years for an annual sum of not less than three dollars per square mile. The lessee is given the exclusive right to hunt in such leased lands, and to prosecute in his own name. Thus the area becomes a private game preserve.

In many cases these game preserves are proving to be a valuable means of protecting the wild life in the districts in which they are situated, and the fact that most of them are owned by clubs is an assurance that the policy of leasing such hunting territories will not result in the widespread creation of a large number of private game preserves controlled by a few persons, thereby defeating one of the main objects we have in view in conserving our wild life, namely, that all who wish may be able to enjoy it.

On the majority of these game preserves the owners have erected cabins or club-houses, and permanent guardians are employed (Plate XVIII, 1). The owners of such pre-

serves should not only appreciate their responsibilities, but also their opportunities, and, as far as may be possible, a constructive policy should be carried out in the matter of game protection. It is not sufficient merely to pay periodical visits for the purpose of hunting and fishing, but every effort should be made to increase the wild life and improve the environmental conditions.

An incessant campaign against predatory animals and birds should be carried out; attention should be given to available food supplies and to their improvement, and the conditions with regard to cover can frequently be improved. In all such preserves the possibility of ground and other fires should always be remembered, and every precaution taken to prevent them within the reserve, or to check them should they start outside. Fires are the most destructive of all factors that adversely affect our wild life, inasmuch as they destroy everything—breeding-stock, food, and shelter —and a lifeless desolation remains.

Throughout Canada there are many areas reserved by clubs and individuals for duck-shooting. These reserves usually include marshes and small ponds and lakes, or the shores of lakes. Many of the areas to which I allude cannot be classed as game or wild-life reserves in the true sense of the word; on the contrary, they appear to be maintained chiefly for the purpose of attracting and killing the greatest number of birds with the least expenditure of trouble; the only encouragement the wild fowl receive consists of the grain that is distributed in order to secure larger bags, and the only protection existing is the protection of the rights of the owners of the reserved area. On the other hand, there are numerous private reserves which have been established chiefly for duck-shooting, in which every effort is made to attract ducks by planting suitable food-plants, to propagate them, and to protect them from their enemies. Such reserves are rendering valuable aid in conserving our

native wild fowl, and their establishment deserves encouragement.

Civic Game Reserves.—There is a type of wild-life reserve that ought to be widely adopted in Canada, but which, so far as I am aware, exists in one or two instances only and on a limited scale. This is what I would call a civic reserve. In a previous chapter the creation of community and civic bird sanctuaries has been recommended. The effect of such sanctuaries in the conservation of wild life in general would naturally be somewhat limited in its scope. A civic wild-life reserve, however, would include within its territory such native mammals and birds as might occur in the region adjoining or within easy reach of the city owning it. As an example, it may be mentioned that the creation of a national or provincial park in the region adjoining the Gatineau River, north of Ottawa, has been urged for a number of years by individuals and local organizations, and this proposal was included in the recommendations of the commission appointed (in 1913) to advise on the planning of the city of Ottawa. Unfortunately, however, no steps have yet been taken to carry out a proposal that would furnish for the adjoining cities an unsurpassed recreation area, in which all the pleasures and benefits of life in the woods and hills would be the means of enlarging the interests and sympathies of thousands of our citizens who are strangers to so many of the joys that they might share.

The idea of such a park or reserve in the country rather than within the city limits is by no means a new one. In England, within a few miles of London, one of the most thickly populated regions of the world, one may lose oneself in Epping Forest, one of the finest forest areas in England, where still may be found deer—not the semi-domesticated kind—badgers, foxes, and other species of wild life, unmolested. The city of Glasgow has a country park at Loch Argoil, and the city of Birmingham a park at the Lickey

Hills. If cities in Great Britain can maintain such park areas for the recreation of their people, surely in Canada, with our incomparable opportunities for creating within easy access of our cities national parks and wild-life reserves, we should be able to make greater progress in this direction than has already been accomplished. All our larger cities have suitable areas in their vicinities; certain cities, such as Quebec, Edmonton, Calgary, Vancouver, and Victoria, already have national or provincial parks within a comparatively short distance, but, in other cases, the distance to the nearest park prohibits many, to whom the opportunities which it affords for recreation are necessary, from taking advantage of them. Few movements would be more effectual as a means of improving the health of our citizens and of increasing their capacity for wholesome enjoyment than one for the creation of such civic reserves, and for this reason their promotion should be undertaken by all civic organizations that are sincerely interested in the welfare of the communities in which they exist.

Game Protective Associations.—Among the numerous methods by which community effort to conserve our wild life may be undertaken, the formation of special associations for this purpose constitutes one of the most influential. There are already in existence in Canada a number of associations of sportsmen, guides, and also of persons interested in the protection of wild life. Although a number of such sportsmen's organizations were primarily formed for the protection of the interests of the sportsmen rather than for the protection of the game, the majority of these associations are fully alive to the importance of adequate protection for our game animals, as evidenced by the support that many of them gave to the Migratory Birds Treaty, even though its provisions somewhat curtailed opportunities for hunting wild fowl.

Of all classes of the community the sportsmen should be,

and in my experience usually are, most interested in the conservation of our wild life. In such associations the selfish element, to whom the idea that the conservation of our wild life for the enjoyment of posterity is a duty does not appeal, is fortunately becoming rarer, though its voices may be heard from time to time. The majority of sportsmen, using the word in its real sense as excluding the game-hog and pot-hunter, in Canada, are behind any movement that tends to the conservation of our game and wild-life resources. I have invariably found this to be the case, and it is an attitude that one might expect.

We need, however, a far greater number of such local associations of sportsmen, naturalists, and others interested in the conservation of game and wild life. There should be one in every large district or county, whose chief object would be to act as trustee for the wild life in his particular region. Upon such associations should rest the responsibility of securing and making effective such protective measures as the wild life of their districts might require. The influence that such associations, when composed of men interested in the wise conservation of wild life rather than its reckless destruction, regardless of the future, would have on the citizens in their respective districts, is incalculable. Their co-operation in the protection of the wild life in their districts would be welcomed by the provincial governments; through them a real public opinion on the subject could be created; and a greater observance of the game laws would be insured. As a means, therefore, of securing the conservation of game and wild life, we would strongly recommend the formation of local associations of all interested. There is, in most districts, a sufficient number of sportsmen, farmers, nature-lovers, and others who seek recreation in the woods and fields, and who have a genuine interest in the conservation of the wild creatures which they pursue with gun, camera, or field-glass, to form such associations;

whether they are called game-protection associations or wild-life-conservation associations is immaterial, so long as their objects are those that this volume is endeavouring to promote, namely, the conservation of our wild-life resources for the benefit of Canadians of to-day and of the future.

The Attitude of the Sportsman

The term "sportsman" has a very definite meaning in the English language, owing to the fact that the predominant characteristic of British sport is "fair play," and any person who takes an unfair advantage of opponent or hunted quarry is ruled out. It is in such a sense that the word should always be used. When applied to the hunting of game the word has a special significance in so far as the conservation of game is concerned, and for that reason it is appropriate that it should be discussed here.

One of the most noted associations of hunters in the world is the Shikar* Club of London, of which His Majesty, King George, himself a famous sportsman, is honorary president, and which includes in its membership the most noted hunters of big game. Its chief object is set forth in the following words:

> To maintain the standard of sportsmanship. It is not squandered bullets and big bags which appeal to us. The test is rather in a love of forest, mountain and desert; in acquired knowledge of the habits of animals; in the strenuous pursuit of a wary and dangerous quarry; in the instinct for a well-devised approach to a fair shooting distance; and in the patient retrieve of a wounded animal.

Such should be the ethics of all who hunt game in Canada; sportsmen's organizations should require their members to subscribe to this definition of the objects of the hunter.

In 1908, Doctor W. T. Hornaday, than whom no man has done more to promote the conservation of our wild life and

* Shikar is the Hindustani word for "hunting."

the real objects of hunting game, realizing the need of an adequate code of ethics to govern the taking of wild game, prepared the following code as a "sportsman's platform." It has been formally adopted as setting forth their objects by the Camp Fire Club of America, by the North American Fish and Game Protective Association, and by numerous sportsmen's and game-protective organizations in Canada, and its adoption may be the means of securing a true standard of sportsmanship and the conservation of our unsurpassed game resources, which it should be the object of every Canadian sportsman to promote to the utmost of his ability.

THE SPORTSMAN'S CODE OF ETHICS

1. The wild animal life of to-day is not ours, to do with as we please. The original stock is given to us *in trust*, for the benefit both of the present and the future. We must render an accounting of this trust to those who come after us.

2. Judging from the rate at which the wild creatures of North America are now being destroyed, fifty years hence there will be no large game left in the United States nor in Canada, outside of rigidly protected game preserves. It is therefore the duty of every good citizen to promote the protection of forests and wild life and the creation of game preserves, while a supply of game remains. Every man who finds pleasure in hunting or fishing should be willing to spend both time and money in active work for the protection of forests, fish and game.

3. The sale of game is incompatible with the perpetual preservation of a proper stock of game; therefore it should be prohibited by laws and by public sentiment.

4. In the settled and civilized regions of North America there is no real *necessity* for the consumption of wild game for food purposes. The maintenance of hired labourers on wild game should be prohibited everywhere, under severe penalties.

5. An Indian has no more right to kill wild game, or to subsist upon it all the year round, than any white man in the same locality. The Indian has no inherent or God-given ownership of the game of North America, any more than of its mineral resources; and he should be governed by the same game laws as white men.

6. No man can be a good citizen and also be a slaughterer of game or

fishes beyond the narrow limits compatible with high-class sportsmanship.

7. A game-butcher or a market-hunter is an undesirable citizen, and should be treated as such.

8. The highest purpose which the killing of wild game and game fishes can hereafter be made to serve is in furnishing objects to overworked men for tramping and camping trips in the wilds; and the value of wild game as human food should no longer be regarded as an important factor in its pursuit.

9. If rightly conserved, wild game constitutes a valuable asset to any country which possesses it; and it is good statesmanship to protect it.

10. An ideal hunting trip consists of a good comrade, fine country, and a *very few* trophies per hunter.

11. In an ideal hunting trip, the death of the game is only an incident; and by no means is it really necessary to a successful outing.

12. The best hunter is the man who finds the most game, kills the least, and leaves behind him no wounded animals.

13. The killing of an animal means the end of its most interesting period. When the country is fine, pursuit is more interesting than possession.

14. The killing of a female hoofed animal, save for special preservation, is to be regarded as incompatible with the highest sportsmanship; and it should everywhere be prohibited by stringent laws.

15. A particularly fine photograph of a large wild animal in its haunts is entitled to more credit than the dead trophy of a similar animal. An animal that has been photographed never should be killed, unless previously wounded in the chase.

CHAPTER XIV

GOVERNMENT RESERVES FOR THE PROTECTION OF BIRDS

In addition to the national and provincial parks which have been described in another chapter, there have been reserved in different parts of Canada by the Dominion Government, alone or in co-operation with the provincial governments concerned, certain areas as reserves for the protection of birds, particularly the migratory species of wild fowl and shore-birds.

Saskatchewan and Alberta.—The greatest number of these are to be found in the provinces of Saskatchewan and Alberta. The reservation of these areas is of very great importance on account of the inevitable destruction of the former breeding and feeding places that has taken place, owing to the agricultural development and settlement of the western plains which formerly constituted the haunts of a very large proportion of our migratory wild fowl and shore-birds. Unless such reservations were made, there would undoubtedly be a continued and marked decrease in the numbers of these birds, which the international treaty for the protection of migratory birds is intended to prevent. Consequently, the policy of establishing and maintaining such bird reserves or sanctuaries is an integral and important part of the work involved in carrying out the intentions and provisions of the treaty.

The steps that have been taken by the Dominion Government in the establishment of reserves for the protection of birds in Western Canada up to the present time are as follows:

By Order in Council of the 8th of June, 1887, certain islands and land adjoining the northern portion of Last

Mountain Lake, in Saskatchewan, were reserved; this area contained altogether approximately 2,534 acres. By an order of the Minister of the Interior on February 13, 1911, all the vacant lands in the vicinity of Ministik Lake, Alberta, and other lakes in that locality, were set aside as bird reserves. On May 18, 1915, the Minister of the Interior approved of the reservation of all the vacant quarter-sections immediately adjoining the following lakes in Saskatchewan and Alberta, with a view to the future establishment of permanent bird reserves:

Saskatchewan

Quill Lakes.	Cabri Lake.	Redberry Lake.
Lenore Lake.	Bigstick Lake.	Johnston Lake.
Basin Lakes.	Crane Lake.	Chaplin Lake.
Bitter Lake.	Goose Lake.	White Bear Lake.

Alberta

Moose Head Lake.	*Birch Lake.	Lac Ste. Anne.
Gaskell Lake.	*Miquelon Lake.	Buffalo Lake.
Grease Wood Lake.	Cooking Lake.	*Many Island Lake.
*Pakowki Lake.	*Ministik Lake.	*Lac la Biche.
*Big Hay Lake.	Wabamun Lake.	

When these lands were withdrawn from settlement, with a view to the permanent reservation of those which were suitable for permanent establishment as bird reserves, it had not been possible to make a thorough examination of their suitability for the purpose for which they were intended. But such an examination was made in 1917 and 1918 by Doctor R. M. Anderson, zoologist of the Geological Survey and a member of the Advisory Board on Wild Life Protection, and, as a result of his careful observations on the species of birds found frequenting, or likely to frequent, such res-

* By Order in Council, dated 15th June, 1920, certain lands in the vicinity of the lakes marked with an asterisk were set aside as bird sanctuaries.

An Order in Council, dated 22nd June, 1920, makes regulations for the control and management of areas reserved as bird sanctuaries.

ervations, and the existence of adequate food and other essentials of a successful bird reserve, it is now possible to determine which of these reserve areas should be established as permanent bird reserves.

The following are brief accounts, prepared by Doctor Anderson, of the lakes that were found to be suitable for permanent bird reserves, and it is expected that they will be so established in the near future.

Last Mountain Lake (formerly known as *Long Lake*), north of Regina, Saskatchewan. Part of north end of lake reserved, both by federal Order in Council and by provincial authorities as a game refuge. This is a very good breeding-ground, with many large ducks, canvasbacks, redheads, and mallards; a few Canada geese nest on the islands, also cormorants and gulls. It is well posted as a provincial game refuge. It should by all means be retained as a sanctuary.

Lake Johnston, twenty-five miles southwest of Moose Jaw (formerly known as *Old Wives Lake*, Plate XIX). It has one large island, *Isle of Bays*, in the north part of the lake, which is also a provincial game refuge. This island is a very valuable reserve, comprising about 200 acres. Large numbers of white pelicans, cormorants, and great blue herons breed on it, also black-headed gulls (Franklin's?). In October, 1918, I saw about 500 Canada geese resting on it in the afternoon, and about 200 whistling swans in the water near the island. The geese feed on the mainland and have a resting-place here. The lake is said to be one of the chief resting-places for swans in migration through this country. The island should be certainly retained as a sanctuary. The land around the lake is mostly poor agricultural land and seems suitable for wild-fowl breeding. Lake Johnston is a good preserve for pelicans and cormorants, as there are no valuable food fish in the lake. Where there is reserved land in blocks of fair size it should be

From a photograph by Augustin Frigon

By courtesy of the Department of Marine

From a photograph by Augustin Frigon

BIRD RESERVES IN THE GULF OF SAINT LAWRENCE

1. Bonaventure Island
2. Bird Rock
3. Percé Rock

retained. There is so much land privately owned around the lake, and the lake is of such size, that it can hardly be retained as a sanctuary complete. With the island reserved as a refuge, and some breeding-ground reserved along the shores, the main shore of the lake might be left open to shooting in season.

Chaplin Lake, forty-five miles west of Moose Jaw, Saskatchewan. A shallow lake; said to be drying up. The land surrounding it is not very good agricultural land.

Quill Lakes, thirty miles southeast of Humboldt. There is good breeding-ground along the south side of Big Quill Lake, from the creek west of Dafoe east to the town of Kandahar. From Kandahar east and north along the east side of the lake to the beginning of the Narrows between Big Quill Lake (the west lake) and Little Quill Lake (the east lake) the land is not so suitable for wild fowl, and better for farming. The region about the Narrows and around the eastern and northern side of Little Quill Lake, and north and west of Big Quill Lake, seems to be attractive breeding-ground.

Lake Lenore and *Basin Lake*, fifteen and twenty-five miles respectively north of Humboldt, Sask. Basin Lake has high, steep, timbered shores, and little lowland near the lake. Lake Lenore has better conditions surrounding it, but most of the wild fowl of the region breed in the numerous swamps and sloughs around Middle Lake (between Basin Lake and Lake Lenore). Lake Lenore seems to have some pretty good qualifications as a breeding-ground, and probably as a resting-place for fowl if the surrounding country is too much shot over. At present the district is not hunted except by local homesteaders, as it is too far from railroads, and there are plenty of ducks nearer the towns.

Redberry Lake, forty miles northwest of Saskatoon. This is an attractive lake and should be naturally a good breeding-ground. The country all around the lake is fairly

thickly settled by Galicians, and the land cultivated or mowed pretty close to the edge of the lake. Some geese are said to breed on the islands in the lake, and they should be reserved, but it is questionable whether the remaining fragments of land on the edges of the lake are worth reserving.

White Bear Lake, fifty miles north of Swift Current, Sask. This has the possibility of being a fairly good wild-fowl refuge, as the land immediately surrounding it is not such as to make it suitable for farming to any extent. It seems to have favourable places for ducks to nest along its shores, and plenty of shelter (thick beds of rushes) and good feeding-ground in the shallow waters.

Crane Lake, fifteen miles northeast of Maple Creek, Saskatchewan. This lake seems to have good breeding conditions for ducks, and also to have many gulls and shore-birds in summer. The land surrounding it is mostly rather poor and sandy; much of it is of little use except for grazing purposes. At present, the grazing does not seem to be close enough to interfere with the birds.

Bigstick Lake, twenty miles north of Maple Creek, Saskatchewan. The land here is very poor farming land—stony near the lake, and sticky alkali on the low places. Numerous ducks were seen on the lake, and numbers of geese on the land near the lake. The north, northwest, and southwest sides of the lake seem to be well taken up, and the small, fractional areas between these farms seem hardly worth retaining as sanctuaries.

Birch Lake, eighteen miles southeast of Vegreville, Alberta. This lake has good possibilities as a bird sanctuary. It is a fair breeding-place for ducks; some Canada geese and gulls nest on the islands in the lake; and the brushy shores afford shelter to sharp-tailed grouse, which will need the shelter more as the country becomes more settled. The land surrounding the lake is, in many places, either too steep or too low for cultivation.

Buffalo Lake, thirty-five miles northeast of Red Deer, Alberta. This is an attractive lake, with considerable natural advantages for abundant bird life. The reserved land is all in one township, and includes only a small part of the shore-line of this large lake. The southern arm of the lake seems very favourable to wild fowl.

Many Island Lake, thirty-two miles east of Medicine Hat, Alberta. This lake is said to be a good shooting-ground in the fall. The country near the lake is rather hilly, sandy, and stony. There are some beds of rushes at the east end of the lake. Fair numbers of ducks were seen on the lake, mostly blue-bills and other small ducks. The long, narrow peninsula, extending half-way across the lake and covered with small bushes, weeds, etc., might afford good nesting sites for ducks, but I did not find any traces of nests.

Big Hay Lake, twenty-five miles southeast of Edmonton, Alberta. This is a good wild-fowl reserve. Many ducks were seen. The large areas of reeds and cattails along the lake should be a good breeding-ground for canvasbacks and redheads, and should also afford a good summer refuge for the numerous ducks which nest around the little ponds back from the lake, and which will ultimately be surrounded by cultivated land.

Miquelon Lake, thirty-three miles southeast of Edmonton, Alberta (Plate XIX, 1). This is a very good bird refuge. Many ducks breed here; also cormorants, great blue herons, gulls, terns, etc. White pelicans formerly nested on an island, but were driven off. The lake has large numbers of islands of all types, from low gravel bars, frequented by terns and gulls, to wooded islands, where the herons nest.

Oliver Lake, about thirty miles southeast of Edmonton, Alberta. Oliver Lake is said to be a good lake for wild fowl. The country around it is heavily timbered and not much settled, so that there are few if any good trails.

Ministik Lake, twenty miles southeast of Edmonton, Alberta (Plate XIX, 3). The country around this lake is well timbered and not much settled. The lake is surrounded by great beds of cattails, bulrushes, reeds, and sedge, and provides unlimited feeding-ground and shelter for wild fowl. Large numbers of ducks were seen on the lake at the time of my visit, and all reports were that it was a good lake for ducks.

Lac la Biche, one hundred miles northeast of Edmonton, Alberta. My visit was too late in the season to tell much about the wild-fowl possibilities. So much of the lake shore is taken up, most of the south side by the "Lac la Biche Settlement" (Indians and half-breeds), and most of the north side of the lake patented, that little land except some on the east end of the lake is reserved. As a good deal of settlement is going up on the railroad along the east side of the lake (the Alberta & Great Waterways Railway), and, furthermore, as the lake is one of the large important commercial fishing-lakes of this district, it may not be worth while to keep land reserved on the shores of the lake. It will be a difficult matter to preserve the game locally, with large numbers of Indians, half-breeds, and fishermen working on the lake. For that reason the land on the shores may not be worth reserving as sanctuaries. There are several large islands in the lake which might be reserved for future investigation. It does not have a very good reputation as a wild-fowl lake.

Pakowki Lake, forty-five miles south-southwest of Medicine Hat, Alberta. This lake was not visited, owing to the difficulty of access to it in a reasonable time. It is situated in a rather rough country, and, as it is the only large lake in that region, it is probably worth retaining as a wild-fowl sanctuary, for a resting-place during migrations if not as a breeding-place.

BIRD RESERVATIONS IN THE GULF OF ST. LAWRENCE

(PLATES XX AND XXI)

In the Gulf of St. Lawrence lie some of the most famous haunts of sea-fowl in the world. Ever since Jacques Cartier reached the Bird Rocks, or "Isles de Margaulx," as he called them, "Margaulx" being the name the fishermen of northern France gave to the gannet, on the 21st of May, 1534, up to the present time, the Bird Rocks, Bonaventure Island, and Percé Rock have been known to naturalists and bird lovers as great breeding-places for gannets, kittiwakes, guillemots or murres of several species, razorbills, puffins, gulls, petrels, and other sea-birds. At the present time the Bird Rocks and Bonaventure Island constitute the chief breeding-places in the western hemisphere of the gannet, one of the most magnificent sea-birds in the world.

During recent years considerable destruction of these birds and their eggs by fishermen and tourists has taken place, and many leading naturalists and ornithologists have urged the protection of the birds on these rocks by the Dominion Government and the government of the province of Quebec. In 1915 the Commission of Conservation took up the question of establishing these rocks as bird sanctuaries, and, as a result of its exertions, in which other organizations and individuals have co-operated, the Bird Rocks, Bonaventure Island, and Percé Rock were, in the spring of 1919, created as national and provincial bird reservations by concurrent legislative action on the part of the government of the Province of Quebec and of the Dominion Government.

The Bird Rocks. These rocks, consisting of the Great Bird Rock, on which a lighthouse has been erected, and the two Lesser Bird Rocks, form part of the Magdalen Islands group, the Great Bird Rock being about twenty miles north of the Magdalen Islands proper. Great Bird Rock is about seven acres in extent. The top of the rock, which is in-

habited by the lighthouse-keeper and his assistants, has been cleared of birds, but the precipitous sides of the rock provide nesting-places for many thousands of several species of sea-birds, the chief of which is the gannet. Doctor John M. Clarke, who has taken a very active part in the creation of these reservations, estimated* that, in 1910–1911, the total bird population was probably not less than 15,000, and that the gannets were not decreasing there.

Bonaventure Island. This island lies about three miles southwest of the village of Percé, in the county of Gaspe, Quebec. It is roughly circular in outline, and about three miles in width. Steep cliffs surround the island, and on the southeastern face they rise to a height of 300 to 400 feet. These cliffs on the seaward side of the island, stretching for about a mile and a quarter, form the chief breeding-places of the gannets, murres, razor-billed auks, and puffins. The gannets are by far the most numerous, and the ledges for about half a mile appear to be covered with the snowy-white masses of these birds during the nesting season. Mr. P. A. Taverner† estimated in 1914 that there were about 7,500 birds nesting on Bonaventure Island.

Percé Rock. Well known to all visitors to the Gaspe Peninsula and the Chaleur Bay, this strikingly shaped rock, with almost perpendicular sides, rising to a height of nearly 400 feet, remarkably coloured, provides nesting-places for innumerable sea-birds, particularly crested cormorants and herring-gulls, which give the top the appearance of snow during the nesting season.

RESERVE FOR GEESE IN NOVA SCOTIA

In order to protect the large numbers of wild geese that collect and spend several months in each year in Port Joli

* "Protection of Sea-Fowl of the Gulf of St. Lawrence," by John M. Clarke. *Sixth Annual Report of the Commission of Conservation*, 1915, pp. 108–116.

† "Recommendations for the Creation of Three New National Parks in Canada," by P. A. Taverner. *Sixth Annual Report of the Commission of Conservation*, 1915, Appendix III, pp. 303–310.

1. White Pelican rookery, Mountain Portage, Slave River, Northern Alberta. From a photograph by R. M. Anderson
2. Notice board on Saskatchewan Provincial Game Refuge. From a photograph by R. M. Anderson
3. Canada Geese on artificial pond in the Miner Sanctuary, Essex County, Ontario
4. Aluminium tag used by Mr. Miner to mark wild geese and ducks for purposes of determining migration

Harbour, in Queens County, Nova Scotia, the hunting and killing of geese in this harbour below high-water mark are prohibited. In 1919 Mr. J. A. Knight, chief game commissioner, reported that the geese wintering at Port Joli were more plentiful than usual. Such protection from molestation will do much to maintain the abundance of these birds visiting the south shore of the province.

From the foregoing account it will be seen that a promising start has been made in the direction of government reservations for our native bird fauna. Many other areas have been recommended as suitable for reservation, and there is every reason to believe that a policy that is sure to have so important an effect on the conservation of this section of our wild life will be continued both by the Dominion and by the provincial governments.

CHAPTER XV

THE UTILIZATION BY DOMESTICATION OF OUR LARGER NATIVE RUMINATING MAMMALS

All the domesticated animals now in the service of man have been derived originally from wild animals which were native to the countries in which their domestication was first undertaken. Horses, cattle, and dogs have been so long associated with man's development that their origin is, in the majority of cases, shrouded by centuries of time, and is largely a matter of conjecture. The history of the horse is lost in antiquity; Egyptian monuments show us that the humped cattle were domesticated at least as early as the twelfth dynasty, that is, 2100 B. C. In China the domestication of the pig is believed to date back at least 4,900 years from the present time. And the dog was domesticated in Europe long before the period of any historical record.

As the cradle of the human race was probably in the subequatorial regions of the Eastern Hemisphere, the wild animals inhabiting more northerly regions would receive the attention of man at a later date, and it is not unlikely that one of the last animals to be domesticated was the caribou or reindeer. The reindeer of northern Europe and Asia have long been domesticated, but no attempts appear to have been made by the northern natives of the American continent to use this animal, and it was not until 1892 that domestic reindeer were introduced into North America. An account of the history of the reindeer on this continent will be given later in this chapter.

Proposed Domestication of the Musk-ox.—There is still another native land mammal of large size which has char-

acteristics which suggest its possible value as a domesticated, or semi-domesticated animal, but which has not yet been tried in the service of man except as a source of wild meat, and this is the musk-ox. Doctor W. T. Hornaday has called my attention to one attempt to colonize this animal on new territory, which took place in July, 1903, when three musk-ox calves, two females and one male, were transported from Greenland and turned loose at Norrland, Sweden, in a locality closely resembling their native habitat, but they all died. The first suggestion regarding the possible domestication of the musk-ox appears to have been made by Professor S. F. Baird, in 1854, in an article on the native ruminating animals of North America and their susceptibility to domestication.* He wrote:

> It is not probable that the musk-ox could stand the warmth of the climate of the United States, although the experiment would be well worth trying. The hair is very long and silky, and has been occasionally worked into articles of dress. Could it be obtained in sufficient quantity, there is no doubt of its being of exceedingly great value in the arts. Unfortunately, this species, like the barren-ground reindeer, does not occur within the limits of the United States, and the experiment of domestication, as well as of economical application in general, must be tried, if at all, by the Hudson's Bay Company. To the best of our knowledge, there is not a single specimen of the musk-ox in any museum of the United States; probably not even a portion of the skin or bone.

A definite proposal, however, to utilize the musk-ox as a domestic animal was made by Mr. V. Stefansson, in 1916, as a result of his observations on the habits and value of the musk-ox in Melville Island. This proposal was embodied in a report to the Department of the Naval Service, and Mr. Stefansson has revised for me his statement since his return from the Canadian Arctic Expedition in 1918. The following is Mr. Stefansson's report:

* "Pictorial Geography of the World," by E. S. Goodrich, vol. II, pp. 39–40.

A Possible New Domestic Animal for Cold Countries

The reindeer industry is now well established by the United States government in Alaska and herds will, in natural course, doubtless increase till most of the tundra is utilized for pasturage, unless a more profitable use of the ground is discovered. In Asia and Europe the tending of reindeer herds antedates history.

In spite of the ancient character of the industry reindeer are in most, if not all places where they are now found, wild to the degree that they must be lassoed as the semi-wild cattle of our large ranches must also be lassoed. In Alaska a dog not used to reindeer or a wolf will stampede and scatter an untended herd, and, in some cases, even herds that have an attendant, and animals are thus frequently lost even when they are not killed by wolves. In bad weather the herds are sometimes hard to control and in inclement springs a large percentage of the fawns die in spite of the best efforts of the herders.

From these points of view, the reindeer is, therefore, not an ideal domestic animal for the arctic lands. A further disadvantage is that a reindeer, unlike a sheep, is of no commercial value until after it is killed, except the few that are used as draught animals. True, reindeer are milked in some districts, but they are unsatisfactory compared with most milk animals.

This summer (1916) our parties have been in more intimate contact with musk-oxen than is common with white men, and they have impressed all of us as a most valuable animal and one easy to domesticate. In fact, they act more like domestic cattle than does the average Alaskan reindeer herd. It is only under special circumstances that they run away from what they seem to consider danger and they never run from dog or wolf. It is still more rare that they charge—this is probably confined to bulls in the breeding season. In the big Canadian caribou herds bulls at the breeding season will charge men and then are far more dangerous than musk-oxen, while the bull moose has perhaps as large a record of man killing as any animal of North America. When in fear of man or wolf the herds commonly group in a circle, heads facing out, with the calves and young animals in the centre of the ring protected by the others.

One of the Eskimos now working for us once took and kept for several months a pair of musk-ox calves. They were as tame as dogs, followed the people about and when less than a year old one of them would pull a sled for which several dogs would have been needed. One of the calves was eventually killed by some strange dogs and the other was sold to a ship (whaler).

Musk-oxen have the following advantages over reindeer as domesticated animals.

(1) A full grown musk-ox gives twice as much meat probably as a grown reindeer of the same sex and twice as much fat. (As to the time it takes to mature, I do not have the facts.)

(2) A musk-ox gives two or three times as much milk as a reindeer. The milk is considered by the white men of our parties to be better than cow's milk in taste. It differs from cow's milk hardly at all except in being richer in cream.

(3) Reindeer, unless herded, tend to range far. Musk-oxen do not move until they have finished the feed in a given locality and then they move to the next spot of good feed. A herd of musk-oxen in grazing moves from three to five miles a month, generally.

(4) Musk-oxen are not stampeded by bad weather as reindeer and cattle are, and they cannot be stampeded by wolves and dogs.

(5) It is probably very rare that wolves kill musk-oxen. A band of wolves cannot make the least impression on a herd of musk-oxen, and I am of the opinion that even two grown animals would stand off a band of wolves. We frequently see them feeding unconcernedly with wolves walking about near them, evidently seen by the musk-oxen.* It is likely, however, that single animals are occasionally surprised away from the herd and killed, though they commonly feed bunched up and form a defensive circle at the first snort of alarm from one of their number. Young calves are probably also killed occasionally by sudden onslaughts of wolves. Whether bears kill musk-oxen, we do not know, but it is likely. We have at least proof that they occasionally try to get caribou; though it is almost certain they rarely or never succeed.

(6) The greatest advantage of the musk-ox over caribou is that, like sheep, it furnishes a large amount of wool annually without having to be killed first. Just what commercial use of wool would best fit, I do not know, but it is clear to anyone familiar with the methods of working wool employed by our grandparents that any Eskimo or other owner of a few musk-oxen could make for himself warm and comfortable clothing at home from their wool. However, I have not the slightest doubt there is a market for the wool, or, at least, that a market will develop as soon as the available quantity becomes considerable. If the animals were clipped there would be a certain comparatively small amount of hair mixed with the wool, but, if this were found detrimental to its commercial value and if machinery could not be devised to separate the hair from the wool, it

* Ekblaw records the killing of a full-grown male musk-ox, one of a band of four, by a pair of wolves in Ellesmere Island (MacMillan's "Four Years in the White North," pp. 348–349).

would be easy enough to get the wool nearly pure at the start by pulling it at the shedding season instead of clipping. The quantity given by one musk-ox would be equal to that of two to three sheep.

The disadvantages of the musk-ox as compared with the reindeer are:

(1) As draught animals they are far inferior to the reindeer in speed. For certain uses this would be more than compensated for by their greater strength. While reindeer in use would correspond to dogs or ponies, musk-oxen would correspond to our domesticated oxen.

(2) The skins of musk-oxen do not make as good clothes as those of reindeer. They are as good as domestic sheep, however, and our expedition and other white men and Eskimos in the Arctic have found sheep moderately suitable if worn with woollen or cotton underwear.

The question of whether musk-oxen would breed in captivity, may, I think, be dismssed, as they would not need to be confined, on account of their quiet habits, nor attended to, on account of their ability to protect themselves; a band of them out of sight and hearing from a house would be practically in their native condition.

From observation I am convinced that the popular idea that musk-oxen require high, rocky land, is wrong. How this idea originated is easy to see. On the mainland from Point Barrow east musk-oxen, wherever they have gone, have been exterminated by man. These have in general been caribou-hunting Eskimo or Indians. As high rocky land is generally not frequented by caribou and, as such land is generally unattractive to the Indian and Eskimo, it happens that the mainland musk-ox has survived generally in high, comparatively barren land. At least here in Melville Island we always find them in valleys and along the coast on the lowest available land.

They are grass-eaters like cattle and not moss-eaters as the reindeer are. They are therefore adapted by nature to any grassy arctic land—which means a large part of the "barren ground" of Alaska and Canada (where, indeed, their bones are everywhere found).

That the musk-ox has been exterminated in many districts is no criticism of him as a domestic animal. The same qualities which prevented him from fleeing from his human enemies are the very ones that commend him to us, as we desire him to take, in the northern districts, the place our sheep and cattle hold in the south.

A question that can be determined only by experiment is whether, in this arctic climate, the musk-ox could stand being shorn of all its wool. If it could not, some half-way method can be found. The death rate among calves, whatever that is, could doubtless be reduced considerably by suitable care.

If the rate of increase of the musk-ox is similar to that of sheep under

domestication, or even similar to that of cattle and if—as seems certain —there proves to be a commercial market for their wool, many hundred thousand square miles of the continental and island part of arctic Canada could eventually be converted into as profitable pasture land as large sections of Australia, to say the least. Should mines and other industries develop, that would only increase the value of the musk-ox as a local source of meat and milk.

The musk-ox could with about equal propriety be called the musk-sheep, and, as far as that goes, the "musk" might well be left out. The meat of even the old bulls had no "musk" smell noticeable to any of the white men of our party nor to the Eskimo, whose sense of smell is, in general (at least out-of-doors), better than ours. All the white men agreed that the first meal they had of musk-ox meat tasted better than their first meal of caribou, except three of us whose first meal happened to be the meat of bulls in the spring. At that season, their flesh does have a strong taste, and that of the cows a slight taste. But, as the same is true of the domesticated sheep and does not interfere with the eating of mutton, this need not be considered serious. In countries like Argentina, tallow is an important article of commerce, and so it is—or was—in Australia. In this connection it is interesting to note that a large, fat musk-ox produces a hundred pounds of tallow in rare cases. It is probable that the males under domestic conditions would produce much more than do the wild ones.

A thing that would appeal to those who have experience with sheep in such countries as the Canadian and American west, is that no blizzard (unless possibly at the calving season) can cause the owner of a herd of musk-oxen worry or even extra work. The blizzard does not blow in arctic Canada that would interfere with the comfort of a herd of musk-oxen. Except during the calving season possibly, and at shearing time, they would require no care.

I shall not go into details as to how the initial breeding animals could be secured, but it is a simple matter, whether on the mainland while yet they are not exterminated, or in the uninhabited Arctic islands. Simplest of all would be to set apart, say Melville Island as an experiment station. If it should not be deemed proper that I urge this matter publicly while in Government service, I hope to do so when that service is ended. When the southern part of our country becomes densely populated, and with our short Hudson Bay and British Columbia routes to Europe and the Orient, such a pastoral development of arctic Canada, as I have outlined above, would become of great commercial importance. That the meat of the musk-ox would not find a ready market need not be feared. As it is, few persons could distinguish it from beef under most of the forms of modern meat cooking.

Mr. Stefansson, since his return, has laid his proposals personally before the Canadian and United States Governments. In Canada, his proposals are now being considered by a commission appointed for that purpose. It is evident that if it can be experimentally demonstrated that the musk-ox is capable of being domesticated or semi-domesticated, it would furnish a factor of inestimable economic importance in the agricultural development of large tracts of our northern regions which are at present producing only furs.

The Zoological Society of New York has demonstrated that the musk-ox can be kept in captivity even in a climate, such as that of New York, totally different from the climate to which these animals are accustomed in their native regions of the north (Plate IV). Doctor Hornaday has kindly furnished me with particulars of the animals that have been obtained and kept by the Zoological Society of New York. The first specimen was received in 1902, but lived only a few months. A second specimen, which was received in the same year, died an accidental death a month after its arrival. The third specimen, which was captured as a calf in the summer of 1909 on Melville Island, by Captain Joseph E. Bernier, reached New York in November, 1909. It fed well and kept in perfect health for five and one-half years, but died in May, 1915. Doctor Hornaday states that "she was so vicious that it was impossible to risk any of the male specimens of the musk-ox herd [the Rainey musk-ox herd mentioned below] in the corral with her. Her fierce disposition robbed the Zoological Park of what would otherwise have been a good opportunity to breed this species in captivity." The food of this animal consisted of red-clover hay and crushed oats. In the late spring of 1910 Mr. Paul J. Rainey captured, on Ellesmere Island, six musk-ox calves, all of which were brought alive to the New York Zoological Park, where they arrived in September, 1910. One died of wounds received during capture, and malnutrition, in Oc-

tober, 1910. The history of the remaining five members of the Rainey herd, consisting of four males and one female, was as follows: one male died three years later (1913) of pneumonia, a second male died in the same year, œdema of the lungs and chronic catarrh being the cause of its death; a third male and the female died in 1916, six years after their arrival in New York, the deaths in both cases being due to fatty degeneration of the heart and kidneys, and œdema of the lungs. The remaining male died in February, 1918, having lived in captivity for *seven years and nine months.* The cause of its death was general malnutrition; there was no actual organic disease. To this animal "all civilized food finally became so distasteful that its appetite failed completely." Experience showed that, in captivity, neither the hardy Rocky Mountain goat nor the musk-ox can endure soaking rains in weather that is either cold or cool. "The woolly under-coats of both these species when once saturated with cold water remain so saturated for two or three days, and inactive captive animals cannot withstand the cold, wet blanket."

Describing the habits of the musk-ox in captivity, Doctor Hornaday states: "In view of the impatient and dangerous temper of the adult musk-ox, amounting in some cases to positive savagery, it was at all times necessary to handle the animals with the utmost care, and at night each one required to have its own separate box-stall. The standard food of our musk-oxen was red clover hay and crushed oats. In summer they were given constantly a moderate supply of freshly-cut green grass, but this supply was carefully limited to avoid intestinal disorders and diarrhœa. They were allowed all the water that they cared to drink, twice per day. It was the expectation of the public that our musk-oxen would suffer during the warm weather of midsummer, but all those expectations were happily disappointed. The location chosen for the herd proved to be

one of the coolest and best-shaded situations in the Zoological Park, but, at the same time, it was sheltered from sweeping winds. We have observed no suffering on the part of any of our musk-oxen during even the warmest weather of midsummer. In the afternoon of the hottest days the animals breathed more rapidly than usual, but there was no evidence of anything approaching real distress. On the whole, these animals seemed to us to develop as rapidly and as perfectly as they could have done in a state of nature. The adult bulls certainly compared very favourably with wild-killed specimens, and if there was any deterioration through living in captivity, it was not observable. These animals moved about freely on the Telford macadam pavement of their corrals sufficiently to keep their hoofs worn down to a proper length, and no trimming of their hoofs ever became necessary."

Should it be decided to attempt experimentally, by the establishment of musk-ox experiment stations in northern Canada and Alaska, to domesticate the musk-ox, every effort will be made to apply our modern knowledge of animal husbandry and veterinary science to the development of such new and potentially valuable domestic animals.

REINDEER IN ALASKA

(PLATE XXIII)

Few movements undertaken for the purpose of developing a new country have proved so successful and so full of interest, as the introduction of reindeer into Alaska, where they now constitute one of the greatest economic assets in that potentially rich country. The first reindeer, numbering 171 animals, were introduced into Alaska from Siberia in 1892; in twenty-five years, that is, by 1917, there were 98,582 reindeer in Alaska; to-day there are over 100,000, and they form the chief agricultural industry of a country formerly

destitute of domestic live stock. A brief summary of the history of this successful industry, for it is no longer an experiment, will be of interest.

Professor S. F. Baird appears to have made the first suggestions in regard to the use of reindeer in North America, in 1851, in a paper published in the agricultural report of the United States commissioner of patents. He was strongly of the opinion that the native races of our North American caribou, the barren-ground and woodland caribou, were as capable of domestication as the species in Europe had proved to be. He suggested that such a step would prove of inestimable benefit to the Indians of the north, who might in time become a pastoral people as a result. In order, however, to avoid loss of time in domesticating our wild species, he advised the importation of domesticated reindeer from Europe. In 1885, eighteen years after the purchase of Alaska by the United States, the desirability of introducing domestic reindeer from Siberia into Alaska was suggested in the report of the U. S. Revenue Marine steamer *Corwin*. Later, in 1887, Charles H. Townsend recommended to the government the importing of reindeer into Alaska, and the teaching of the natives how to care for and to use the animals. These recommendations were not followed, and it remained for Doctor Sheldon Jackson, general agent of education in Alaska, to make a beginning in this work, the ultimate success of which is a lasting monument to his indomitable zeal. When he first visited Alaska, in 1890, with a view to establishing schools in that region for the natives, he was impressed with the necessity of introducing and maintaining in Alaska reindeer for domestic purposes and as a means of saving the inhabitants of that region from starvation. Accordingly, on his return to Washington, he recommended the introduction of Siberian reindeer into Alaska for the relief of the destitute Eskimos, and his recommendation was duly transmitted to the Senate in December, 1890.

No action was taken, and, fearing the results of further delay, Doctor Jackson made a public appeal for funds in 1891. The prompt and generous response enabled him to commence the purchase of reindeer in Siberia, and their introduction into Alaska at Teller, in 1892, when 171 animals were transported. In 1893 the United States Congress appropriated $6,000 for the introduction of domestic reindeer into Alaska. The management of this appropriation was intrusted by the Secretary of the Interior to the commissioner of education, as the work of introducing domestic reindeer into Alaska, and the instruction of the natives in the arts of herding, harnessing, driving, etc., was made part of the scheme of industrial education maintained by the government in Alaska.

Between 1892 and 1902, when the importation of reindeer from Siberia ceased altogether, the total number of animals imported was 1,280. The present abundance is due to the prolificness of the reindeer. The statistics covering the years 1892 to 1904 showed that the increase of the reindeer herds progressed at an average rate of forty-five per cent per annum, doubling the total once in two and one-third years.

Doctor Jackson stated that the objects of the reindeer industry were: "To convert the nomadic tribes of fishers and hunters in Northwestern and Central Alaska into raisers of reindeer; to change their occupation from the precarious pursuits of hunting wild animals and of taking the fish from the waters of inland rivers to that of herders and teamsters; to elevate a people who, in their wild, uncivilized state, are the prey of unscrupulous, transient immigrants into a self-supporting race, not enemies but friendly allies and auxiliaries of the white man."

It was realized that, as the reindeer is the only draft animal in arctic regions that is able to secure its own food while on a journey, the question of cheapness and speed

Photographs by courtesy of the Bureau of Education, U. S. Department of the Interior

REINDEER HERDS IN ALASKA

1. Reindeer herd crossing a river
2. Reindeer feeding through the snow
3. Reindeer teams
4. Portion of reindeer herd

would bring it into universal use. The Eskimo is very well adapted to the work of herder or teamster, and is thus becoming an important agent in the development of the country.

In order to fit the natives to become the helpers of the white man in the development of Alaska, the United States Government, through the Bureau of Education, established a number of reindeer stations for the training of the young men in the raising, care, and management of reindeer as an industrial branch of the public-school system of central and northern Alaska. Bright young men were selected and placed in these schools as apprentices for a period of five years, under skilful Finn or Lapp instructors, who drilled them in the business. Reindeer herds were allotted to the various mission stations, and a skilled herder was furnished for the purpose of instruction. It was found that it was more economical to instruct the young Eskimos through the mission-station rather than the government herds.

The following is a summary of the rules and regulations regarding the United States reindeer service in Alaska:

The supervision of the reindeer herds and stations in Alaska shall be included in the duties of the district superintendents of schools for natives in Alaska. These herds and stations are to be inspected at least once a year, and quarterly in the case of stations easily accessible. It is the duty of the district superintendent to see that all regulations regarding the service, distribution of reindeer to apprentices and herders, contracts and all other business are carried out, and monthly reports are to be submitted to the commissioner of education.

A local superintendent shall have immediate supervision of each herd of reindeer and oversight of the apprentices, herders, and reindeer herd. He is required to superintend the annual marking of the reindeer, and to see that they are marked correctly according to ownership. The local superintendent may butcher each year not to exceed two male

reindeer, none of which shall be under four years of age, for every hundred reindeer in the herd, for the support of apprentices, but the sale or barter of such meat is not permitted.

Apprentices are required to bind themselves to obey the rules and regulations, which also govern all reindeer received by them during their apprenticeship. Each approved apprentice receives the following numbers of reindeer at the end of each year of his apprenticeship: end of first year, six reindeer (four females and two males); second year, eight reindeer (five females and three males); third year, ten reindeer (six females and four males); fourth year, ten reindeer (six females and four males). Additional reindeer are provided in certain cases. At the end of the fourth year, if the apprentice has been faithful and successful, and is at least twenty-one years of age, he can be certified as a trained herder. When a native herder owns at least fifty reindeer he may train apprentices and distribute reindeer to them according to the aforementioned rate per annum. Additional apprentices may be trained by such a herder, as his herd increases, according to a fixed scale.

The herders may sell, exchange, give, kill, or in any way dispose of female reindeer, only to the government, or, by official sanction, to another native inhabitant of Alaska. Each native herder must remain with his herd at least ten months each year, or arrange for a competent substitute. Intemperance or continued neglect involves forfeiture of the herd, either to a member of the herder's family competent to manage it or to the government.

No female reindeer may be sold or disposed of to any person other than a resident native of Alaska, and such sale or disposal must have official sanction. Only competent herders may receive such reindeer.

The following are the latest complete official statistics regarding the United States reindeer service in Alaska, as given in the annual report of the work of the Bureau of

Education for the natives of Alaska for the year 1917–1918. The reports from the reindeer stations for the fiscal year ending June 30, 1917, show that the reindeer had increased from 82,151 in 1916 to 98,582, and the number of herds from 85 to 98. Of the 98,582 reindeer, 67,448, or 69 per cent, were owned by 1,568 natives; 3,046, or 3 per cent, were owned by the United States Government; 4,645, or 5 per cent, were owned by the missions; and 23,443, or 23 per cent, were owned by Lapps and other whites. The whites obtained their reindeer by buying out the Lapp herders who had obtained deer without restrictions. The total income of the natives from the reindeer industry during the fiscal year 1916–1917, was $97,515. The total number of reindeer, namely 98,582, is a net increase of 20 per cent during the year, notwithstanding the fact that 13,144 reindeer were killed for meat and skins, or were lost. There were in Alaska, June 30, 1918, approximately 100,000 reindeer.

With the establishment of this industry on a firm basis the government has reduced the appropriation made to this service. A number of reindeer companies have been formed, and steps are being taken by scientific management to place the industry on a business basis. Outside markets are being secured for the meat and for the tanned skins, and reindeer meat is now shipped not only to cities on the Pacific coast, but to the Middle West and as far as New York.

It is claimed by some that while a certain amount of new blood has been introduced into the herds by association with the native caribou, new blood is needed, as the last importations of reindeer from Siberia were made in 1902. Constant inbreeding has led to a noticeable reduction in the prolificness of the females, and degeneration is to be observed in many herds.*

* The United States Biological Survey is giving attention to the question of grazing. In Norway, it has been found that the reindeer moss takes from five to seven years to reproduce itself.

A serious menace to the industry in Alaska is the prevalence of the reindeer warble-fly. This is of particular importance on account of the damage that it causes to the hides and its consequent effect on the development of a market for reindeer leather. This insect is also a serious pest in northern Europe and Siberia, and affects a large proportion of the native barren-ground caribou in northern Canada.

THE USE OF REINDEER IN CANADA

Although a vast area of subarctic Canada affords as suitable range for reindeer as the areas in northern Europe and Asia, where they have been utilized by man for centuries, and reindeer were introduced into Alaska in 1892, their introduction into Canada is of comparatively recent date. The first and, up to the present, the only attempt to introduce these animals into Canada was made by Doctor Wilfred T. Grenfell in connection with his famous mission in Labrador to deep-sea fishermen, which includes within its scope the welfare of the natives of the Labrador coast.

During his many years of medical-mission work on the coast of north Newfoundland and Labrador he discovered that one out of every three deaths on the coast was due to tuberculosis, and that one out of every three native babies died before reaching the age of one year. Diseases due to malnutrition were rife among these people. There were no milk-producing animals, and milk was the great need on the coast. The keeping of sheep, goats, or cattle was out of the question, and this caused Doctor Grenfell to turn his attention to the possibility of introducing and using reindeer, which had been successfully introduced into Alaska. In the introduction to his account* of this work Doctor Grenfell gives an excellent account of the economic value of the rein-

*"Labrador, the Country and the People," by Wilfred T. Grenfell and others ("Reindeer for Labrador," pp. 251–271), 1909.

deer to the people of northern regions that is well worth quoting. He says:

Few other animals on the earth's surface offer as much to man with so little outlay. With scarcely any aid, races of men can subsist on what these beasts alone can provide. For transport they have been shown, under right circumstances, to be able to compete with the Eskimo dog in speed and endurance. On the Alaskan tundra, where the snowfall is much like that of Labrador, they have been an unqualified success. On journeys they can find their own food by the way—an item most important, for the dogs are obliged to carry this additional, and by no means inconsiderable, burden with them. Reindeer are now used not only for packing over open land uncovered with snow in summer-time, when dogs are entirely useless, but they are in regular use for running the United States mail service in the depth of an Arctic winter. Geldings are said to be far more readily trained to harness than stags, and are easier to keep in good physical condition. At a pinch, one's steeds may be killed and eaten with relish, while the carcass, where meat supplies are scarce, is always of incomparable value. The tongues and kidneys form great delicacies, and the tongues may be smoked for export. A good-sized stag will weigh three hundred pounds, and has for meat alone fetched $50 in the Alaskan markets.* The large, thickly haired skin of caribou or of the Lapland reindeer is invaluable for many purposes,—for boots, clothing, sleeping-bags, tents, and blankets. These skins need scarcely any preparatory treatment. Dehaired and dressed, they make most satisfactory clothing for use in cold climates. The sleek, dark-brown hair of the early fall affords a very beautiful material for ladies' jackets or motor coats, and picked skins for such purposes should well repay exportation; two dollars apiece is the present local price for Labrador deer skins. Some of our deer have snow-white skins in winter, and the hair is as thick as a cocoanut fibre mat.

Moccasins manufactured from the thinner deer skins make the warmest foot-gear known. The heavier stag skins furnish admirable light, soft, flexible over-clothes. They are perfectly wind-proof, and, when dressed for use, fetch fifty cents to one dollar per pound weight. Stretched, undressed, they are sold by the pound as parchment; this, cut into strips,

* This figure is too high. In 1919 the average value of reindeer in Alaska, hide and meat, was only $25 per head.

In 1919 about 1,000 reindeer carcasses, averaging about 150 pounds each, were shipped from Nome to Seattle, making an aggregate of 75 tons. This meat sold for 28 cents per pound, f. o. b. Seattle, making the total value of the trade about $42,000.—J. W.

is rolled up, and sold as *babiche*, out of which all the fillings for snow-shoes are made. Of this, also, are made the lashings for our sledges and the harness for our dogs. The tough thongs show remarkable elastic strength as they "feel" the jarring and jolting of the rough trails. The very tendons that are useless as food are amongst our most valuable acquisitions, affording our women all the sewing material they need for making boots, skin-boats (or kayaks), and clothing. These animal tendons are taken and dried, and fetch from ten to fifty cents for each animal. They strip easily into single fibres, and these separate threads form a strong sewing material, which resists water, and yet, when used in boots intended to be water-tight, swells up as soon as the boots are immersed in moisture. In this way leakage through the needle holes is prevented. The tendons do not rot easily, nor do they tear the skin substances, for they contract and expand with that material. Even the horns and hoofs are valuable, and furnish many of the household essentials of the natives. Some of these various manufactured products can be exported to the European markets. Reindeer may thus largely increase the earning capacity of any region, by converting its unsaleable material into valuable products. The fresh rich milk of the does in the summer has also supplied us with what is a vital necessity, and one which was obtainable in Labrador in no other way; while the excellent and easily made cheeses afford a method of storing the nutriment in a palatable and assimilable form without any necessary outlay for a preserving plant.

Doctor Grenfell consulted Doctor Sheldon Jackson in Washington, who had been responsible for the successful introduction of the reindeer into Alaska. It was found that suitable food occurred in Labrador and Newfoundland, where, of course, the native caribou find ample means of sustenance. Convinced that a natural means of sustenance existed, Doctor Grenfell set to work in 1907 to carry out his scheme. He collected a sum of $10,000 by public subscription, and in addition obtained a grant of $5,000 towards the work through the Dominion Department of Agriculture. It was decided to purchase a herd of 300 reindeer from Norway and Lapland. Of these 250 were does of an age to bear fawns in the following spring, and 50 were stags. In addition, a contract for thirty tons of reindeer moss was arranged for to serve as feed for the animals *en route*. It was

decided to ship the reindeer from the north coast of Lapland to the mission station of St. Anthony in north Newfoundland. The herd set sail on December 30, 1907, but, owing to ice conditions, it was necessary to land them on the Newfoundland coast about eight miles from the harbour selected as the wintering-place for the deer. Lapp herders accompanied the deer, which were safely landed and took kindly to their new environment.

In the following spring (1908) the herd was reduced to 200 does and 50 stags, 50 of the deer having been sold to the Anglo-Newfoundland Development Company, 300 miles to the south of the place where the herd was maintained, for use in the logging camps. As far as it was possible to ascertain, 168 fawns were born in the spring. After deducting certain losses, the number of reindeer had increased to 405 animals by the end of 1908. During the summer the reindeer chose the high grass-covered hills close to the sea, and ate mostly the young grass and green leaves. The does gave about a pint of very rich creamy milk per head.

The herd increased from 250 to 1,250, but, owing to the lack of government support, either financially or in checking the poaching, which gradually increased, the subsequent history of these reindeer was a sad one. As the expenses of the Lapp herders could not be met, it was impossible to retain them. Instead of creating a reservation for the reindeer from Pistolet Bay to Hare Bay, the killing of reindeer north of that line was prohibited, but the prohibition was not enforced. It was claimed that the reindeer were "dangerous to life," and other objections were raised in order to create a local sentiment antagonistic to the animals. In the end the poaching became so bold that the fishermen, coming in the summer in schooners, used to go out and shoot the deer. Thus a gradual diminution in the herd took place, until, by the end of 1916, hardly more than 100 animals remained.

Early in 1917 Doctor Grenfell approached the Canadian Department of Indian Affairs with a view to having the herd of reindeer transferred from Newfoundland to the Canadian coast, where it might be developed for the benefit of the Indians on the north shore of the Gulf of St. Lawrence. Owing to various difficulties, it proved impossible to move the herd during 1917. In 1918, the International Grenfell Association undertook to move the deer in one of their own ships, and the Department of Indian Affairs decided to place the herd on a peninsula bounded on the west by Napetibi Bay and on the east by Lobster Bay. The department constructed there one herder's hut and erected posts for a fence across the neck of the peninsula, a distance of about three and one-half miles. Lack of wire prevented the completion of the fence at the time it was begun, but Doctor Grenfell agreed to complete the work and move the deer in in the fall of 1918.

The herd was finally moved late in the fall, and herders were brought from Newfoundland to take care of them. At the time of moving there were about 125 reindeer. Since their removal and transfer to the Department of Indian Affairs there have been no complaints of poaching, and the territory to which they have been moved appears to be well suited for the protection and breeding of the deer; 40 fawns were born in the spring of 1919.* There is every reason to hope that under the more adequate care that will be given them by the Canadian Government they will ultimately fulfil the expectations of those who believe that they may be developed for the benefit of the Indians of that region, who stand in great need of the food and clothing that such valuable animals produce.

* In March, 1921, the herd numbered between 140 and 150.

FIRST ATTEMPT TO INTRODUCE REINDEER INTO THE NORTHWEST TERRITORIES

In 1911 the Forestry Branch of the Department of the Interior undertook the first attempt to introduce reindeer into Canada from St. Anthony, Newfoundland, where, as already stated, the herd had been established by Doctor W. T. Grenfell. A small herd of fifty deer, comprising forty does, six stags, and four oxen, was purchased from him. They were shipped from St. Anthony on September 7, 1911, to Quebec, *via* North Sydney, N. S. Accompanying them were three experienced herders, thirty days' supply of reindeer moss, and three deer dogs. From Quebec they were transported in stock-cars by rail to Edmonton, and thence sixty miles north, which was as far as the railroad had been at that time completed. From that point they were taken in waggons to Athabaska Landing, where they were unloaded into four scows, the final destination of the herd being Fort Smith. After many difficulties the herd, now reduced by deaths to thirty-three animals, was taken to a place about seventy miles from Fort Smith, where a camp was established in November. In May, 1912, the herd, now comprising thirty-one animals, was transported on scows to Fort Smith, where quarters had been prepared for them. During the latter part of June the flies ("bull-dog" flies or *Tabanidæ*) became very troublesome, and the whole herd of reindeer stampeded, escaped from the enclosure, and scattered, with the result that the chief herder was only able to recapture twelve of the thirty-one animals. On account of the abundance of the flies it was decided to remove what remained of this herd elsewhere, for the summer months, and a suitable island in Great Slave Lake was selected, but as no boat could be obtained at that time the reindeer had to remain at Fort Smith until the following year, when the flies again tormented the animals to such an extent that they

broke from their enclosure and escaped into the surrounding country. After much difficulty eleven of the animals were rounded up, but, at the end of the summer of 1913, only ten remained in the enclosure at Fort Smith. Owing to deaths from unknown causes, only four deer remained in the spring of 1914. Finally only two were left, and they were transported to an island in Great Slave Lake. The last survivor died in the autumn of 1916.

CHAPTER XVI

THE SALE OF GAME

It is universally recognized now by sportsmen and conservationists that the free marketing of wild game is one of the greatest factors tending rapidly to exterminate our native game resources, and that, with the existence of so many other factors that are beyond our control, adversely affecting the abundance of our game mammals and birds, the sale of protected game must be prohibited if the disappearance of such game is to be prevented and its continued existence secured for use and enjoyment by sportsmen and nature-lovers dwelling in our cities and countryside.

The sale of game for food is only justified in the case of game from private or government game farms and preserves. The utilization of non-agricultural areas for the propagation of game is to be strongly commended, with a view to augmenting the domestic meat supply. But the sale of such surplus and propagated game is an entirely different matter from the sale of wild game as it now exists in our woods. Let us propagate game by all means for those who desire it and are unable to obtain it by other means than purchase, but do not allow the market hunter to profit at the expense of the wild life, as he will if the sale of game is permitted.

The sale of wild game is unnecessary, as those who need it for food are able, as a general rule, to obtain it legitimately by taking out a hunting license. Most of the game that is sold is consumed not by people who need it but by those who do not need it and demand it only to gratify their jaded appetites. The fight against laws prohibiting the

sale of game has been carried on not by the sportsmen but by the pot-hunters, dealers, and those who profit by such commerce. But the game resources of the country are for the use and enjoyment of all and not for the small percentage by whom the sale of game is demanded.

There should be no wavering in this matter, nor catering to the interests of a few objectors who are unable to appreciate the wider significance of this aspect of game protection. Our wild life is not sufficiently abundant to withstand the toll of the market hunter. Is it preferable to have our wild life in its natural haunts for the benefit of the nature-lover and sportsman, or in the butchers' and game dealers' shops to gratify, in the majority of cases, the tastes of those to whom wild-life protection has no meaning or interest?

In the United States the disastrous results of the policy of permitting the sale of game have been so obvious that, with the disappearance of the greater portion of the fur and feathered game, it has been practically a question of deciding whether the remainder should be killed and sold for food, or protected for legitimate sport. Consequently, no less than thirty-four States, including the best of the game States, prohibit the sale of protected game, and it is safe to predict that the few States which still permit, in a more or less modified way, the sale of certain classes of game, will follow the example of the majority within a few years.

In Canada there is a gradual and strong increase in opinion against the sale of game. It is realized that, in the more settled parts of Canada, there is no excuse for the sale of game. Already the sale of protected game is entirely prohibited in the provinces of Manitoba and Saskatchewan. In British Columbia the sale of game is prohibited, with the exception of moose, which may be sold during part of the open season in the northern districts of Atlin, Prince George, Omineca, and Cariboo, and bear, which may be sold throughout the province. In Nova Scotia moose is the

only game that may be sold when lawfully killed. The sale of certain game, such as grouse and wild fowl, is prohibited in most of the provinces. In 1918 the sale of game was prohibited in New Brunswick, but we deeply regret that it was resumed after one season's trial, owing to the natural opposition which was found to such a necessary measure. The act was repealed in spite of the fact that the sportsmen and guides of the province are strongly of the opinion that, in New Brunswick, the conservation of the game, and particularly the moose, depends upon the prohibition of its sale. We would urge not only upon the Province of New Brunswick, but also upon all other provinces that have not, as yet, adopted this essential measure, to amend their game laws in such a manner as to make it illegal to sell protected game of all kinds, except in those remote regions where the difficulty of obtaining other forms of meat may render necessary the sale of game, lawfully killed; in such cases adequate safeguards, such as the appointment of special hunters to kill such game, and the submittal of sworn statements as to the amount killed and its disposal, should be adopted to prevent abuse of the privilege. Such prohibition will have to come sooner or later, and it is surely more desirable to put it into effect while the game is still fairly abundant than to wait until its rarity compels the adoption of this essential step in game and wild-life protection.

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