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THE ECOLOGICAL CHARACTERISTICS AND HISTORICAL DISTRIBUTION OF THE FAMILY CERVIDAE IN ALBERTA

by

© MARY V. DWYER

A THESIS

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42

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The Ecological Characteristics and Historical Distribution of the Family Cervidae in Alberta," submitted by Mary V. Dwyer in partial fulfilment of the requirements for the degree of Master of Science.

ABSTRACT

Knowledge of past faunal distributions is highly advantageous in the understanding of present day distributions of wildlife forms, and the study was carried out specifically to trace the historical distribution of Cervidae members indigenous to Alberta. The Alberta environment, as habitat for indigenous Cervidae, is assessed. The Cervidae family is taken as a whole and factors concerned with general distribution, intraspecific and interspecific relationships and forage requirements are reviewed.

Each species is studied individually. A general description of the species, and its ecology is followed by a summary of its known historical distribution. A map of the present day distribution is compiled in conjunction with a complementary text.

In conclusion the reasons behind changes in historical distribution and population figures are reviewed in the light of the reliability of the documents studied.

Flora nomenclature used throughout is in accordance with that found in Moss 1959 while fauna nomenclature is in accordance with that found in Soper 1965.

ACKNOWLEDGEMENTS

Dr. S. I. Smith was very patient throughout the time I spent working on the project. I wish to sincerely thank him for his help.

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Without the willing assistance of Joy and Cam Finlay it would have been impossible to have the final typing and printing of this thesis done during the latter part of November. I wish to thank them for their kindness.

"The West of which I speak is but another name for the Wild; and what I have been preparing to say is, that in Wildness is the preservation of the World. Every tree sends its fibers forth in search of the Wild. The cities import it at any price. Men plough and sail for it. From the forest and wilderness come the tonics and barks which brace mankind . . ."

Thoreau

--1862--

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

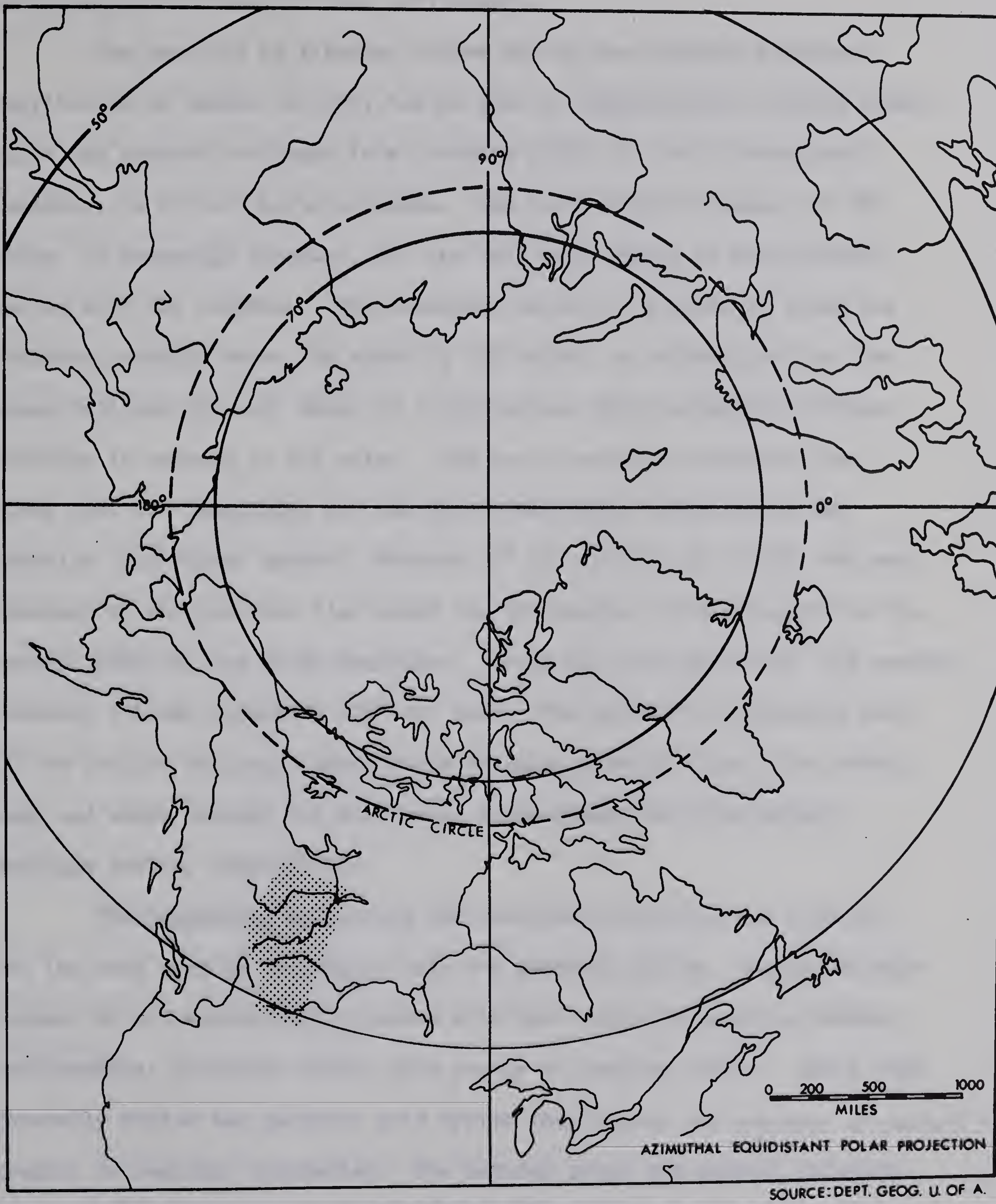
CHAPTER 1

THE ALBERTAN PHYSIOGRAPHIC ENVIRONMENT

Historical data all too often are restricted to dates associated with political events. When considering development within the borders of long established nations analysis of history as indicated by dates of political events may suffice, but, not so in young or pioneer lands. The natural resources of a new land, including its wild animals, significantly influence human pioneering settlement and exploratory expansion. Of this fact subsequent generations are often either unappreciative beneficiaries or unaware victims.

During initial exploration and settlement of North America the ranges of most large mammals contracted more or less as a direct result of the expansion of exploration and subsequent settlement by Europeans. The range retraction of these species, many of which today hold high esteem in the sportsman's eye, was due to wholesale slaughter and an unchecked utilization. In Alberta the critical stage for indigenous ungulate populations was reached during the first decade of the twentieth century. Although exploration, settlement, and population have increased constantly since that time, acts, laws and regulations regarding the indiscriminate slaughter of animals have been enacted, and in many cases these have enhanced the perpetuation of populations.

It is necessary therefore to begin by establishing the physiographic and other environmental settings in which this exploration and settlement took place in so far as it applies to Alberta. By this means it is possible to infer that the Cervidae under study have been forced, and in many instances able, to make their adjustments to the changing and



SOURCE: DEPT. GEOG. U. OF A.

FIGURE 1

GEOGRAPHIC LOCATION OF ALBERTA

continually disturbed Albertan environment.

The province of Alberta, carved out of the original Northwest Territories of Canada in 1905, has an area of approximately 255,285 square miles and extends northward from latitude 49°00' N, the international boundary, to 60° 00' north latitude. The north-south distance, of 756 miles, is generally constant, but the east-west extent of the province varies with the latitude. The narrowest sector of Alberta is along the southern boundary where the width is 182 miles; the widest portion lies along latitude 53° 40' where it is 404 miles, while along the northern boundary it narrows to 342 miles. The east boundary of Alberta lies along 110° 00' longitude, or, the Fourth Meridian, according to the Dominion Land Survey system. Between 49° 00' and 53° 40' North, the west boundary of the province lies along the Continental Divide located in the central chain of the Rocky Mountains. North of latitude 53° 40' the western boundary follows longitude 120° 00' west. The province lies wholly east of the Pacific drainage, thus waters draining Alberta flow to the north, east and south through the MacKenzie, Saskatchewan and Mississippi drainage basins, respectively.

The boundaries delimiting the province of Alberta are laid out for the most part in accordance with the geodetic system. These man-made borders do not necessarily coincide with the natural boundaries between environmental divisions within this sector of western Canada. Since they generally follow the geodetic grid system they ignore the presence of natural geographic or regional boundaries. The natural areas and spatial relationships between components of the natural environment were in general disregarded in the creation of the province as a stable political and self-

sufficient unit within the Dominion of Canada.[1]

Geographically North America is the smaller of the two continents making up a virtually circumpolar land mass in the northern hemisphere. It shares many environmental components with Eurasia. Biogeographically these partly-contiguous land masses of which Alberta is a part are known as the Holarctic Realm.[2] This realm is divided into two sectors: the Palaearctic, Eurasian or the Old World land mass, and the Neoarctic or northern portion of the New World. Figure 1 shows this realm in its entirety.

Alberta lies within the sub-arctic zone of the North American section of the realm geographically and of the boreal zone biologically. The province lies within the northern confines of the Great Plains sector of North America. This Great Plains region appears as a basin between the plateau of the ancient Precambrian Shield to the north-east and the rugged Tertiary Rocky Mountains to the west. The province is basically a plains area and the predominant vegetation is the boreal forest so prevalent throughout much of Canada.

The lands within these provincial boundaries have long been prime habitat for North American members of the Cervidae Family. The remainder of this chapter deals with the landscape and the soils of their Alberta environment.

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[1]Nicholson, N. L., Memoir 2, Geographical Branch, Queen's Printer.

[2]Darlington, P. J., Zoogeography, Wiley & Sons, N.Y., N.Y., 1957.

Physiography

Geologically Alberta lies within the highest or Third Prairie Step of the Great Plains or the western sedimentary basin of North America. This Third Step abuts against the Cordilleran region to the west. The land slopes generally from the south-west to the north-east. The highest elevation in Alberta is the peak of Mt. Columbia, which is 12,294 feet above sea level, while the lowest elevation, (655 feet above sea level) occurs along the Slave River north of Lake Athabasca.

There are four major physiographic divisions in Alberta; mountains, foothills, plains and the Precambrian Shield.[3] Of the total provincial area (255,285 square miles) the mountain division occupies approximately 15,000 square miles or six percent. The foothills region occupies about 12,000 square miles, or four percent while the Precambrian Shield area covers approximately 8,000 square miles or three percent. The remaining area, approximately 220,000 square miles, or eighty-seven percent lies within the plains topographic division.[4] It may therefore be emphasised that Alberta is largely a "plains" province with an average elevation of approximately 2300 feet above sea level.

The Mountain division includes the eastern or front ranges of the Rocky Mountains of North America's cordilleran region. This rugged, mountainous region of Alberta is world-famous for its spectacular alpine scenery. The lower slopes of this area are clothed with an admixture of the boreal and montane forests, while at higher altitudes alpine tundra

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[3]Allan, J. A., <u>General Geology of Alberta</u>, Research Council of Alberta Report No. 34 Part 1, 1943.

[4]<u>Ibid</u>.

grows upon a shallow regolith. The unvegetated portions of the higher peaks are often snow-covered for much of the year, and numerous alpine glaciers such as those of the Columbia Ice Fields occupy valleys in this region; thus some areas lie under perpetual snow and ice. The elevations in this division range from approximately 3,500 feet above sea level in the valleys of the Crowsnest and Yellowhead Passes, to peaks such as 11,870 foot Mt. Assiniboine, 11,874 foot Mt. Alberta and 12,294 foot Mt. Columbia. Few Cervidae venture into this area and though caribou (Rangifer spp), moose (Alces alces) and wapiti (Cervus canadensis) are found within this division much of it is solely range lands for sure footed members of the Bovidae Family such as, the bighorn sheep (Ovis canadensis) and the Rocky Mountain Goat (Oreamnos americanus).

The second division, the Foothills, consists of rolling topography with long narrow ridges representing broken and folded strata, with intervening valleys caused by the gradation of the less resistant rocks. In general, the valleys and ridges trend parallel to the north-south direction of the mountains. This corresponding trend is due to the fact that the strata underlying this foothills sector have been folded by the same orogenic forces which formed the Mountains during the Laramide Orogeny of the Tertiary Period. Along with the front or eastern ranges of the Rockies this division comprises what is commonly called the East Slope. Geographically the term East Slope corresponds to the eastern side of the Rocky Mountains proper and the adjoining foothills region. Elevations within the foothills belt generally range from 3,000 to 5,000 feet above sea level. Today this foothills division is prime habitat for Cervidae members such as the wapiti and mule deer which have been pushed from their original prairie range as well as for the moose which have

long utilized this range type.

There is no obvious sharp line of demarcation between the Foothills belt and the third division, the Plains. The Plains region slopes gradually downwards from a high of approximately 3,000 feet along the eastern face of the foothills of the south western corner of the province to a low of less than 800 feet above sea level in the low Peace River area. Throughout this division there are numerous outliers or prominences rising several hundreds of feet above the surrounding plains. These outliers, commonly called "hills" are remnants formed through differential erosion which has removed the less resistant surrounding rocks. The highest and most prominent of such residual hills are the Cypress Hills in the southeast and the Swan Hills in the west-central portion of the province, where the benches or plateau elevations are approximately 4,200 feet above sea level. Much of the southern or prairie portion of this division has been greatly influenced by settlement so only those indigenous members of the Cervidae which can co-exist with man's use of the land remain. However, in the northern or forested sector of this division many Cervidae populations still exist in essentially pristine conditions.

The Precambrian Shield division of the province occupies approximately 8,000 square miles in the extreme north-east sector. This is the western edge of the Canadian Precambrian Shield, which is the ancient, eroded, exposed shield area of North America, often called the basement complex of the continent. The lowest elevation in Alberta occurs in this Shield region, which is the area adjacent to the north shores of Lake Athabasca. Lake Athabasca is 699 feet above sea level while the elevation of Fort Fitzgerald, located along the Slave River near Alberta's northern

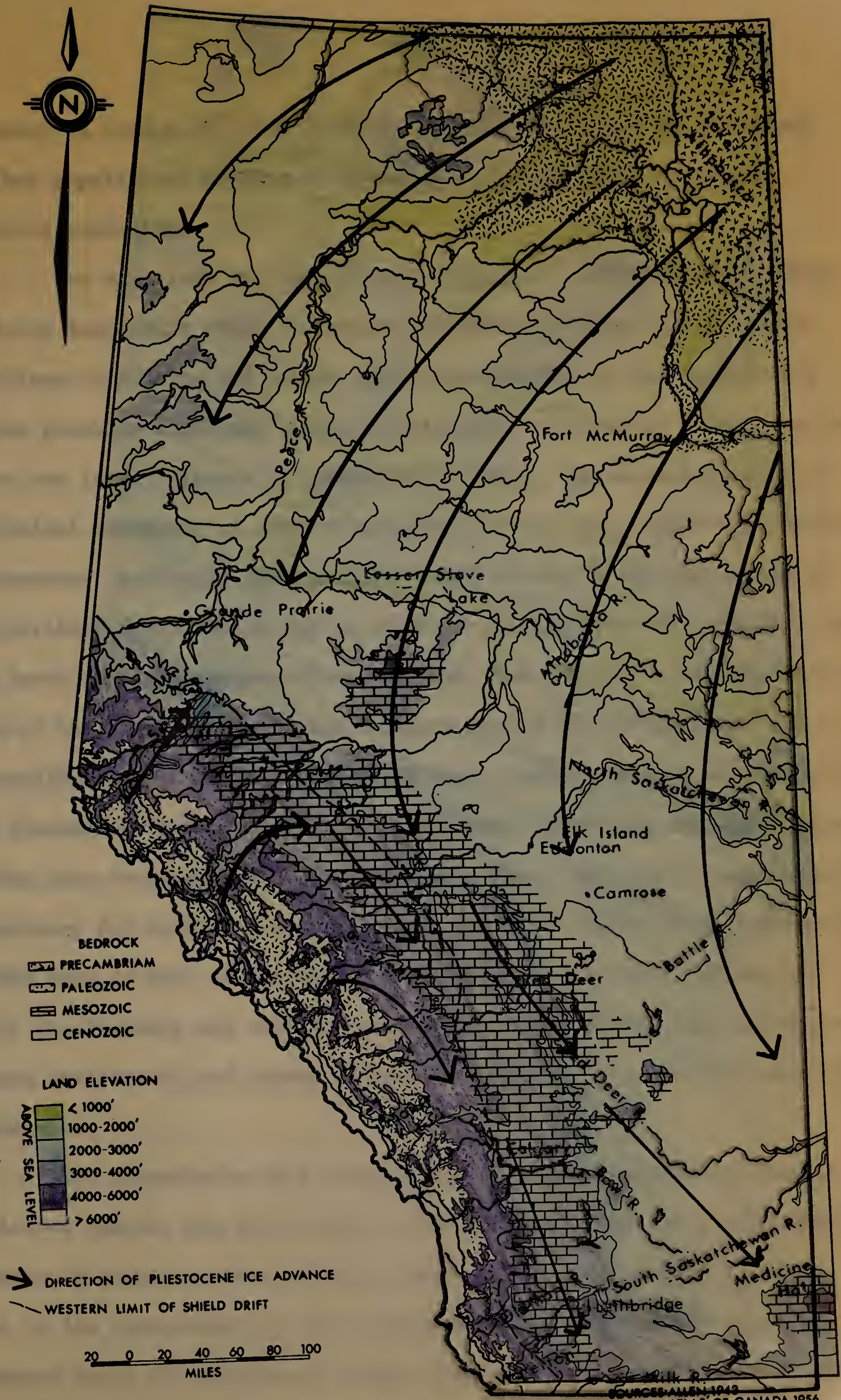
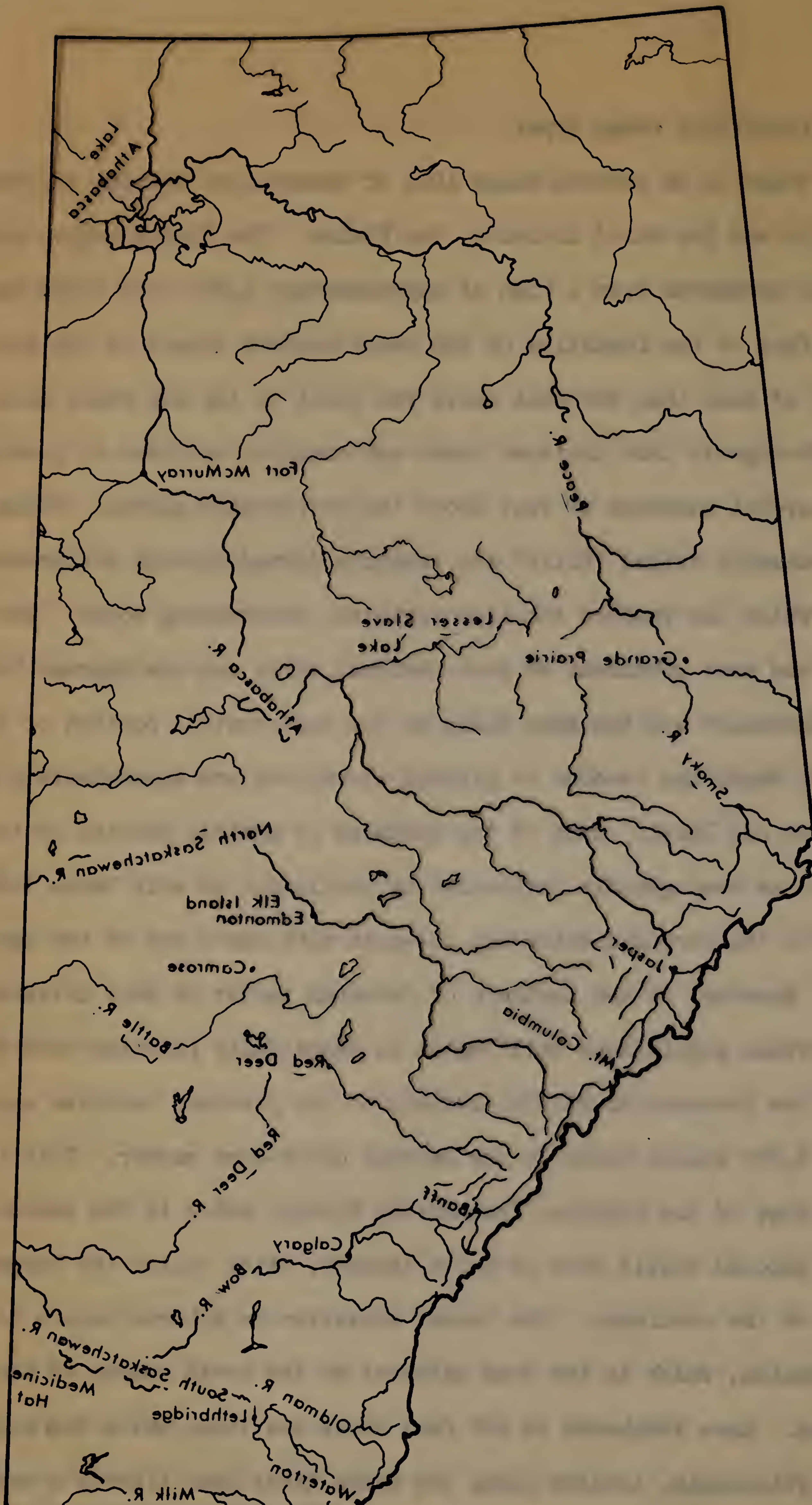


FIGURE 2

OVERLAY 1

PHYSIOGRAPHY OF ALBERTA



Lake Athabasca
Fort McMurray
Peace R.
Lesser Slave Lake
Grande Prairie
Athabasca R.
Smoky R.
North Saskatchewan R.
Elk Island
Edmonton
Camrose
Jasper
Battle R.
Mt. Columbia
Red Deer
Red Deer R.
Banff
Calgary
Bow R.
South Saskatchewan R.
Medicine Hat
Oldman R.
Lethbridge
Waterton
Milk R.

OVERLAY 1

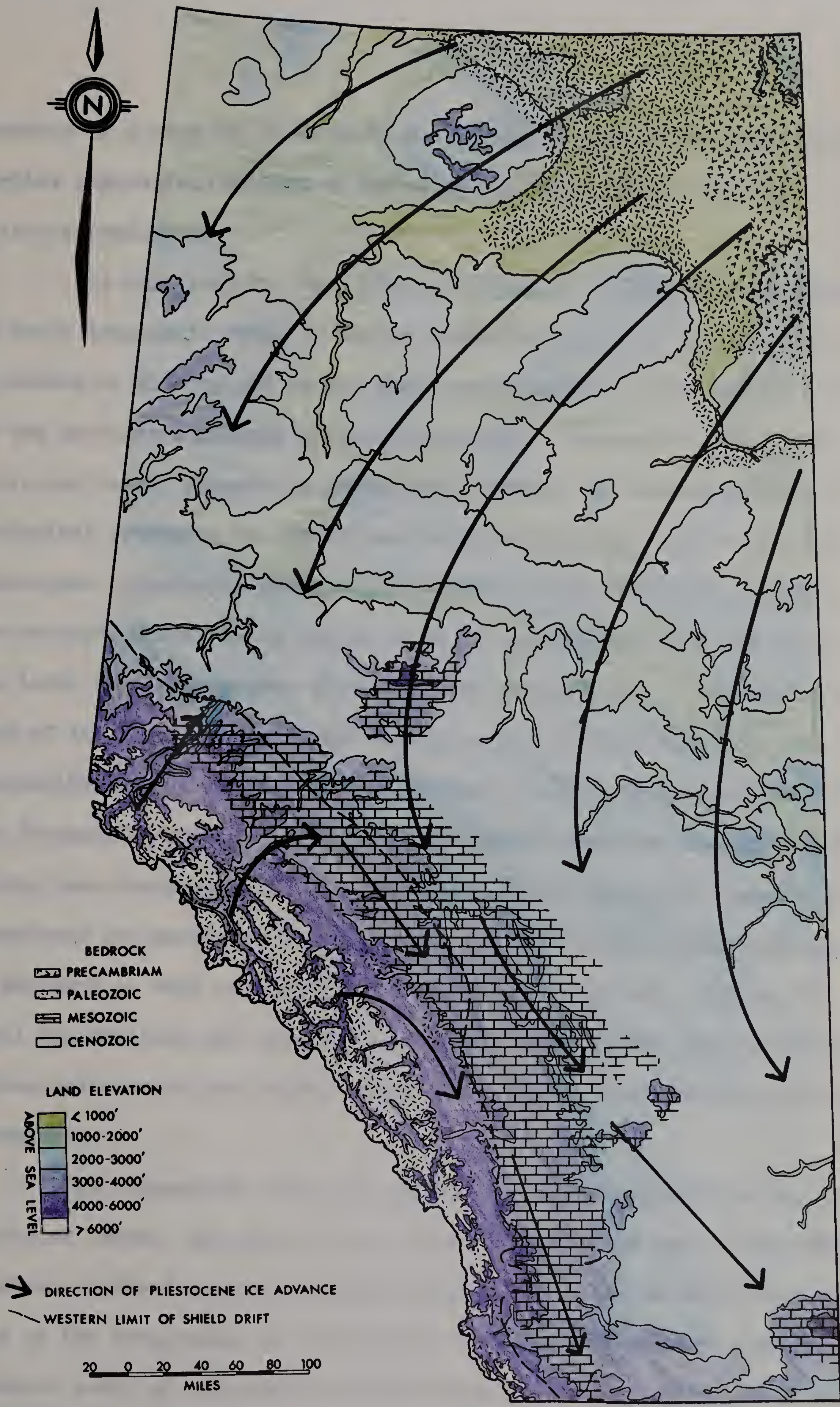


FIGURE 2

PHYSIOGRAPHY OF ALBERTA

boundary is a mere 665 feet above sea level. The moose and migratory caribou populations of this division as yet exist under relatively pristine conditions.

One must look at the geologic history of this particular region of North America in order to better comprehend the four physiographic divisions of Alberta and to see their relationship to one another and to the province's overall physical geography. As part of a land mass well above sea level, Alberta is geologically young. It is an area wherein geological processes of erosion are today acting upon relatively youthful landscapes. Basically Alberta lies within the north-western sector of the northern Great Plains region of North America which did not rise above sea level until Cretaceous times and even then shallow inland seas occupied much of the area. Prior to the Tertiary Period this Plains area was a geosyncline and acted as a collection basin for the erosion materials from the Precambrian Shield to the north and east. After the Laramide Orogeny during late Cretaceous and early Tertiary times, the basin became a major depository for erosional material from the newly formed Rocky Mountains to the west as well as the Shield area to the north-east. It was not until the Tertiary age that the area that is now Alberta rose above the marine environment and became a landscape subject to subaerial gradational processes.

The Precambrian rock outcroppings in north-eastern Alberta, as mentioned before, are part of the ancient shield which was the pre-Rocky Mountain highland portion of North America. It acted as the formative base in the development of the present continent. There are also Precambrian rocks of sedimentary origin along the western fringe of Alberta.

These were apparently upthrust and exposed during the orogenic period in which the Rocky Mountains were formed. Paleozoic rocks occur as outcrops throughout the Mountain Division and extensive areas of them are exposed in conjunction with salt and gypsum deposits in north-eastern Alberta.

Surficial strata of approximately three-quarters of the total area of the province are rocks of Cretaceous age. The most noteworthy surficial exposures of the Lower Cretaceous occur in north-eastern Alberta as the MacMurray formation, commonly known as the bitumunous tar sands. Surficial rocks covering approximately one-half of Alberta's area were formed in the Upper Cretaceous period. Rocks of this period are commonly exposed within the foothills belt, and form the surficial parent rock material for the soils throughout a large proportion of the Plains division.

Alberta's youngest consolidated strata which are of the Tertiary Period, are well represented in the Foothills. Much of the early Tertiary strata consists of soft sandstones and clay shales. Rocks of this same age appear as cap formations on the tops of erosional remnants such as the Cypress Hills. Rocks of the late Tertiary are by no means common in Alberta but do occur as a conglomerate cap on several outliers as do those of the earlier phase of this period. From the middle of the Tertiary period to the onset of glaciation during the Pleistocene epoch, Alberta was subjected to extensive erosion which resulted in the removal of hundreds of feet of Tertiary and Cretaceous sediments from the Plains division.[5] The actual amount of material removed during this period can be estimated

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[5] Gravenor, C. P. and Bayrock, L. A., "Glacial Deposits of Alberta," in Soils of Canada, 1961.

from the relief shown by gravel-capped erosion remnants which are found in many localities in the province. The Cypress Hills in the south-east rise approximately 1,800 feet above the surrounding plains surface and are capped by gravels of Oligocene age, an epoch of the mid-Tertiary period. In Northern Alberta the Swan, Buffalo Head, Cameron, and Naylor Hills, Mount Watt and the Birch and Caribou Mountains all exhibit local relief of over 1,000 feet and probably form part of the Cypress Plain the erosional level represented in southern Alberta by the hills of that name. A lower erosion surface which has a local relief of the order of 300 to 600 feet in southern Alberta is represented by the gravel-capped Hand, Wintering and Neutral Hills. This latter erosional surface is thought to be Pliocene in age and thus also part of the late Tertiary surface. In most cases these gravel-capped erosion remnants are surrounded by broad pediment-like surfaces that slope away from the actual remnant to the major drainage courses. These pediment-like areas often exhibit remains of gravel derived from the reworking of the gravel or conglomerate caps on the higher plateau or bench surfaces. From the shape of the erosion remnants and that of the surrounding surfaces, it is believed that erosion took place under arid to semi-arid conditions essentially under a process of pediplanation.[6]

The topography of much of Alberta immediately before glaciation was much the same as it is today, except for the thin veneer of glacial materials and modifications to the drainage systems caused by glaciation. The glacial veneer deposited upon the bedrock of former times does not form strata such as those rocks of previous geological periods, but,

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[6] Ibid.

exists as unconsolidated surficial deposits. During the Pleistocene period vast continental glaciers advanced and retreated across Alberta from the Keewatin centre in the Shield area, and from local alpine glaciers originating in the Rockies. The flow pattern these glacial bodies took across Alberta during the last advance is outlined in Figure 2. There is evidence for four major glacial advances and withdrawals across Alberta but little is known about the actual direction of ice movement in the first three. Evidence for the direction of advance during the last major glaciation, the Wisconsin, has been compiled from drumlin and fluting directions, the distributional pattern of erratics and the analysis of the altitudes of the highest glacial deposits in southern Alberta.[7]

In Alberta the young, unconsolidated surficial deposits of the Quaternary period are generally grouped under three headings; ground and hummocky moraine, lake deposits, and, outwash and wind worked materials.

Many parts of southern and central Alberta are characterized by broad areas of level to gently rolling ground moraine. This relatively flat topographic feature commonly grades into irregular or elongate tracts of hummocky moraine which are composed of knobs and kettles, linear elements such as till ridges or chains or knobs and moraine plateaux. It appears that the ground moraine was constantly deposited as the glacial ice body moved across the landscape; thus today, a veneer of glacial till normally exists throughout once glaciated regions. It is felt that the formation of a hummocky moraine took place during a relatively rapid down-wasting period or a lengthy stagnation phase of deglaciation. During these periods glacially transported materials were literally dumped in situ.

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[7] Ibid.

Although glaciers carried boulders and smaller stones long distances and deposited them as erractics located far from their original site, it is the local bedrock of any one area which today comprises the basic material of the glacial till or surficial deposits on any one location. Over eighty percent of the glacial till for a given area is normally comprised of the local bedrock material.[8] However, erratics are important in analyzing the ice movements regionally and form interesting components of the glacial till of an area.

One of the most striking features of Alberta's landscape, particularly in the northern portion, is the presence of vast areas of glacial lake deposits. The large accumulation of lake deposits in northern Alberta and the more sporadic occurrence of them in the central and southern areas of the province, are a consequence of the direction of both ice retreat and regional topography. In southern and central Alberta, the regional slope is towards the east; hence melt-water lakes ponded between the retreating ice margin and the higher land to the west drained rapidly eastwards via outlets along the terminus of the northward retreating ice. In these regions there was no opportunity for the entrapment of large quantities of water and hence the ice-marginal lakes were relatively small and short-lived. North of the Edmonton area, in north-central Alberta, the regional slope changes from east to north-east as exemplified by the present-day river systems of the Athabasca and the Peace. During glacial retreat in this region melt-waters from ice of both the retreating Cordilleran and the Keewatin glacial bodies were ponded between the terminus of the retreating Keewatin ice and the higher land to the west.

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[8] Ibid.

As the ice retreated northeastwards successively lower outlets were found around its southern and eastern extremities. As lower outlets to the east were uncovered, the lake levels slowly dropped until eventually most of the water-bodies such as Lesser Slave Lake and Lake Athabasca lay in the lower basins of these once extensive water bodies. Raised beaches around such remnant lakes, beach ridges, sand dune areas, stratified sands, silts and clays all remain as today's testimony of the impounded melt-waters of the post-Pleistocene period.

Outwash and wind-worked deposits are in general post-Pleistocene in origin. No doubt both occurred, during the Pleistocene epoch, as deposits laid down by running melt-waters, and as wind-worked particles of sand and silt. Outwash deposits are locally prevalent where ever glacial or post-glacial streams flowed. Windblown deposits are locally prevalent in stagnant as well as active sand dune areas found in present day Lake Athabasca, and sand dune areas in the Grande Prairie, Wainwright, Red Deer, Edmonton and Medicine Hat regions.

Glaciation caused much erosion in the Mountain and Precambrian physiographic divisions but acted to a large extent as an aggrading agent in the Foothills and Plains divisions. Pre-glacial drainage was disturbed during glaciation and evidence that today's drainage does not coincide with the former systems can be exemplified by examining the bedrock or pre-glacial channels which are found buried under the veneer of glacial till throughout Alberta.[9] The general or regional pre-glacial drainage was in many cases closely aligned with today's but the actual channel courses of most present-day watercourses are post-glacial in origin.

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[9] Ibid.

Because of the prevailing slope of the province, the major river systems of southern and central Alberta flow to the east. The Saskatchewan river system, comprised of the North and the South Saskatchewan with their many affluents, flows eastward into the Hudson Bay drainage region from headwaters rising in the East Slope. The major river systems draining northern Alberta, the Peace, and the Athabasca, along with their many tributaries, flow north-east and empty into the MacKenzie system and hence into the Arctic Ocean. In south-eastern Alberta the Cypress Hills act as a minor divide and one small drainage system, the Milk, flows south-east into the Mississippi. Alberta as aforementioned lies wholly on the east side of the Continental Divide and thus has no streams whose waters normally flow west into the Pacific Ocean.

Ever since the Cretaceous Period this region has been a habitat for terrestrial plants and animals. Geologic history is an influential element in the biographical history associated with these living organisms and plays a vital role in their presence and distribution within any particular location at any particular time. Today members of the Cervidae inhabit various sectors of Alberta and their range relationships are directly determined by landscape which is a product of geologic history particularly that of the Pleistocene or post-Pleistocene.

Soils

The soil, derived from parent rock material through the action of weathering, is the basic component of the life of all terrestrial organisms. Soil is a biological entity, not simply a mineralogic aggregation. The action of climate and vegetation upon parent geologic material as conditioned by topography forms a soil body providing sufficient time is

elapses. So that the product is a complete aggregation of both living and dead flora and fauna, as well as soil water and air. The soils of Alberta, as anywhere else are a product of a number of factors and processes which involve climate, physiography, and biotic interaction. The indigenous life forms of any one area are interrelated with the soils of that area.

The soils of Alberta as may be expected have been developed under post-Pleistocene weathering conditions predominantly similar to those of today. Some 11,000 years ago the glaciers of the Wisconsin glaciation commenced their retreat leaving glacial till as a thin veneer over the bedrock. It is from this glacial till, as well as the bedrock exposed in certain areas, that the soils of Alberta have been developed. Initially the geologic weathering processes of climatic and physiographic conditions were the only forces operative in the soil development. Floral and faunal components of this temperate region became important soil building factors as they re-invaded, flourished and became established in the area subsequent to the ice recession. Biotic components of post-Pleistocene Alberta moved into the region from refugia in the south, north and east of the glaciated region as well as from a small refugium within the region itself.[10] Six of the world's major soil orders are represented in Alberta.[11] These orders, are the Chernozemic, the Solonetzic, the Podzolic, the Brunisolic, the Gleysolic and the Regosolic.

The Chernozemic soils occupy much of the southern and central

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[10]George, W., 1962, Animal Geography, Heinemann Ed. Books.

[11]Leahay, A. (ed.) 1965, Report on 6th Meeting of National Soil Survey Committee, Laval University.

portion of Alberta. They are commonly known as the grassland and Parkland soils of the province. Solonetzic soil is a hardpan soil caused by an overabundance of sodium in the soil body. This soil is found in scattered locations throughout the Chernozemic soil regions and occupies small areas within the Podzolic regions. The Podzolic soil is characteristic of the forested areas of Alberta. It has developed under a boreal forest cover, under moister conditions than did the Chernozemic soils and has also had less time for development due to the regional pattern of deglaciation. Brunizolic soils are known to occupy only a small portion of Alberta, mainly the area between the Birch and Caribou Hills and the Slave River. Much of this area was once covered by glacial Lake Athabasca. The Brunizolic soil of Alberta has developed under forest vegetation much like that of the Podzolic soils. This youthful soil which has a weakly developed profile is commonly known as the Acidic Brown Soil.

The Gleysolic soils are generally more prevalent in the northern half of the province but, do occur in ill-drained or low-lying water-logged areas throughout Alberta. Gleysolic soils are the result of poor drainage and may be identified by the presence of gley* within the soil profile. Such soils generally have a mineral profile lacking much of the normal organic composition of other soils. Soils of this type are prevalent in many low-lying areas which were post-glacial lake basins or small kettle holes. The indigenous vegetation growing on this gleyed soil is predominantly hydrophitic with acid-resistant marsh and bog types such as sedges (Carex spp.), labrador tea (Ledum groenlandicum) and black

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*gley -- Gleying is a reduction process that takes place in soils that are saturated for extensive periods of time. The horizon of the product of the most intense reduction is characterized by a grey mottled appearance which when dry shows numerous rusty brown iron stains or streaks.

spruce (Picea mariana). The Regosolic soils of Alberta are those soils which have developed almost solely through geomorphic or weathering processes. These thin soils, which have a weakly developed profile, are usually found on the higher elevations or the mountainous slopes of western Alberta where the weathering processes are still active.

Alberta's soils may all be accounted for in six Great Groups or zones, which are sub-divisions of the Soil Orders, and are recognized by the mechanism of their development. The six soil zones of Alberta are noted in Figure 3. From the relatively dry Brown soil zone of the south east the moisture effectiveness tends to increase as the climate becomes progressively more humid towards the west and north. Accordingly, the native vegetation short-grass prairie grades into the Parkland belt to the west and north, and thence into alpine and boreal forests further west and north respectively. Travelling northwards from the southeastern sector of the province one encounters the Brown, Dark Brown, Thin Black, Dark Gray Wooded and Gray Wooded Soils.[12]

The Brown Soil Zone of Alberta occupies what is commonly known as the semi-arid or short-grass prairie zone. This soil covers about 12 million acres of the province.[13] The 3 to 6 inch surface soil horizon is generally a light medium brown in colour. The soils of this region are generally of firm texture and have a relatively high lime content. The Brown soils generally fall within the realm of the Chernozemic order but many local areas of this soil are Solonetzic in character because of high concentrations of sodium.

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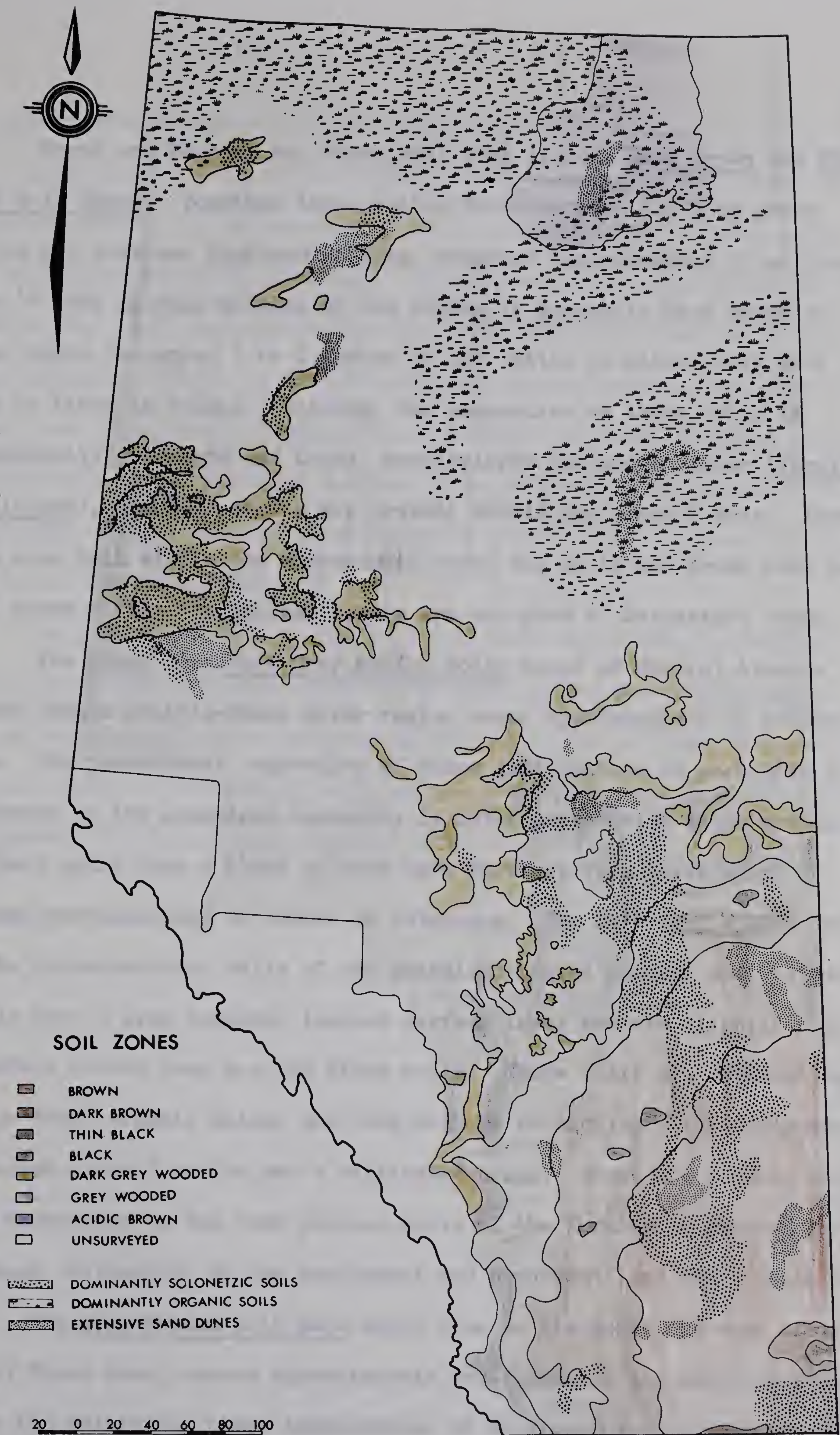
[12] Odynsky, Wm., 1962, Soil Zones of Alberta, Research Council of Alberta.

[13] Ibid.



SOURCE: ALBERTA SOIL SURVEY

FIGURE 3

SOILS OF ALBERTA

North and West of the Brown soil zone lie the Dark Brown and Thin Black Soil Zones. Together these soils, which support the long-grass prairie and southern Parkland ecotone, comprise approximately 15 million acres.[14] The surface horizon of the former is generally dark brown in colour while the upper 3 to 6 inches of the latter is either very dark brown or black in colour. Although the vegetation on these soils is predominantly grassland and trees, particularly the aspen poplar (*Populus tremuloides*), numerous shrubs are present within the general area. These soils also fall within the Chernozemic order but as in the Brown zone many local areas within the general region are occupied by Solonetzic types.

The Black, and Dark Gray Wooded Soils zones of Central Alberta and the Grande Prairie-Peace River region cover approximately 10 million acres. The predominant vegetation of these soil regions is park-like in appearance as the grassland community is interspersed with aspen groves. The Black soils have a black to very dark brown surface layer which averages approximately 12 inches in thickness. The Dark Gray Wooded Soils are the characteristic soils of the grassland-forest ecotone and, as such, usually have a gray somewhat leached surface layer and are slightly lighter in profile colour than are the Black soils. These soils are comparatively rich in total organic matter and rank high in productivity for indigenous vegetation as well as for man's cultivated crops. These Chernozemic soils, which correspond to the rich plateau soils of the Ukraine in central Europe, have been influential in the settlement and permanent land use of this region.

The Gray Wooded Soil Zone which lies to the north and west of the central Black zone, covers approximately two-thirds of the entire province. Due to the relatively lower temperatures of this northerly region and the

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[14] *Ibid.*

subsequent retardation of organic decay, the soil profile is usually characterized by a thin surface layer of semi-decomposed leaf litter above a greyish leached layer averaging 6 to 8 inches in depth. These soils are relatively deficient in organic matter when compared to the Black soils to the south and east. The native vegetation of the Gray Wooded Soils consists of a mixed deciduous and evergreen forest. Throughout the region peat bogs, organic and gley soils occur in extensive areas. Much of this infertility is a consequence of the over-abundance of moisture due largely to a decline in evaportranspiration. This soil zone falls within the Podzolic order.

As aforementioned the soil is the basis upon which terrestrial life forms of any land area depend. In order to understand the region from a biogeographic point of view man must account for the landscape and the soil types of the area as well as the floral and faunal types which are present within the given region.

CHAPTER II

ENVIRONMENTAL COMPONENTS CONTINUED

In the foregoing chapter, in which the physiographic components of the environment were reviewed, it was implied that vegetation, faunal components and climate of an area interact with these bases of the terrestrial environment. In this chapter these three operative components of the environment will be investigated so as to better understand the total environment of organic life in this province. Vegetation and climate play vital roles in the alteration of the landscape and in the development of the soils. Faunal components which are distributed in accordance to their ecological requirements, are directly related to the "green-mantle of vegetation because they depend upon this component of the ecosystem for both their food and their shelter.[1] In their own way they too are part of the ecosystem and help to evolve the total environment.

VEGETATION

Botanically Alberta is an interesting study region. From the point of view of ecologists, phytogeographers and taxonomists this province holds more than just general botanical interest as it is a region of vegetational transition zones. Within its boundaries two great plant formations - the steppe and the forest - meet along east-west as well as north-south ecotones. Here also is the meeting ground of the Atlantic or eastern and the Pacific or western floras. In the extreme north of the

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[1]Tansley, A.E., "The Classification of Vegetation and the Concept of Development," in Journal of Ecology 8:118-149, 1920.

province and in the high elevations of the west a transition from boreal to arctic and arcto-alpine vegetation respectively occurs. For discussional purposes one may say that vegetation acts as a self-recording 'lag mechanism' registering conditions within a geographical area. Thus, by studying the vegetation of the area we can learn much about the climatic and other history of the region.[2]

According to Halliday and Rowe the most practical way to assess vegetation complexes on a large geographical scale is to categorize the vegetation types into major geographic belts or classify the vegetation into broad zones and thus work with the resulting distribution as a geographic entity.[3, 4] These broad zones have been designated as regions by both the above authors. It is felt that these regions are equivalent to the climaxes or ecologically stable formations characterized by the presence or dominance of particular floral species as set forth by Clements.[5] These large zones or regions are sub-divided into sections which are essentially parts of the broader regions but are classified individually due to differential expression of vegetational components or of physiography. The presence of certain associations or recurring community types of floral components is utilized in the delineation of such sections.

According to reference material gleaned from Moss 1955, Rowe 1959 and the publications of several other authors the vegetation of Alberta may be classified into five regions or broad general categories which can be

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[2]Newbigin, M. I., Plant and Animal Geography, Metheun & Co. Ltd.

[3]Halliday, W. E. D., 1937, Bulletin 89, Forest Service, Queen's Printer.

[4]Rowe, J. S., 1959, Forest Regions of Canada, Bull. 123, Dept. of Forestry, Queen's Printer.

[5]Clements, F. E., 1920, Plant Indicators, Carnegie Inst., Wash., Pub. 290.

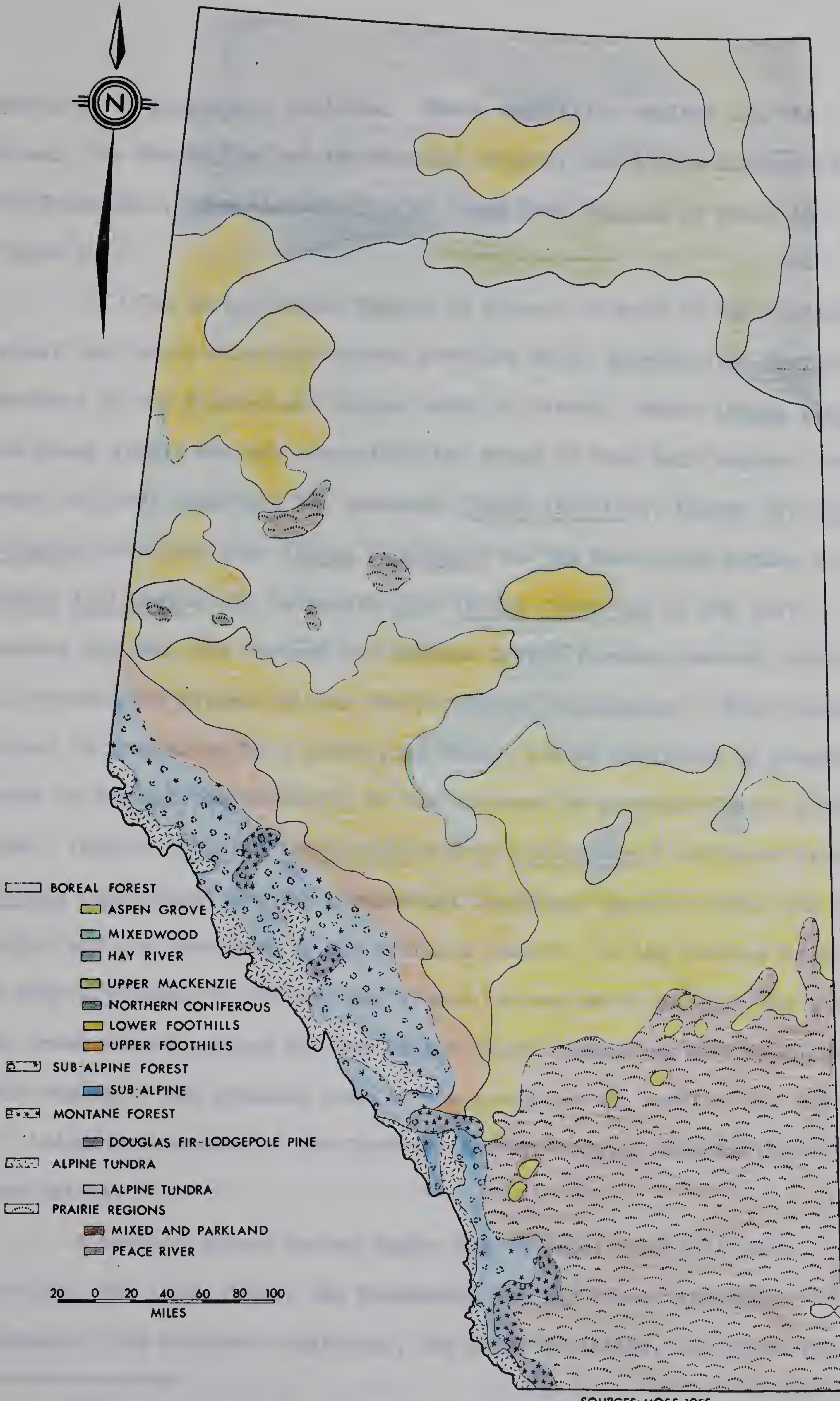

FIGURE 4

VEGETATION OF ALBERTA

appraised as geographic entities. These vegetation regions are the Boreal, the Sub-alpine and the Montane Forests, the Alpine Tundra and the Grasslands. The distribution of these five regions is shown in Figure 4.

(I) The Boreal Forest Region of Alberta is part of the continuous forest belt which stretches across northern North America from Newfoundland westward to the Rockies and thence north to Alaska. White (Picea glauca) and black spruce are the characteristic trees of this vast region. Among other conifers found are the tamarack (Larix laricina), balsam fir (Abies balsamea) and jack pine (Pinus banksiana) in the east, and, alpine fir (Abies lasiocarpa) and lodgepole pine (Pinus contorta) in the west. Because the two, the eastern and western boreal forests, meet in Alberta all species are present within the provincial boundaries.[6] This boreal forest is predominantly a coniferous forest but an admixture of broadleaf trees is present, particularly in the southern or parkland-forest ecotone area. Poplars (Populus tremuloides and P. balsamifera) and paper birch (Betula papyrifera) are the predominant deciduous species within the forest region and are prevalent in the southern sector. In the extreme north and in high altitudes in the west the forest becomes more open and the individual trees become stunted in size as the forest-tundra ecotone is approached. This region is the primeval home of the moose and the caribou but today all indigenous members of the Cervidae Family frequent this habitat to some extent.

Alberta's Boreal Forest Region may be subdivided into seven sections, the Aspen Grove, the Mixedwood, the Hay River, the Upper MacKenzie, the Northern Coniferous, the Lower Foothills, the Upper Foothills.

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[6] Moss, E. H., 1955, "Vegetation of Alberta" in Bot. Review (21) 9:493-567.

(i) The Aspen Grove, which is commonly called the Aspen Parkland, is the forest-grassland transition in Alberta. To a large extent it coincides with the Thin Black and Black Soil zones. Outliers of this vegetational type are recognized within the forestland of the north where limited areas of true Parkland occur in the Grande Prairie-Peace River country. The topography of this region is generally undulating to gently rolling. Surface materials are deep tills and glacio-lacustrine deposits, mainly of loam to clay loam texture and moderately calcareous. Black soil profiles are predominant, though signs of podzolic degradation as exemplified by greyish black profiles can be recognized under the aspen stands. Under pristine conditions the aspen bluffs are interspersed with prairie and meadow patches giving the entire area an open Parkland appearance. Rough Fescue (Festuca scabrella) is the dominant grass of the area while aspen is the predominant tree species. Balsam poplar is frequently present in moist lowlands while white birch which is scattered throughout the region, is most abundant on rough or broken landscape. There is a clear gradation in the heights reached by mature stands of the poplar from forest to prairie with the best growth attained in continuous stands of the north falling off to the low bluffs and patches in depressions and around sloughs to the south.

(ii) Extending northward from the Aspen Grove section and occupying much of central and northern Alberta is the Mixedwood section of the Boreal Forest Region. This vegetational growth is roughly coincident with that part of the Upper Cretaceous Upland north of the aspen parkland, and is recognized by the appearance in abundance of the needle leaved conifers. It is bounded on the north by the Hay River section and on

the west by the Cordilleran forest elements, such as the lodgepole pine. Along this latter boundary, the forest is broken up by patches of grassland and aspen groves, as well as by outliers of lodgepole pine, harbingers of the Lower Foothills Section. The relief of the area is not excessive locally as it is the result of pre-glacial erosion on soft shale bedrock. Subsequent glaciation modified the landscape, resulting in the present topography which is characterized by rolling morainic deposits on the uplands and smoother glacio-lacustrine deposits on the lowlands. The characteristic soil development is the gray wooded soil profile. The characteristic forest association of the well-drained sites, as the name implies, is a mixture of varying proportions of aspen, balsam poplar, white birch, white spruce and balsam fir. As a result of the ability of the aspen to regenerate quickly following disturbance the cover type of the greatest extent is this species. White spruce and balsam fir are predominant in old stands. In addition to its usual dominance on sandy soil areas, jack pine enters the general forest composition on drier till soils and is a co-dominant with white spruce on the plateau-like tops of the higher hills. Lowlands and upper water-catchment areas develop black spruce and tamarack muskeg, but, the accumulation of peat within this region is not very deep.

(iii) A northern extension of the Mixedwood Forest, the Hay River Section which is modified by a rigorous climate and a low level terrain occurs in north central Alberta. This forest section abuts against the riverine forest of the Peace and Slave Rivers in the east and that of the Upper Liard on the west, and it encloses the outlier foothills forest of the Caribou Hills. Shale and sand of Cretaceous age underlie most of this section. Glacial advance incorporated a high percentage of cal-

careous material in the surface drift, and the resultant soil profiles are frequently high in lime content and only superficially leached. The quality of forest growth is not as good as that of the Mixedwood section to the south, and the abundance of white spruce in admixture with poplar is less. Black spruce covers a large part of the land and commonly forms stands on the plateau-like uplands as well as in the lowland habitats. In the eastern portion of the section jack pine is found, while along the western boundary lodgepole pine appears (*Pinus contorta* var. *latifolia*).

(iv) The Upper MacKenzie section riverine forest is present along the lower Peace River and the Slave River in north-eastern Alberta. This forest grows on the valley floodplain environment which is much more favourable for tree growth than are the adjacent uplands. Topographic conditions are everywhere constant, the alluvial flats being bordered by low benchlands and terraces which in turn give way to undulating or rolling uplands with isolated ridges and low hills. Gray wooded and brown wooded soils have developed on well drained sites, though immature profiles are more usual in alluvium. Permafrost is experienced in the sub-stratum of this area and extensive areas of swamp and peat occur, particularly in its northern area. White spruce is the dominant tree under these riverine conditions.

(v) In the northeastern corner of Alberta lies the southwestern extremity of the Northern Coniferous forest section. South of Lake Athabasca relatively open Jack pine forests dominate the sandy soils areas, while black spruce and tamarack frequent the moist, fine textured soils. Extensive areas of unstabilized dunes are found in the area immediately adjacent to the lake. North of Lake Athabasca, growing on shallow regolithic soils derived from Pre-Cambrian bedrock, is the

relatively-open transition forest lying between the closed coniferous forest to the south and the sub-arctic woodland to the north. Areas of bog,muskeg and rock barrens are interspersed with sheltered patches of soil supporting tamarack, birch, jackpine, and black spruce. Light coloured, foliose lichen, favoured winter food of the caribou, covers the upland sites.

(vi) In the foothills of the Rocky Mountains, and at low elevations in the front range, a transition forest between the true Boreal and the Sub-alpine Regions, known as the Lower Foothills section is found. The extensive eastern portion of this forest ecotone covers low hills and plateaux between 3,000 and 4,000 feet in elevation in the south, descending to about 2,500 feet farther north. The topography of this section is rolling, with some plateau areas among low to high rounded hills. The main rivers flow eastward in broad incised valleys. Glaciation from the north-east and to a lesser extent from the west or Cordilleran region covered the Mesozoic sedimentary rocks of this area with a drift of variable composition. Two outliers of this area are present on the Caribou Hills in northern Alberta and the Cypress Hills in the south-east. The soils of this area are gray wooded or Podzolic in profile depending on the calcareous quality of the parent materials. The distinctive tree species is the lodgepole pine, which with aspen and balsam poplar has assumed a dominant position in the wake of fire over much of the area. In old stands of this forest white spruce is an important constituent and black spruce is frequently present in low-land sites. White birch are scattered throughout the area in well drained sites while tamarack is present in poorly drained sites throughghout the section. Both balsam fir and alpine fir are common locally throughout the main body of the section.

(vii) A long narrow strip of forest classified as the Upper Foothills Section extends parallel to the Front range of the Rockies, from the Aspen Parkland of Southern Alberta to the Aspen Parkland outliers of the Grande Prairie-Peace River area. This area lies adjacent to and above the Lower Foothills section and comprises the western part of the transition from boreal to sub-alpine forest. The foothills reach as high as 6,000 feet in altitude and are normally forested to their summits with conifers. A distinctive feature in comparison with the lower-lying forest of the Lower Foothills is the relative scarcity of the mixedwood stands, as poplars and white birch are only sparsely represented in this higher section. In addition to lodgepole pine, which is predominant, the major species is the white spruce. Black spruce is a frequent constituent of the forests north of the headwaters of the Red Deer River, but is only of sporadic occurrence to the south of these headwaters. Both alpine fir and alpine larch (Larix lyalli) have a scattered distribution throughout the area.

(II) The Sub-alpine Forest Region of Alberta is typical of the coniferous forest found on mountain uplands of western Canada. The most characteristic species of the forest is the Engelmann spruce (Picea engelmannii). This forest region has a close relationship with the Boreal Forest from which the black and white spruce as well as the aspen intrude. The sub-alpine Forest of Alberta is not sub-divided but is essentially one section known as the East Slope Rockies. This section which covers the eastern slope of the Rocky Mountains and rugged adjacent foothills, from approximately 5,000 to 6,800 feet altitude, is a coniferous forest distinguished from that of the adjacent Upper Foothills by the presence of

Engelmann spruce and the Engelmann-white spruce hybrid. An important associated species is the lodgepole pine whose rapid regeneration following a fire has resulted in its replacement of the spruce over extensive areas. At higher elevations, particularly in old stands, within this sub-alpine section, alpine fir is abundant. Toward the treeline in northern portions of this section the white bark pine (Pinus albicaulis) is found on rocky ridges and exposed slopes while at the same locations in the southern part of the region limber pine (Pinus flexilis) and alpine larch appear. The mountainous topography - steep slopes and deep valleys - has been for the most part developed on uplifted Mesozoic shales and sandstone with some local Cambrian limestone exposures. The derived residual and glacial surface materials are variable in texture and composition, and under the influence of a wide range of local climatic conditions the soil development has also been variable. The most frequent soil types found in this region are regosols and shallow podsols. The Sub-alpine Forest is the mountain counterpart of the Boreal Forest, and the primary member species of both show very close relationships. The Englemann spruce of this section is matched by the white spruce of the Boreal region, the alpine fir by the balsam fir, the lodgepole pine by the jack pine, and each pair of species hybridizes where their ranges overlap. A marked difference in composition of the forest types of the two regions is seen, however, in the relative insignificance of the poplar species, white birch and black spruce in this sub-alpine section.

(III) The third vegetation region of Alberta, the Montane Forest Region, is represented in small areas on the eastern slope of the Rocky Mountains. The river valleys of the areas are often inhabited by grassland vegetation where prairie-like communities of bunch-grasses and

forbs abound. This Forest has developed in response to the prevailing dry climate of the southern mountain valleys of Alberta's East Slope. The characteristic tree of these small areas is the inland or "blue" Douglas fir which differs from that of the Pacific coast in its smaller size and rapidly tapering form. On the central and nothern parts, the lower edge of the Montane Forest is in contact with the grasslands of the dry interior, and the vegetation is frequently marked by a savanna-type character. Northward there is a gradual change to Sub-alpine Forest, and this latitudinal change is matched by a similar altitudinally induced east-west change wherever the mountains are sufficiently high.

This blue Douglas fir - lodgepole pine association which is apparent on rocky or gravelly sites between Waterton and Banff occurs in four small localities in Alberta: the Porcupine Hills - Waterton Lakes District, the Bow and Kananaskis River valleys west of Calgary, on low slopes west of Nordegg and along the Athabasca River in Jasper National Park. The underlying rocks of these regions are contorted Palaeozoic and Mesozoic sediments. The soils are largely colluvial in origin and possess a gray wooded or podzolic profile. The finest stands of Douglas fir and lodgepole pine are mostly confined to south facing warm, dry slopes, while northern slopes, seepage spots and ravine bottoms are dominated by white spruce. On the higher altitudes, Engelmann spruce, alpine fir and limber pine are present. Limber pine also occurs on rock outcrops and stony soils at lower elevations. At the forest-grassland ecotone of the lower elevations, aspen groves interspersed with scattered white spruce prevail. Mule Deer and wapiti are the most numerous Cervidae in these areas, but white-tailed deer have often been noted as being locally

abundant during the past decade .

(IV) The fourth vegetation region of Alberta, the Alpine Tundra Region, which occurs between the timberline of the sub-alpine forest and the snow-line, is reminiscent of the tundra region of the arctic and shares numerous elements with this latter area. On Albertan mountains as a whole, the timberline varies from an altitude of 6,500 to 8,000 feet, the line being, in general, progressively higher southward. Daubenmire in 1943 stated that nowhere in the youthfulness of the Rocky Mountain was topography more important vegetationally than in the alpine zone.[7] In this zone the surface is essentially an alternation of rocky outcrops with depressions encompassing varying degrees of imperfect drainage, and the soil, when present, varies from peat to gravels which are practically devoid of organic matter. Because of this heterogeneity of the edaphic factor in the alpine region plant communities are seldom extensive or very homogeneous. Alpine vegetation consists almost wholly of perennials, mostly of caespitose habit and either herbaceous or suffrutescent. The flora of the alpine region of the Rocky Mountains contains many arctic species. It can be said that the flora of this high elevation zone is a southward prolongation of the true arctic flora plus admixtures of more southerly species. Numerous plant species of the alpine region of Alberta are circumpolar in distribution. Such plants as Dryas octopetala, Saxifraga cernua, Arctostaphylos alpina and Sedum rhodiola are examples of this latter pattern. Few members of the Cervidae frequent this

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[7]Daubenmire, R. F., 1943, Vegetational Zonation in the Rocky Mountains.

region but individuals of all species save the white tailed deer may occasionally be found in sections of this region particularly during the spring or summer.

(V) The Grasslands of Alberta form the fifth vegetation region within the borders of the province. The grassland region of Alberta, often called prairie or steppe vegetation region, may be subdivided into three sections in accordance with the dominant grass species found within the area; the mixed prairie or Stipa-Bouteloua association, the main Parkland Prairie or Festuca scabrella association and the Peace River Prairie or Agropyron-Stipa association. These areas were once prime habitats for herds of wapiti but today members of the deer species both white-tailed and mule deer are the most common members of the Cervidae present.

(i) The Mixed Prairie grassland is characteristic of the brown soil zone and much of the adjacent dark brown soil zone of southeastern Alberta. Numerous studies regarding the vegetation complex of the Stipa-Bouteloua association have been carried out in this region. Much of the area now known as the short-grass prairie was within Palliser's triangle as it was designated in the late 1850's.[8] An extensive investigation of this section by Coupland, in the late 1940's, revealed that the vegetation of mixed prairie area of south-eastern Alberta was dominated by six grasses; Stipa comata, Stipa spartea, Bouteloua gracilis, Agropyron dasystachyum, Agropyron smithii and Koeleria cristata.[9] The

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[8]Hector, Sir James, 1861, "Physical features of Central Part of British North America with Special Reference to the Botanical Physiognamy," New Phil. Journal, New Series XIX, No. 11, Edinburgh, pp. 212-240.

[9]Coupland, R. T., 1950, "Ecology of the Mixed Prairie in Canada," in Ecological Monographs, Vol. 20, No. 4, pp. 271-315.

climate of this region is dry or semi-arid. The topography is generally level to undulating with the broad valleys of the major river courses providing the only major local relief.

(ii) The main Parkland Prairie or Festuca scabrella association of Alberta lies to the north and west of the mixed prairie. This is the characteristic prairie of the black soil zone and the aspen grove or Parkland transition of southwestern and central Alberta. An outlier of this prairie type exists as the grassland of the plateau of the Cypress Hills in southeastern Alberta. In 1947 this association was envisaged by Moss and Campbell as the climax grassland of Alberta and as the virgin prairie of the Parkland belt. Festuca scabrella is the sole dominant of this grassland section.[10] The topography of this zone is generally rolling to undulating and the basic soil parent material is glacial till of the Wisconsin glaciation.

(iii) The Peace River Prairie or Agropyron-Stipa association is the third grassland section. This grassland associated with poplar and willow groves forms the parkland areas of the Grande Prairie area on the Dark Gray soils of the generally forested Peace River region. The grassland of this area may be divided into three faciations; Agropyron-Carex on low areas, Stipa on dry slopes or xeric sites and Agropyron-Stipa on mesic sites, as this latter faciation is the most common prairie grassland of the region and may be interpreted as the "climax" vegetation of the area. The Peace River grasslands have rather close floristic affinities with the Festuca scabrella association in that secondary grass

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[10] Moss, E. H., and J. A. Campbell, 1947, "The Festuca grassland of Alberta," in Canadian Journal of Research C-D, Vol. 25, pp. 209-227.

species of the latter: Agropyron trachycaulum, Koeleria cristata, and Stipa spartea, are present in the former. The outstanding difference is the complete absence of Festuca scabrella in this northern grassland.[11]

Botanically then, Alberta is basically within a Prairie-Forest transition zone. The province lies within the east-west ecotone of the prairie vegetation of the Great Plains region and the forest vegetation of the Boreal region to the north, as well as within the north-south ecotone between that same prairie vegetation and the altitude-induced forest vegetation of the mountains to the west. The understanding of the floral components of the Alberta environment is vital to the appreciation of the distributional pattern of mammalian constituents. The foregoing vegetation regions and sections found are summarized in Table I.

MAMMALIAN FAUNA

Members or component species of Alberta's fauna reflect a circumpolar pattern in distribution similar to that of other elements of the environment. The indigenous mammals of Alberta are generally those species which are distributed within the Boreal Forest and the Grassland regions of the northern Great Plains.

Large herbivorous ungulates such as the bison, (Bison bison) moose, wapiti occupied much of the entire area of this province prior to European induced human settlement with its associated agricultural developments. The smaller ungulates such as the pronghorn (Antilocapra

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[11]Moss, E. H., 1955, "Vegetation of Alberta," in Bot. Review (21) 9:493-567.

species of the latter: Agropyron trachycaulum, Koeleria cristata, and Stipa spartea, are dominant in the former. One outstanding difference is the complete absence of Festuca scabrella in this northern grassland.[11]

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Large herbivorous ungulates such as the bison, (Bison bison), moose (Alces alces), elk (Cervus canadensis) occupied much of the entire area of this province prior to European induced human settlement with its associated agricultural developments. The smaller ungulates such as the antelope (Antilocapra americana) and mule deer (Hemionus odocoileus), white-tailed deer (Hemionus virginianus), bighorn sheep (Ovis canadensis)

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[11]Moss, E. H., 1955, "Vegetation of Alberta," in Bot. Review (21) 9:493-567.

americana) and mule deer (Odocoileus hemionus), white-tailed deer (Odocoileus virginianus), bighorn sheep and mountain goat are still present throughout much of their original range. Large carnivores such as the cougar (Felis concolor) and wolf (Canis lupus) have largely been eliminated. Some smaller members of the predatory group such as the coyote (Canis latrans) and lynx (Lynx canadensis) are still found throughout much of the province while some such as the kit fox (Vulpes velox) have virtually been eliminated from their habitat by man. Alberta is the home for numerous rodent and laganorphe species, characteristic of the Neoarctic.

The initial human activities associated with the exploration of western Canada were fur-trapping and trading. Despite the fact that many species suffered large-scale reductions in population during the latter half of the nineteenth century many fur bearing mammals such as bears, (Euarctos spp), mink (Mustela vison), muskrat (Ondrata zibethica), beaver (Castor canadensis), wolverine (Culo luscus), fisher (Martes pennanti) are still present in suitable habitats within the forested regions of Alberta.[12]

The mammalian fauna of Alberta is numerous in terms of both species and numbers of individuals. This land area has been settled by man on a large scale only recently and much of it exists in what superficially appears to be a pristine state. Mammals indigenous to this province have not come through the historical period unscathed; their distribution as well as their ability to perpetuate their kind in a "ravaged" environment has been affected. Man has influenced many mammals

[12]Soper, D., 1964, Mammals of Alberta, Queen's Printer.

in regards to their distribution and numbers within Alberta. This thesis attempts to trace the historical distribution pattern of members of one small group of mammals - the Cervidae - with respect to their ecological requirements in this geographic environment, and in the light of the dynamism of the environment.

However, one all-pervading element of the environment is climate and it is necessary to summarize the role of this interactive component of Alberta's environment before one can fully understand the total interrelationship of the Cervidae and their Albertan environment.

CLIMATE

All living organisms are directly affected by climate, the long term phenomena of the pattern of temperature, precipitation, wind, and the presence or absence of sunlight, and other weather elements; that is the actual atmospheric conditions at any chosen place and time.[13] An area's climate and its transitory weather depends primarily upon the latitude, altitude, land-water relationship and prevailing wind direction of the area.

Alberta, lying towards the centre of the North American continent between 49° and 60° north latitude within the belt of the prevailing westerlies, experiences a climate which is relatively typical of continental areas in the north temperate zone. This climate is characterized by long cold winters, short, cool summers, accompanied by relatively low annual precipitation and wide ranges of seasonal temperatures.

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[13]Longley, R. W., 1967, "Climate and Weather Patters," in Hardy, W. G. (ed.), Alberta - A Natural History, Hurtig Publishing Co., pp. 53-67.

Within the province itself there is considerable variation in climate. In general, at the same latitudes locations in the western portions tend to be warmer than those locations in the eastern portion. Due to the latitude encompassed there is of course a definite north-south variation in temperature, but, during the winter season this gradient is much more noticeable than it is during the summer. Alberta lies wholly within the zone of prevailing westerlies but due to the mountains and associated phenomena its wind pattern is complex. The Rocky Mountains bounding the province on the west have a profound effect on its climate as this mountain barrier provides both wind steering and blocking effects. Most of the circulating air patterns over the province come either over the mountains from the west or from the north and north-west by way of the Gulf of Alaska and the MacKenzie Basin. Close to the mountains the winds are mainly westerly, while further away from this barrier winds from the south, south-east and north-west predominate. The mountains to the west affect the climate in terms of precipitation as well as general wind patterns as the province lies on the lee side or rain shadow of the Rockies. It therefore experiences a relatively dry climate. However, there are marked variations in the annual rainfall regime of the province. Precipitation is greatest along the foothills, diminishing relatively rapidly both north and east. Heavily forested uplands in the southern Peace River to Pelican Mountains region is a secondary zone of high precipitation.[14]

Most of Alberta's rainfall is convectional in origin but extensive and prolonged rains are generally caused by frontal action between the

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[14]Alberta Government (ed.), 1963, Alberta Farm Guide, Queen's Printer.

relatively warm Pacific maritime air or even warm, moist air from the Mississippi basin and cold polar air. Snowfall generally accounts for approximately twenty-five percent of the total annual precipitation for most areas in the province. As Alberta is well north in the hemisphere the sun is relatively low in the horizon, particularly during the winter period. During the summer there is only a slight difference in the amount of solar energy received from North to South as the long daylight period in the northern sector compensates for the lower elevation of the sun. However, solar energy is limited in the winter due to the low angle of incidence of the sun's rays and the high reflecting power of an existing snow cover. The overall altitude in Alberta decreases generally from south-west to north-east and this factor tends to modify the latitudinal differentiation. The actual growing season and frost free periods are of course related to topography as well as geographic locations. The mean frost-free period in general becomes shorter northward and westward but the Grande Prairie Parkland region has a longer frost-free period than the surrounding forested area. The mean annual temperatures and annual precipitation for Alberta are shown in Figure 5.

According to the Koëppen classification most of Alberta lies in the cool north temperate zone. The high altitude lands of the south-western edge of the province lie within the polar climate; with the glacial covered areas being in the ice-cap zone and the regions between this zone and the tree-line being in the tundra zone. The major portion of Alberta lies within the general cool, temperate zone but may be sub-divided into two regions; one having a short cool summer of less than four months with a mean temperature of over 50° F and the other having a cool summer with over four months with a mean temperature of over 50° F.

Vegetation is probably the most significant indicator regarding the subdivision of Alberta's climate and as such the boundary between the climatic sub-zones for the most part is drawn within the bounds of the prairie-boreal forest vegetation transition the Aspen Parkland. This climatic boundary runs from the Cold Lake-Lac La Biche region west to the McLeod River drainage basin then southwest through Calgary and Cardston.[15] The south-eastern prairie-Parkland region of Alberta is thus categorized separately from the remainder of the province on the basis of having a longer, cool summer.

Alberta's climate is one of extreme seasonal variations and although the mean annual averages of its components are of some assistance in portraying it a breakdown of the seasonal variabilities is far more significant in understanding the climate and its relationship to the lives of indigenous organisms. Although officially Alberta has four seasons of equal length, a clearer picture of the annual regime is taken by allowing winter to encompass November to March inclusive, summer to encompass May to September, and fall and spring to grasp at October and April respectively. Figure 5 which denotes the mean annual temperature and precipitation does not give sufficient detail of information to be of much assistance to the reader. Dr. B. W. Currie's maps in the 1965 publication on the Agriculture Climate of the Prairies gives very helpful details concerning Alberta's climate on a seasonal basis.[16]

Sudden shifts of wind direction and temperature occur throughout the year bringing short lived abnormal periods of weather to bear on any

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[15]Longley, R. W., 1967, op. cit.

[16]Currie, B. W., 1965, Agriculture Climate of the Prairie Provinces, Queen's Printer (mimeo).

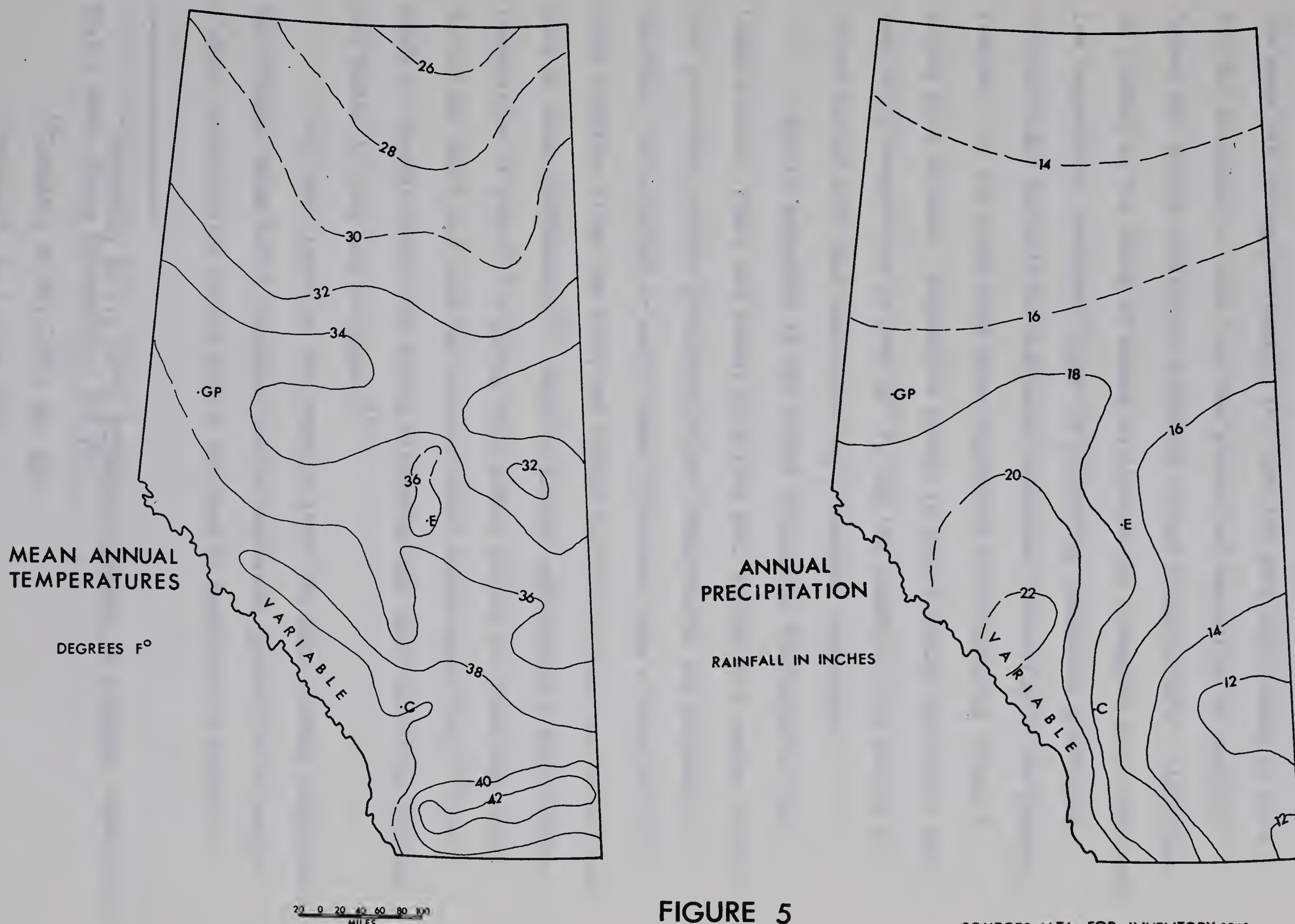

FIGURE 5

CLIMATE OF ALBERTA

SOURCES: ALTA. FOR. INVENTORY, 1961
MCKAY, 1965

one area but spring is normally the time for snow melt waters to flow rapidly downslope or sink into the ground and vegetation to rapidly "green up" giving indigenous ungulates "a new lease on life". April can be classed as the month of Spring in Alberta but extensive snow cover and low temperature sometimes linger on inhibiting vegetation growth and causing undue hardship on indigenous ungulates, particularly the pregnant females. On the other hand green vegetation is forthcoming in March during mild winters. Vegetative growth is active during the period that mean daily temperature is over 42° F, and the length of this period of course varies with each year according to weather conditions.

May to September is the period of maximum precipitation and temperatures. Plant and animal life fare well during this season of the year providing neither precipitation nor temperatures are extremely abnormal. Late spring or early summer floods may take a heavy toll of young ungulate lives and cold, wet spells during this same period are also hard on these individuals.[17] Most of Alberta experiences a mean average temperature of over 50° F during this summer period but frost may occur during any month and snow has occurred every month except July.[18] Hot winds or drought conditions during mid-summer may cause nutrition problems and deaths if they are prolonged.[19]

Fall may linger on for sometime after the mean average temperature has dropped below 42° F, stopping active vegetation growth, or it may be a short colour filled period before the land is swathed in a shawl of

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[17]Mitchell, G. J., 1965, Pronghorn Antelope in Alberta, unpublished Ph.D., Wash. State University, 221 pp.

[18]Longley, R. W., 1967, *op. cit.*

[19]Mitchell, G. J., *op. cit.*

white. Summer is the period of rapid growth for both vegetation and animal life, during the fall vegetation becomes dormant and herbivores must change from a diet of actively growing plants to one of dependency on either dead or dormant forage.

Winter is the period of extreme low temperatures and forage difficulties for all indigenous ungulates. Cervidae members generally subsist on browse throughout the winter period but the deer and wapiti will graze if opportunity arises. Deep, soft, powdery and differentially crusted snow inhibit travel and the animals often tend to yard up or at least move along well packed trails. The landscape lies under snow cover for much of the winter period and thus procurement of forage by browsing is highly advantageous to these species. In the south-western sector of the province chinook winds, strong, warm, dry westerly winds, created through a Föhn effect, often clear the foothills of snow cover thus allowing the animals to move more easily and even to graze extensively. Winter is the critical period in the annual turnover of seasons experienced by indigenous Cervidae. Females are carrying young, males are low on fat residue due to exertion during the fall breeding season, and, young of the year are often not large enough to reach good quality browse. Blizzards, particularly in the prairie and parkland regions, deep snows in any region, prolonged cold spells or erratic temperatures causing freeze-thaw conditions all tax the individual animal's strength. As winter breaks and spring with its increasing day length brings forth rapid vegetation growth animal species bring forth their offspring thus completing the cycle of life.

It is assumed that since the final recession of glacial ice the

climate of western Canada has been essentially the same as it is today although trends and periods of specific climatic conditions are known to have occurred and affected the biogeography of the region during this period. However, our actual knowledge of the climate of this area prior to one hundred years ago is still very meagre. Early explorers such as MacKenzie, Richardson, Thompson and Umfreville mentioned aspects of the climate in their journals. The first scientific exploring expeditions to report on climatic conditions of this part of North America were those of the Palliser Expedition in the late 1850's. In the last fifteen years numerous authors such as Longley (1953), Currie (1964), Kendall and Thomas (1956) and Thomas (1964), have published papers concerning the climatic trends prevailing in western Canada.[20] Climatic trends within these past centuries have been noted but it appears that the overall climate of Alberta has remained essentially the same throughout the last few centuries.

The climate of Alberta is continental and has been essentially so since the Larmide orogeny of the late Cretaceous Period. The mountains to the west have greatly influenced the climate of this area since that time. The Pleistocene epoch brought components of what is generally through of as an arctic climate to bear upon the area, but, since the final retreat of these vast ice bodies and subsequent drainage of the melt-waters left in their wake Alberta's climate, except for minor

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[20]Thomas, M. K., 1964, "Climatic Trends on the Canadian Prairies." (mimeo).

fluctuations, has essentially been equivalent to that experienced during the last hundred years.

CHAPTER 3

ECOLOGY OF ALBERTA CERVIDAE

Mammals originated in the Triassic but it was not until the Tertiary that they rose to dominance. It was during this latter period that their major deployment occurred thus rendering them worthwhile as subject matter from a zoogeographical point of view.[1] The rise of various groups of mammals and their dispersal patterns through time presents a complex chronicle.

The Cervidae are a portion of the Group Artiodactyla, or even-toed ungulates, which arose during Tertiary times and are in general today's dominant ungulates.[2] Initial members of the Cervidae, or deer family, probably arose from early traguloids in Eurasia during the Oligocene.[3] The earliest records of Cervidae stock in North America date from the Miocene.[4] Primitive Eurasian stock apparently extended into North America during the Miocene but disappeared from their newly acquired habitat during the Pliocene. The main line of evolution within the Cervidae continued in Eurasia. Several periods of dispersal into North America were effected as evidenced by fossils. These migrations occurred via the Bering Bridge, a land connection between Eurasia and North America during several recent geological periods.

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[1]Darlington, P. J., 1957, Zoogeography.

[2]Ibid.

[3]Simpson, G. G., 1945, Bull. Amer. Mus. Nat. History, No. 85.

[4]Allen, J. A., 1892, Bull. Amer. Mus. Nat. History, No. 4, pp. 199-243

It appears that Cervidae evolution occurred along two major lines, The Cervinae and the Odocoileinae. Today the Cervinae are dominant in and confined to Eurasia with the exception of the genera Cervus in North America, while the Odocoileinae, though represented in Eurasia, is particularly characteristic of the Americas.[5] Odocoileinae probably originated in Eurasia and invaded North America during the Pliocene. It is felt by some workers that the genera Alces and Rangifer, which are the northern Odocoileinae and completely circumpolar in distribution, may not have entered North America until the Pleistocene.[6] Members of the Cervidae, which are found throughout the Holarctic Realm, comprise the dominant family within the Artiodoctyla group of the Northern Hemisphere.

Species within this family, commonly known as the "Deer Family," possess particular body characteristics whereby they are easily identified. All members of the Cervidae, regardless of size, exhibit the same general stream-lined body appearance and fleetness of foot. All are cloven-hoofed, that is the hoof is divided so as to create two major toes per foot. A unique growth or bone structure particular to this family is the development of antlers. Antlers are branching bony outgrowths of the skull which are grown and shed on an annual basis. During the spring and early summer the growing antlers are covered by vascular tissue or "velvet" which supplies nourishment to the bony structure. In late summer when growth is complete the "velvet" dries and is rubbed off leaving the hard bony structure of the fully developed antlers. In most species only the males normally develop antlers, which are used basically as weapons of intraspecific com-

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[5]Darlington, P. J., op. cit.

[6]Scott, W. B., 1949, History of Land-Mammals in the Western Hemisphere.

petition during the fall rutting or breeding season. Subsequent to the breeding period the males drop or lose their antlers thus all the members of the herd go through the severe winter period antlerless. In the case of the caribou both sexes normally exhibit antler growth but those of the females or cows are generally not as fully developed nor as majestic as those of the bulls. The number of tines or prongs per set or pair of antlers does not correspond directly with the age of the animals but rather gives a general indication of the age and physical condition of the individual. Antlers of any individual buck or bull usually grow larger each year until the animal reaches its prime. Old age and senility cause subsequent antlers to be smaller and misshapen once the fully mature age is passed. A fourth characteristic of the Cervidae family members is the presence of the metatarsal gland. Each member of this family exhibits a pair of these glands on the inner sides of the lower hind legs. These glands, which appear as long, hair-bordered depressions, give off a musk odour which is used in intraspecific communication.[7]

Today five species of the family Cervidae inhabit Alberta. These five species, which comprise the dominant indigenous ungulate fauna of this province, are the mule deer (Odocoileus hemionus), Rafinesque, the white-tailed deer (Odocoileus virginianus) Rafinesque, the wapiti or elk (Cervus canadensis) Linnaeus, the moose (Alces alces) Gray, and the Caribou (Rangifer tarandus) Hamilton-Smith. These species form a significant portion of the indigenous faunal populations of the province.

In order to appreciate an animal and its position within the

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[7]Taylor, W. P. (ed.), 1951, Deer of North America, Stockpole Co.

ecosystem one must have some knowledge of the animal's lifeways. Each species within the Family Cervidae has its individual requirements as to range or geographical distribution, herd or intraspecific relationships, good habits and preferences and interspecific relationships. A general concept of these elements in relation to each species and in relation to the family as a whole enables one to better understand and appreciate the role of these species both during the settlement of the province, and at present in so far as they have become the sportsmen's quarry as well as important resources in a tourist industry.

Distribution

Each of Alberta's five Cervidae species has affinity with and preferences for specific types of range. Therefore each has a particular range or pattern of distribution. These ranges may be mapped and thus the geographic distribution of the species compared. This work in comparative analysis of range relationships assists in ecological work since much of the ecology of a species may be noted through its general environment.

The mule deer is the true deer of Alberta. Today this species is found throughout Alberta, with the exception of the extreme north-western or Hay-Zama Lakes corner and the higher mountains of the south-western border. The preferred range of this species lies between 52° and 57° north latitude and encompasses the parkland, the foothills and the lower mountain slopes of the East Slope physiographic region. Scattered populations occur throughout a great portion of the remainder of the province. In the southern or prairie sector of the province members of this species are concentrated in wooded outlier areas such as the Cypress Hills and

Milk River Ridge as well as in the wooded river valleys of major streams such as the Milk, Oldman, Bow, South Saskatchewan and Red Deer Rivers, and their major tributaries.

This wary denizen of the "wilds" was found throughout the Parkland and the river valleys of the Prairie and Foothills regions when first encountered by the whiteman in the area now known as Alberta. The mule deer still inhabits much of its former range but the population in Southern Alberta is highly scattered with definite concentrations in major river valleys. Since the influx of European settlement this species has increased its range northwards and thus inhabits a far greater general area than it did prior to European settlement. The mule deer has moved to as yet unsettled territory, and thus its populations have spread out and the species now inhabits a great portion of the province. (See Figure 7) If the human settlement pattern of Alberta is held within the boundaries denoted by present legislation the mule deer population will not suffer severe range restriction in the future. It should no doubt continue to thrive and the species will remain as an important indigenous ungulate within the province.

The white-tailed deer had a foothold in Alberta at the time of initial exploration of western Canada, but, like the European, this species is a relative newcomer to much of its present range within the province. This species now inhabits much of Alberta south of 55° north latitude, with the exception of the mountains and higher foothills of the East Slope, and the heavily wooded outliers such as the Swan Hills where as yet the species is represented only by sparse and wildly scattered populations. As human settlement has spread northward along the Peace and Athabasca Rivers, so has the white-tailed deer population. Instead of

fleeing ahead of settlement the white-tailed deer enlarges its range along with settlement or in the wake of settlement thus taking advantage of the open areas and seral forest growth stages initiated by human occupation.

One hundred years ago white-tailed deer probably inhabited the valleys of the Milk and lower South Saskatchewan in Alberta as well as the territory in between these watercourses. Today populations of this species inhabit the same general area as agricultural settlement while scattered populations inhabit forest regions, which have been opened up by forestry or mineral exploration, north and west of agricultural areas. Although periodic winter die-offs occur in its northern ranges due both to severity of climate and lack of available forage, this wary species is able to survive in conjunction with human habitations and thus appears to be the deer of the future for Alberta.[8]

Today the wapiti or elk occupies but a fraction of its former range in Alberta. The wapiti inhabits the mountains and foothills of the East Slope and outliers such as the Cypress Hills and Swan Hills as well as the Frog Lake Moraine area in the vicinity of Cold Lake and the Cooking Lake Moraine east of Edmonton.

At the time of initial European exploration into this region of western Canada wapiti inhabited all of what is now Alberta with the exception of the Athabasca Lowlands and the Shield areas of the extreme north eastern corner. During the late 1800's the wapiti population suffered severe reductions and has never regained its former range.

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[8] Webb, R., 1966, "White-Tailed deer in Alberta," paper given at Symposium C.W.F.B., Montreal.

The preferred ranges of the present wapiti population lie along the western edges of the Parkland amongst the mixedwood forests of the foothills and mountain slopes. Members of this species utilize the high pastures of the upper foothill and mountain slopes during the summer and migrate downslope to lower river valley or foothill areas during the winter period. Wapiti is a wilderness animal and cannot exist in direct conjunction with human habitation therefore the populations of the future will never regain the regions ranged over in the past.

The moose, the largest of the Cervidae, is the boreal forest representative of this circumpolar family. Alberta's moose population generally inhabits suitable habitats in the entire province north of 54° north-latitude and within the mountain and foothills areas of the East slope south of this, as well as outliers such as the Cypress Hills.

The moose is a forest animal and requires wilderness for existence thus it is not found in close conjunction with human settlement and generally loses range whenever human habitation encroaches upon the forest regions of the province. Today's moose population in Alberta occupies much of the same territory it did at the time of initial European contact although it has lost out to human habitation along both the south and east edges of its range. Five to six hundred animals are under fence in Elk Island National Park and dozens of individuals exist within that portion of the Beaverhills Moraine south of the Park. Likewise the moose in the Cypress Hills area are generally confined to the wooded Cypress Hills Provincial Park.

The caribou, the fifth member of the Cervidae family inhabiting Alberta, has three specific populations and each of these has a general area within which it ranges. These three populations which are separated

on a geographical basis are the Barren Ground, the Mountain and the Woodland Caribou. The caribou is an overt wilderness animal and definitely requires mature or even what is commonly thought of as overmature forest stands for its livelihood, thus any interference by human occupation upsets its range relationships.

The barren ground caribou is the true migrant of the Cervidae family. It is this member of the family that undertakes the classic circular migration route from the taiga onto the tundra and back again every year. The north eastern or Shield corner of Alberta is the only portion of the province used as range by the barren ground caribou. During the winter periods herds of these animals enter this corner of the province in order to obtain forage. The mountain caribou frequents the mountain and high foothills slopes along the north eastern portion of the East Slope in regions within Jasper National Park and Willmore Wilderness. Scattered bands of Woodland caribou are found in suitable habitats throughout the boreal forest of Alberta. Both the woodland and the mountain caribou have suffered range depletions during the settlement of Alberta but the barren ground herds never ranged through much more of the province than they do now.

Intraspecific Relationships

Just as each species of the Cervidae has specific range requirements and preferences so each has particular intraspecific or individual to individual relationships. The intraspecific relationships or ways of treating their own kind follow general family traits but each species has unique traits unto itself. Herd as well as individual relationships come under the heading of intraspecific relationships.

All Cervidae are relatively gregarious, but each species exhibits particular groupings of individuals, and thus herds or groupings of members of the species are different in structure, extent, and longevity. Deer, both mule and white-tailed spend most of their lives attached to single family aggregations which are often united into loosely organized herds during the critical winter food period. These family bands are matriarchal in structure with the doe, her present fawn or fawns and yearlings forming the basic structure. Two year old deer, particularly young bucks, and sometimes mature bucks spend extensive amounts of time with this summer family group. During the fall rutting these basic family groups are broken up by the mature bucks which attempt particularly in the case of mule deer, to herd several does simultaneously. Subsequent to the rutting period the family bands reunite and as the winter season progresses in intensity individuals and various family bands unite to form loosely organized herds which feed together in "yards" or suitable forage areas. With the advent of spring the loosely joined herds break up and the family bands are once more operative with the does and immatures forming the basic groupings, while the mature bucks roam singly or in small loosely organized bands.

Amongst the wapiti herds or relatively extensive groupings of individuals in a somewhat hierarchical arrangement are operative throughout the year. During the summer the bulls range in various sized groups in relatively high pasture lands while the cows, calves and yearlings or immature animals, which are united in fairly extensive groups, forage in slightly lower pasture areas. During the fall rutting period these summer herds are broken up as the mature bulls herd numerous cows together and attempt to collect harems. Once the rutting period is over the wapiti

congregate various sized wintering herds which unite into larger herds as the season progresses. During the critical winter period the herds graze on wind swept hillsides or browse along shrub covered valleys. These winter herds are composed of all members of the species. Although the old cows appear to lead the herd to yarding or forage areas the mature bulls generally dominate the herd during this period in the same way that they dominate relationships throughout the remainder of the year. As the spring breaks the large winter aggregations disband with the bulls migrating rapidly upslope while the cows and immatures follow at a slower pace.

In contrast to other North American members of the Cervidae the moose is a relatively solitary animal. Moose basically live in a solitary or semi-solitary organization. The largest grouping is generally the cow and her calf of the year. Often yearlings or even two year olds are seen tagging along with the basic two cow-calf unit. Bull moose are solitary throughout most of the year. During the rutting period a bull moose accompanies one cow at a time and does not attempt to consolidate a harem. Individual moose or members of the basic family group along with one or two other individuals may yard in one general location throughout the winter period. The spring again sees the birth of a new calf and the subsequent alienation of the yearling or two year old to a life outside the basic family group.

Moose do not migrate nor do they normally travel extensively outside the small area considered their home range. A cow moose may spend her entire life within a ten-square mile area.[9] Occasionally moose

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[9]Millar, J. B., 1953, Ecological Study of the Moose at Rock Lake Area of Alberta, unpublished M.Sc. Thesis.

are sighted far out of the forest area. It appears that these individuals, who exhibit extra-areal movements, follow the riparian growth of water-courses out into the prairies or tundra area.[10]

Caribou spend their entire lives associated with each other in loosely organized herds of combined sexes except for the early spring when the bulls and cows separate during the calving period. These loosely organized, heterogenous herds are the basic grouping of the caribou. The herds of the barren ground caribou are the most extensive and generally number in the hundreds. As are all the males in the Cervidae the caribou bulls are polygamous but they do not attempt to gather and keep harems as do the wapiti, but rather loosely herd the females as do the mule deer bucks. During the winter period the caribou do not yard extensively as bands roam rather freely from one suitable browsing area to another. They utilize mature forest areas. Their forage is relatively scarce as well as easily affected by overbrowsing so this species is constantly moving. The mountain caribou can sometimes stay in an area for longer than their lowland relatives as the wind swept slopes often offer substantial forage areas.

Forage

Environmental factors influence the available forage supply and thus the welfare of the animals. Conversely, foraging activities affect the plant cover and result in some cases of intraspecific and interspecific competition. Winter is the critical or severe period of the year. It is during this period that the animals have difficulty securing suf-

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[10]Skov, personal communication.

ficient forage. Individuals normally undergo weight-loss and the death toll particularly among the immature, the senile, and the pregnant females is highest during the winter or cold period.

As each species has its specific range and intraspecific relationships so each species has specific food or forage requirements and preferences. The forage of the various species of the Cervidae is similar in some respects but unique in others so that as the range requirements were compared so may the food habits. Members of the family are generally known as browsers but not all individuals nor species adhere to this general categorization. Browse forms the major portion of the diet of deer, moose and caribou. Elk are intermediate in foraging habits and have demonstrated their ability to thrive on diets predominating in either browse or grass and forbs and thus may be called either browsers or grazers according to their diet in a particular locale or during a particular period.

Seral stages of forest growth are very important in the ecology of all the Cervidae. Seral stage forest growth is highly favorable to the welfare of deer, wapiti and moose whereas it adversely affects the welfare of the caribou which depends on mature and old age forest habitat for its forage. Fires, forestry, mineral exploration and agricultural practices open up regions and eliminate portions of the forest. Regrowth of forests in these areas so opened up, in other words, the seral stages of the forest are the forb, shrub and sapling growth periods in forest succession. Browse is at its height of productivity in these secondary growth forest areas.[11] The potentialities of these regions to produce

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[11] Stelfox, J. G., 1964, b) Effects of Harvesting a White Spruce Forest on Big Game Range in Western Alberta, Sc. Paper 1, Dept. of Lands & Forests, Govt. of Alberta.

wild ungulates is likewise highest during the period of seral stage forest growth.[12] Unlike the other members of the Cervidae the caribou, due to its ecological requirements and food habits, suffers range losses in any part of its range wherein any stage of growth other than mature or old-age forest is present.

Both species of deer are predominantly browsers, they are consistently associated with forest-shrub or shrub-prairie ecotones in that they utilize tree and shrub growth as escape cover as well as for forage. Spring is the period wherein deer obtain the greatest variation in their diet as during this period they nip all available new growth of grasses and forbs as well as young twig and leaf growth. Summer is the period of plenty and forbs complement the main diet of browse. The fall and winter diets are almost totally made up of browse. A deer normally loses approximately fifteen percent of its weight during the winter and some individuals can withstand up to a thirty percent weight loss. The texture, depth and continuance of snow are influential in deer survival during the critical winter period. Snow covers up low shrubs and thus reduces the availability of browse species, and if crusted or much over twenty inches in depth it impedes deer movement. The preferred browse species of Alberta deer are generally chokecherry (Prunus virginiana), rose (Rosa spp), saskatoon (Amelanchier alnifolia), red osier dogwood (Cornus stolonifera), aspen, and willow (Salix spp).[13] Young aspens are highly favoured in areas of recent burns as are many of the fruit bearing shrubs which grow

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[12]Flook, D. R., 1962, Range relationships of some Ungulates native to Banff, and Jasper National Parks, Alberta, papers presented at symposium Brit. Ecol. Soc., Banghor.

[13]Shepard, 1961, Ecology of Mule Deer of Sheep River, unpublished M.Sc. Thesis.

in these fire induced seral stages.

Elk inhabit a wide variety of habitats and utilize various types of forage. They are found in relatively open grassland and shrubby areas as well as river valleys and mountain slopes. They are highly versatile in their feeding habits and have been known to subsist on diets of solely browse or grass. It appears that they are able to adjust their foraging habits to a marked degree and can therefore exist in highly variable habitats. From data obtained from a study conducted between 1961 and 1963 in Riding Mountain National Park, Manitoba, which is a parkland area, Blood drew the conclusion that where grass, forbs and browse forage classes all exceeded the demands of wapiti browse was the preferred forage.[14] Wapiti are not as hampered by snow depth as are the deer but do migrate downslope and into areas of lesser snow depth as well as into windswept slopes in order to avoid deep snows. Aspen is the preferred browse species of wapiti in most areas and in times of high populations this browse species may suffer from heavy bark stripping if sufficient forage is not readily obtainable.

Moose are predominantly browsers throughout the year although they do supplement their spring and late summer diet with aquatic vegegation.[15] Members of this species are relatively specific feeders and their browse forage is relatively sensitive to overutilization but since moose are solitary animals, maximum forage use is well effected. A mature moose requires an average of fifty pounds of forage per day year round. The preferred browse species of the moose are generally aspen, willow, choke-

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[14]Blood, D., 1966, Range Relationship of Elk and Cattle in Riding Mountain National Park, Wildlife Management Bulletin series 1, No. 19.

[15]Millar, J. B., *op. cit.*

cherry, saskatoon, red osier dogwood, bog birch (Betula glandulosa) and alder (Alnus spp). The spring and late summer diet is supplemented by aquatic growth emergents such as sedges and equisetum (Equisetum spp) and submergents such as potamogetons (Potamogeton spp) and mares-tail (Hippuris vulgaris). Snow depth, except in extreme instances, does not normally deter this long legged loosely jointed denizen of the forest. Moose appear to be able to withstand up to almost three feet of snow without serious consequences.[16] The moose as a relatively large and powerful ungulate is able to break saplings and twigs of one inch in diameter with its strong jaws and powerful neck to snap them off.

The caribou or "deer of the north" is a migratory animal. This species has evolved to its present day pattern of migration because of the sensitivity which its forage has to overbrowsing. Lichens, the mainstay of caribou, particularly during the winter period, are extremely slow growing. Thus this species migrates in herds so that the maximum number of animals utilizes the maximum amount of territory. Evolution has thus enabled this species to obtain maximum use of food stuffs by maximum numbers of animals via long annual migrations of extensive herds while the same result was accomplished through the evolution of the moose as a solitary, non-migratory animal.[17] The caribou, like the moose is a relatively specific forager. Large scale migrational patterns of this species allow for the highest stable population under habitat conditions. The summer diet of the caribou consists of grass, sedge, moss, lichens, forbs and browse. During the winter or snow period foraging is predom-

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[16] Formosov, A. N., 1964, Snow Cover as an Integral Factor of the Environment and its implications in the Ecology of Mammals and Birds, Occ. Paper No. 1, Boreal Institute, U. of A.

[17] Pruitt, W. O., 1960, "Animals in the Snow," in Sc. Amer.

inated by crater-feeding and the major items of the diet during this period are terrestrial lichens, labrador tea, sphagnum moss, sedges and willows, although aboreal lichens, woody shrub material and some coniferous tree growth are ingested. Numerous authors believe that lichens are utilized to a far greater extent than aboreal lichens.[18]

Interspecific Relationships

Not only do individuals of one species interact with members of the same species in intraspecific relationships but they interact with members of other species. All members of the deer family tolerate other members to a certain extent. The wapiti the most aggressive in behavior and versatile in feeding habits is also relatively non-tolerant of other species.[19] Perhaps it is the moose which stands at the opposite pole when considering the family as a whole for the solitary moose appears to lose out at any time where it comes in direct competition with other family members.[20] From data compiled on range relationships it would appear that there are many instances wherein there is interaction between species and that there are no doubt numerous cases of direct competition within these interspecific relationships.

Several studies concerning interactions and competition between species have been carried out in the National Parks of western Canada and the findings in these areas no doubt signify the general inter-

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[18]Scotter, G. W., 1966, "Study of Winter Food habits of Barren Ground Caribou."

[19]Mair, W. W., 1952, Impact of an Introduced Population of Elk upon the Bioata of Banff National Park, unpublished M.Sc. Thesis.

[20]Stelfox, J. G., personal communication.

relationships between the species throughout much of their overlapping range within the province of Alberta. The data gathered by Mair, Banfield and Flook show that wapiti are the most aggressive of the Cervidae in both its general herd and forage habits.[21] Elk and deer probably compete directly in the spring for new growth of grasses and forbs. Elk and moose compete for forage in fall and winter when both species are depending mainly on aspen and willow browse. Although species do not appear to be in direct competition one is often influencing the welfare of the other. Elk and moose may browse all available low shrubs and saplings thus starving deer, or, a herd of either deer or elk may deter a solitary moose from obtaining sufficient forage required during the critical winter period. The action of one species may affect the welfare of more than one other species and thus affect the ecosystem. A heavy population of elk could strip numerous aspens of their bark upon which beaver too are dependent for food. The affected beaver might have to leave their damsite due to insufficient food sources. The unattended dam could give way thus allowing all the water to drain out from a pond containing favoured aquatic food of the moose. In such a case the wapiti did not directly compete with the moose for forage but indirectly and adversely affected the moose by competing directly with a third species whose normal living habits are compatible with those of the moose.[22]

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[21]Banfield, A. W. F., 1958, Mammals of Banff National Park, Nat'l. Mus. of Can. Bull. No. 139, Queen's Printer.

[22]Mair, W. W., *op. cit.*

The caribou does not inhabit a large proportion of the province of Alberta. Areas in which its populations are present may have to be restricted from further human encroachment if this "wilderness" species is to continue as a member of the indigenous ungulate fauna. When considering the future welfare of this and other ungulate species in this province one feels that wildlife management techniques could be properly applied in conjunction with forestry, mineral exploration and agricultural practices within all areas of the province. A fully integrated or properly conceived multiple-use plan must be devised for areas thus providing plans for individual regions under a cooperative, inter-disciplinary regime.

CHAPTER 4

DISTRIBUTION AND RANGE OF MULE AND WHITE-TAILED DEER IN ALBERTA

Of the five species of the Cervidae which inhabit Alberta, only two are commonly known as deer; the mule deer, so called because of its large, mule-like ears, and, the white-tailed deer, so called because of the white-haired underside of its large flag-like tail. The loss of particular ranges and extension of others by the mule and white-tailed deer during the past 80 years are very interesting phases of their history in Alberta.

The mule deer is the typical Alberta deer. This species inhabited the southern one-half of the province prior to European settlement. Although the original range of this species has suffered drastic reduction due to the settlement of the province as aforementioned members of this species are today scattered throughout it, being absent only in the extreme north-west corner.

The white-tailed deer is a relative newcomer to much of its present day Alberta range. Members of this species probably inhabited the breaks associated with the Milk River Ridge, the southern slope of the Cypress Hills and the river valleys in south-eastern Alberta prior to European settlement. The phenomenal range extension of the white-tail in Alberta during the past century has largely been due to adaptability of this species to the agricultural and forestry practices utilized by the European settler.[1]

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[1]Webb, R., 1959, Big Game of Alberta, paper given at Dept. of Lands and Forests Symposium, Edmonton.

Both the mule deer and the white-tailed deer belong to the genus Odocoileus. Numerous anatomical and structural differences serve to identify these two deer as separate species. The three diagnostic visible external features, besides body coloration, serve as prime field identification or distinguishing criteria; the structure and hence appearance of the antlers, the shape and size of the metatarsal glands, and the shape, size and coloration of the tail are shown in Figure 6. The antlers of the two deer species serve as definite identification markings of the bucks. The mule deer buck "sports" dichotomously branching, widely spread antlers. The male white-tailed deer has vertical tines rising from the horizontal main beams, which are generally not as wide spreading as those of the mule deer. The metatarsal leg glands of the mule and white-tailed deer are situated on the lower outer side of the hind legs. The metatarsal gland of the mule deer is approximately five inches long and is completely surrounded by brown hair. The metatarsal gland of the mature white-tailed deer is seldom over two inches in length and is more or less surrounded by white hair. A most obvious diagnostic identification component between these deer species is the size, coloration and form of the tail. The mule deer has a short black tipped tail with a naked ventral side. A running mule deer generally holds its tail relatively close to the body. The white-tailed deer on the other hand has a dark, bushy tail averaging fourteen inches in length and edged with white on the dorsal side. The ventral side of the tail of this species is white-haired. This species tends to hold its tail upright when running and the white underside resembles a waving flag, as the deer bounds away.[2]

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[2]Taylor, W. P., op. cit.

ADAPTED FROM TAYLOR, 1956

FIGURE 6

DIAGNOSTIC FEATURES SPLITTING GENUS <u>ODOCOILEUS</u>

Besides the above three diagnostic external features which are usually used in distinguishing the deer species several other external features are noteworthy. The ears of the mule deer are large and mule-like in appearance while those of the white-tailed are relatively small and less conspicuous. The relatively broad face of the mule deer bears a dark forehead patch with a lighter triangular facial patch extending from the eye region to the nose, while the narrower face of the white-tailed deer is dark except for a pale circle of hair around the nose. The mule deer has a distinct white throat patch or bib of white hair while the white-tailed deer lacks such a mark.

Apart from structural features the two species possess peculiarities of behavior which tend to set them apart. The mule deer demonstrates a preference towards an open parkland habitat and this aptitude besides the innate curiosity of this species acts as a deterrent factor in its ability to live within heavily settled areas. When running the mule deer generally runs with a stilted, stiff-legged gait or a rapid bounding or jumping motion thus exhibiting a gait true to its nickname "the jumper." The white-tail prefers a habitat providing a fair amount of natural cover and tends to run or hide from unfamiliar elements rather than first inspecting them. An alarmed white-tail usually runs or lopes in the normal fashion with its raised flag-like tail waving from side to side with each bound, hence the common name flag-tailed deer.[3]

These two deer species inhabit a great portion of Alberta and overlap of distribution occurs throughout much of their range. Ecological requirements and habitat preferences tend to separate the species on a

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[3]<u>Ibid</u>.

local basis in areas of overlap. Such factors are also responsible for the prevalence of populations of one of these species over that of the other in regional as well as local environs.

Mule Deer

In general the mule deer is the larger of the two Alberta deer species. Its body structure is true to the streamlined pattern that is usually designated as "deer-like". Mature bucks weigh approximately 200-250 pounds while the weight of the does averages about three-quarters of this.

Both sexes exhibit a particular patterned body coloration which undergoes seasonal changes. During the summer the upperparts of the body are tawny to yellowish brown in color while the throat, rump patch and inner sides of the legs are white. The short white black-tipped tail of the mule deer is completely surrounded by the large whitish rump patch. Its winter pelage is similarly patterned to that of the summer season but has a more greyish-brown tone as winter bleaching lightens the hair. Both sexes possess the dark triangular forehead patch but this is more noticeable on the head of the bucks. The dark-reddish colored fawns exhibit six irregular rows of white spots along their back and sides until about three months old. As the hair grows out the fawns lose their spots and thus enter their first winter with a patterned coat essentially similar to that of the adults.

The large ears possessed by both sexes and the annually deciduous, doubly bifurcate branching antlers of the males which were mentioned earlier are diagnostic references too. The mature bucks exhibit a relatively heavy, broad, antler rack which curves back from the skull at

the initiation point of the brow-tine but curves forward above the head, prior to the development of any further tine branching. Male fawns develop buttons or nubbins, and as yearlings, exhibit V-pronged antlers, but, no true branching is normally evident until the buck reaches his second year. The antlers are normally shed in late February and regrowth commences in early May of each year. The actual age of a male mule deer cannot be discovered from the antler tine number as this indicates only the relative maturity and health of the individual. The number of teeth, and the wear noted upon examination of them, indicates the true age of the individual animal in the case of this species and all other members of the Cervidae.

The liquid substance produced by the large metatarsal glands of the mule deer plays an important part in intra-specific interaction between species. This glandular excretion is a musky-odoured, viscous liquid, which clings to the hairs surrounding the gland. The excretion of the metatarsal gland is used as an element of intrapsecific identification throughout the year but its prime usage probably occurs during the fall rutting season when the bucks make full use of it in the designation of their territories.

Mule deer occur throughout most of Alberta and occupy numerous ecological environs and biological zones. Due to this fact it is difficult to exemplify an annual cycle which would encompass all populations. Since the largest population numbers occur in the foothills and mountains or in areas generally adjacent to these regions, an outline of the annual biology of mule deer in these general areas should suffice for that of the general Alberta population.

During the winter season the mule deer are generally grouped in

various sized herds in river valleys and other areas of low elevation where the snowfall is not too excessive. During this period muleys depend almost entirely on browse with the preferred species being aspen, willow, red osier dogwood and numerous wildberry producing shrubs such as rose, and members of the currant (Ribes spp) and raspberry (Rubus spp) families. Winter is the critical period in the lives of all the individuals of the herd, but, the fawns and does are particularly susceptible to starvation when deep snows and consequent inaccessibility lead to lack of foodstuffs. Browsing is the dominant feeding habit throughout the year but grazing of green grasses in early spring provides a high proportion of the foodstuffs ingested during that season. The preferred browse species are aspen, willow, saskatoon, red osier dogwood and juniper (Juniperus spp) in the forest habitats while sagebrush (Artemisia spp) forms an important part of the diet in prairie habitats.

The largest grouping of individuals occurs during the winter season. These herds occupy what is commonly called winter yarding areas. When the spring melt comes the wintering herds break up and a general migration upslope commences. Initially the deer tend to stay on southwest facing slopes and graze on the spring growing grasses in these areas. The bucks migrate upslope rapidly but the does remain on the lower slopes until the fawns are born in late May thus migrating upslope well behind the mature bucks. Browsing again becomes an important procedure of food procurement as soon as the leaves appear on shrubs and young trees. The rut occurs during late October and early November during which time the deer are moving slowly downslope. The males of this species are polygamous and groups of several does and their fawns can often be seen with one mature buck.

Mule deer prefer relatively open habitats throughout the year and are thus relatively conspicuous components of the fauna where ever present. A highly interesting feature concerning Alberta's mule deer population is its range extension in the northern portion of the province since initial contact with Europeans some two centuries ago. This species has lost much of its southern range due to human encroachment on primitive range but has gained a great deal of range in the northern sector of the province and in all probability will continue to inhabit this new region providing environmental factors remain relatively stable. The records written by numerous explorers and later authorities serve to document the historical and present day range of Alberta's mule deer populations.

Probably the first documented sightings of mule deer in northern Alberta were recorded by Alexander MacKenzie during his 1792-93 expedition from Lake Athabasca to the Pacific. MacKenzie noted mule deer in the vicinity of the Vermilion Rapids, on the Peace River, in October 1792. Numerous mule deer were seen in the vicinity of Fort Fork, the wintering location of MacKenzie's party on the Peace, and MacKenzie noted that the Clear Hills to the west of the Fort were a favorite haunt of this species.[4] Daniel Harmon, an explorer and trader, recorded two types of deer in Journals which were devoted to his travels in what is now the province of Alberta. Harmon called wapiti, the red deer, and the mule deer, jumping deer. According to Harmon numerous mule deer were present in local areas throughout Central Alberta during the first two decades of the nineteenth

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[4]MacKenzie, A., 1911, Voyages from Montreal through the Continent of North America, Vol. 1, Courier Press, Toronto.

century.[5] Bird, in 1961, stated that prior to settlement mule deer were, no doubt the most common deer encountered within the Parkland region.[6]

In southern Alberta deer were the dominant species noted in the montane forest west of Calgary and in the adjacent grassland zone by Palliser's expedition in 1863.[7] Denny noted numerous deer in the above locations when he wrote his memoirs concerning the initial establishment of the North West Mounted Police in the Calgary-MacLeod area in 1872. Denny noted that deer were plentiful within the Stoney Indian hunting grounds, in the Sheep River headwaters and the Highwood Range when the police arrived in 1872, but by 1878 they appeared to be less common in these same areas.[8] Denny does not identify the exact species of deer in any of his writings but it is likely that both species were present in the south-western sector of the province at that time. In 1882 MacCoun stated that deer inhabited southwestern Alberta and the bushy country to the east and north. It is probable he was referring to both the mule and the white-tailed deer in this case.[9]

When Preble wrote his North American Fauna No. 27 in 1908, he mentioned several late nineteenth century sightings of mule deer in central and northern Alberta. Preble stated that during the summer of

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[5]Harmon, D. W., 1957, Sixteen Years in the Indian Country, annotated by W. Kaye Lamb, MacMillan, Toronto.

[6]Bird, R. D., 1961, Ecology of the Aspen Parkland, Queen's Printer.

[7]Hector, 1861, "Palliser's Expedition, notes of, concerning botanical physiognomy."

[8]Denny, 1956, "Animals of the Early West, Part 1," Alta. Historical Review, No. 2, Vol. 4, pp. 23-28.

[9]MacCoun, 1882, Manitoba and the Great North West, World Pub. Co., Guelph, Ont.

1895, A. J. Loring reported seeing deer near Jasper House. In the fall of 1896 Loring noted that mule deer were relatively rare between Jasper House and Smoky River but individuals were often sighted to the west and south of this area. In 1897, J. S. Edmonton, a trapper from the Athabasca region, noted several mule deer in the vicinity of Stoney Rapids some two hundred river-miles below Athabasca Landing.[10]

Mule deer populations, like most of Alberta's indigenous ungulates suffered a decrease in numbers near the turn of the century. The late 1890's were the ebb years of their historical population numbers in Alberta. During this period mule deer, as did other ungulate species, suffered from severe and unregulated hunting by both Indian and European hunters who utilized both the meat and hides of the animals. The settlement of southern Alberta began in earnest in the 1880's and this process steadily encroached upon the original range lands of the mule deer and tended to eliminate this species from much of the favoured southern areas of its range. Hunting regulations concerning the capture of wildlife species were imposed shortly after 1900 and this offered some protection to the remaining ungulate populations.[11]

A series of severe winters during the late 1800's served to eliminate many individual deer which were unable to cope with the deep snows and low temperatures. Climatic records show that there was some amelioration of climatic conditions at the turn of the century and this, plus protection, as well as the absence of interspecific competition with other wild ungulates enabled the mule deer populations of Alberta to

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[10]Preble, E. A., 1908, <u>North American Fauna No. 27</u>, U.S.D.A., Wash., 574 pp.

[11]Webb, R., 1959, <u>op</u>. <u>cit</u>.

increase and move to new ranges as well as repopulate some available former ones. When Lawton, Chief Game Commissioner of Alberta, wrote his 1907 report he noted that deer were more plentiful in Alberta than they had been for several years and it appeared that they were steadily increasing in numbers.[12]

Mule deer have inhabited a large portion of the province in historical times. The lack of valid species identification prevalent in many early writings which noted only the presence of members of the Genus Odocoileus makes it difficult to document many valid population sizes and range relationships for this species in Alberta. Perhaps the best data available for such a documentation can be gleaned from several of the writers who, from 1912 to 1958, wrote articles on the zoogeography of the mountainous section of Alberta. In 1912 Hollister, who wrote on the 1911 Mt. Robson expedition, noted that mule deer were common throughout the lower valleys of the headwaters of the Athabasca, Miette and Frazer Rivers or what was known to him as the Canadian biotic zone. Hollister stated that the mule deer probably inhabited all the lower headwater valleys, in the Mt. Robson district, and that they had been seen by various expedition members in the vicinities of Prairie Creek, Jasper House, Henry House, Miette River and Maligne Lake. Hollister thought that Mt. Robson was near the northern extremity of the common range of the mule deer and that they were probably rarer north of the surveyed area.[13]

In the fall of 1913, Soper noted that mule deer frequented the

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[12]Lawton, 1908, "Report of Game and Fire Commissioner, 1907."

[13]Hollister, N., 1912, "Memoranda of the Alpine Club - Expedition to the Mt. Robson Region of Canada," Can. Alpine Jour., pp. 1-44.

Wildhay River area adjacent to Jasper Park but stated that according to the local Indians the population was much lower than it had been in former times.[14] Hewitt stated that in 1919 mule deer were seen daily along various trails near the Banff townsite and that populations in both Rocky Mountain and Waterton National Parks were definitely increasing.[15]

During an expedition into the Cardinal River-Rocky Pass area in the fall of 1922 Soper noted numerous mule deer.[16] In 1928 Kindle wrote that mule deer could be seen along any of the public trails in Jasper Park and that they were probably the most abundant large animal in the Park at that time.[17] Two mule deer were collected, for the American Museum of Natural History, in the vicinity of Entrance and Thoral Creek in 1935.[18] In expeditions undertaken in 1941, Soper found mule deer to be relatively common in the Rocky Mountain National Parks and stated that the provincial foothill areas adjacent to the Parks were probably being replenished by stock migrating from within the Park areas. In 1941, Soper noted that Indians he met stated mule deer were relatively common throughout the Rocky Mountain sector of Alberta from Waterton Park to the headwaters of the Wapiti River and that probably lesser numbers of this species inhabited points well north of the Peace River.[19]

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[14] Soper, J. D., 1947, "Observations on Mammals and Birds in the Rocky Mountains of Alta.," Can. Field Naturalist, No. 5, Vol. 61, pp. 143-174.

[15] Hewitt, C. G., 1921, Conservation of Wildlife in Canada, Scribners & Sons.

[16] Soper, J. D., 1947, op. cit.

[17] Kindle, E. M., 1928, "Wildlife of Jasper Park," in Can. Field Nat'l., Vol. 17, No. 5, pp. 111-118.

[18] Crowe, R. E., 1943, "Notes on Some Mammals of the Southern Canadian Rocky Mountains," Bull. of Amer. Mus. Nat'l. Hist., LXXX, Art. XI, pp. 391-410.

[19] Soper, J. D., 1947, op. cit.

In summarizing the population dynamics of Banff mule deer from the turn of the century to 1958 Banfield stated that the mule deer populations in the Park increased until the mid-1930's.[20] There was a population decline between 1935 and 1939 due mainly to competition with the Park's increasing wapiti herds. Subsequent to this the mule deer population rose and remained relatively static in numbers from 1943 to 1958.[21] Today due to conservation measures the Mountain Park areas and the adjacent foothills support some of the highest mule deer populations in Alberta.

Although mule deer have continued to inhabit favorable local habitats in south-eastern Alberta few authors have noted their range in this area. Williams sighted a mule deer in the Cypress Hills area in 1925.[22] In his survey of the area of former Nemiskan Park in 1949, Soper noted several mule deer in the vicinities of Chin and Forty-mile Coulees.[23] In 1965 Soper stated the following concerning the distribution and populations of mule deer in south-eastern Alberta. ". . . of sparing occurrence in the semi-arid south except in Cypress Hills and such wooded bottomlands as occur along the Milk, Oldman, South Saskatchewan and Red Deer Rivers, and the larger, brushy coulees."[24]

The parkland area of Alberta has long been a favored habitat of the mule deer but few authors have included this species in their notations

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[20]Banfield, A. W. F., op. cit. [21]Ibid.

[22]Williams, M. Y., 1946, Notes on the Vertebrates of the Southern Plains of Canada 1923-26, Can. Field Nat'l. 60 (3) pp. 47-60.

[23]Soper, J. D., 1949, "Notes on Fauna of Former Nemiskan Park Vicinity, Alberta," Can. Field Nat., No. 5, Vol. 63, 1949, pp. 167-182.

[24]Soper, J. D., 1964, "Mammals of Alberta," Queen's Printer, p. 344.

concerning the area. In 1921, Soper noted mule deer were common residents in the Islay area prior to 1910 but since that year had been relatively scarce. However in his writings he noted that the species was no doubt still present in local sectors of the North Saskatchewan and Vermilion River valleys in the Islay area.[25] In 1925 Farley stated that mule deer had been very common in the Camrose area in the late 1800's and that a five year closed season in the area would probably be sufficient for natural restocking to take place. Farley cited a case in point concerning former abundance when he stated that a single hunter had killed fifty-five deer along the Red Deer River south of Buffalo Lake in the winter of 1893-94.[26] When Keith summarized the 1907 to 1942 diary of the Hodgson family of New Sarepta he noted that the insignificant total number of sightings signified the scarcity of deer in this area during the outlined years.[27]

As aforementioned mule deer today inhabit much of northern Alberta with the exception of the extreme north-western corner. It is generally concluded that this species has moved northward in advance of agricultural settlement due to their incompatibility with this form of land use. MacKenzie noted mule deer along the Peace River during the fall of 1792. Approximately one hundred years later Preble noted that they occurred along the Athabasca as far north as Stoney Rapids.[28] In 1914 Harper

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[25]Soper, J. D., 1921, "Gleanings from Canadian West Part 2, Mammalia Fauna of Islay, Alberta," Can. Field Nat., Vol. 25, pp. 102-111.

[26]Farley, F. L., 1926, "Changes in Status of Certain Animals and Birds During the past 50 Years in Central Alberta," Can. Field Nat. 39(9) pp. 200-202.

[27]Keith, L., 1965, "Early Notes on Wildlife from New Sarepta, Alberta," Can. Field Nat'l., Vol. 79, pp. 29-33.

[28]Preble, E. A., *op. cit.*

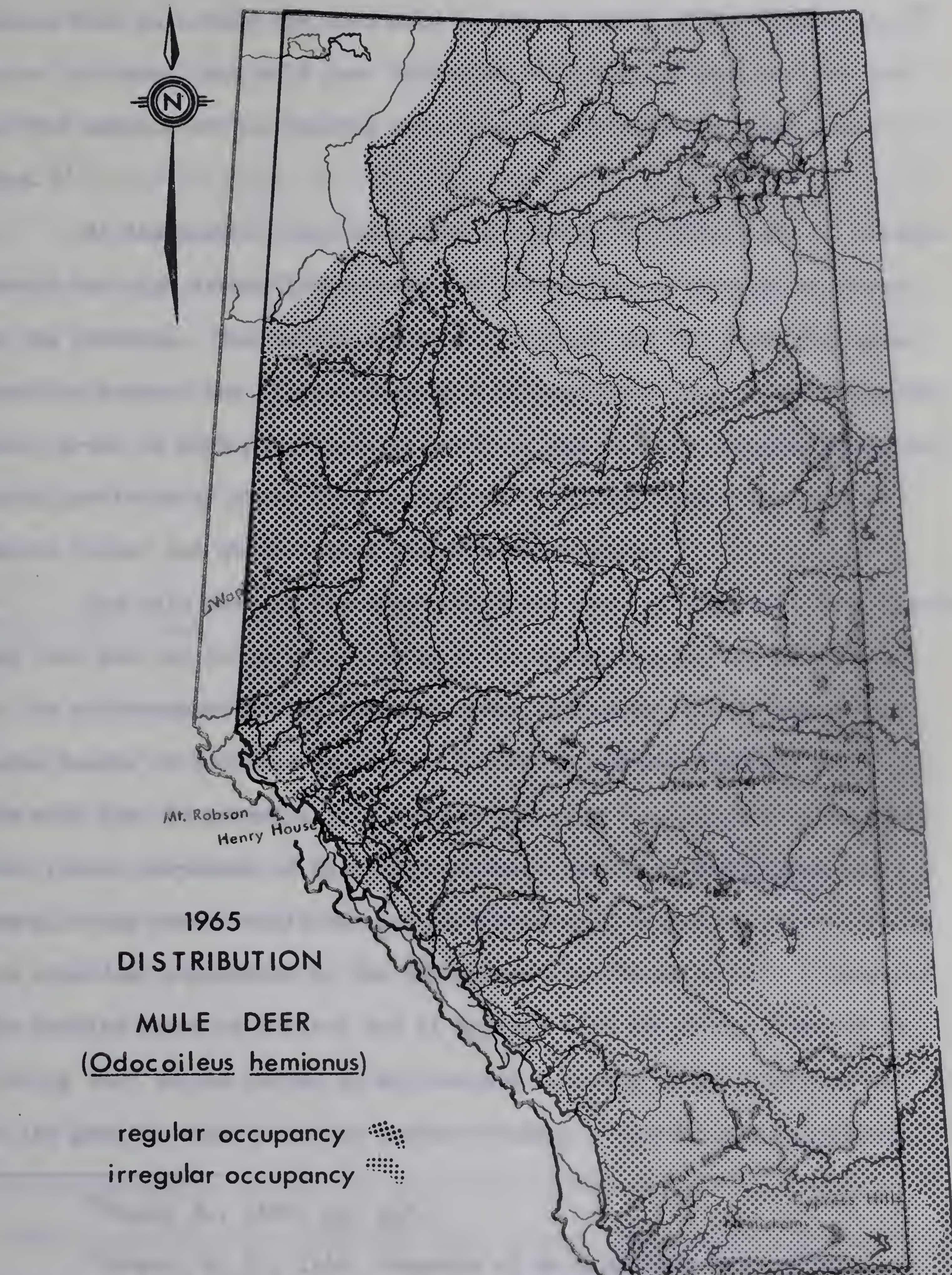
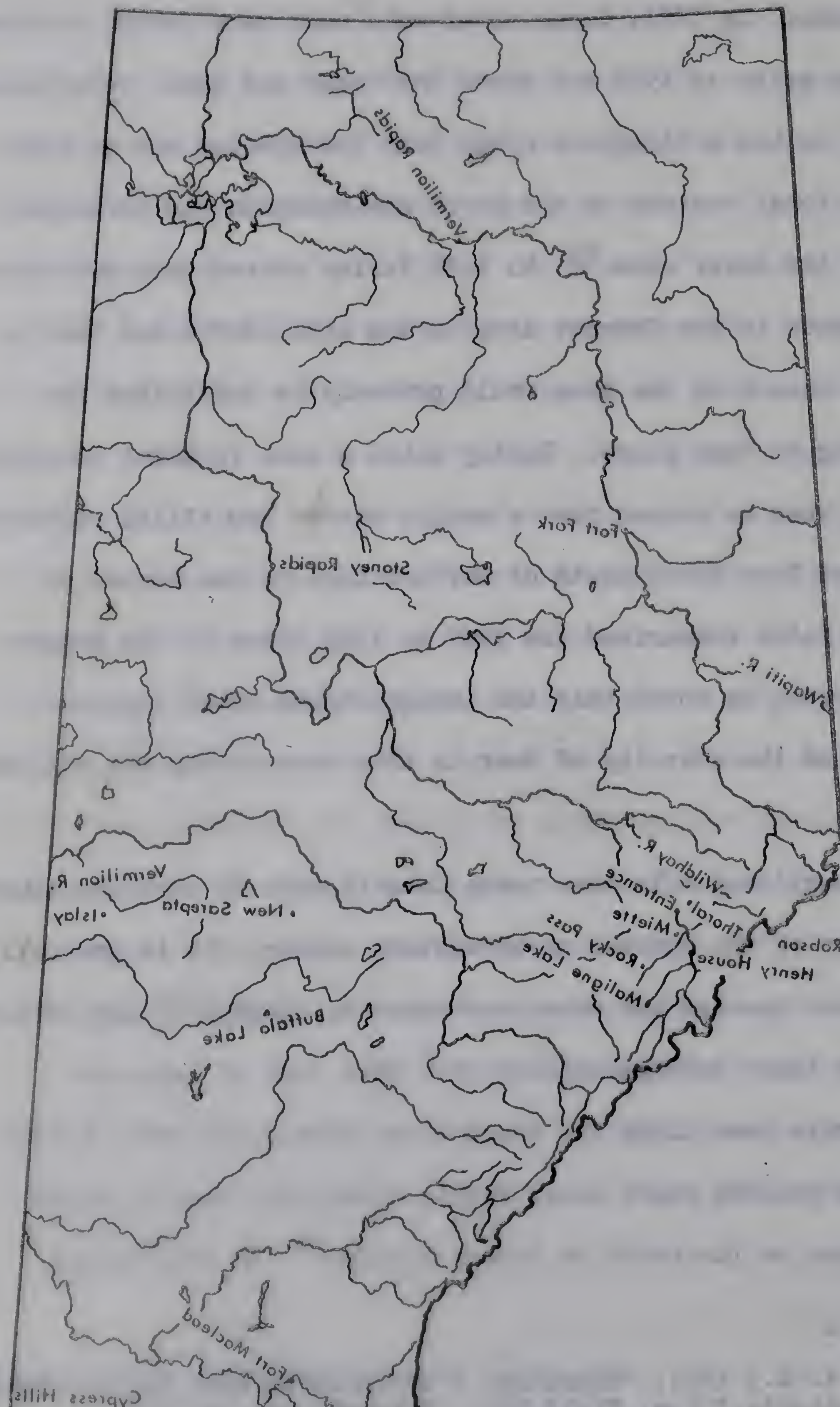

N
Mt. Robson
Henry House
1965
DISTRIBUTION
MULE DEER
(Odocoileus hemionus)
regular occupancy
irregular occupancy
0 50 100 150 200
MILES

FIGURE 27


Vermilion Rapids
Fort Fork
Stoney Rapids
Wapiti R.
Wildhay R.
Entrance
Thoral
Miette
Rocky Pass
Lake
Maligne
Henry House
Mt. Robson
Vermilion R.
Islay
New Sarepta
Buffalo Lake
Fort Macleod
Cypress Hills
Nemiskam

OVERLAY 2

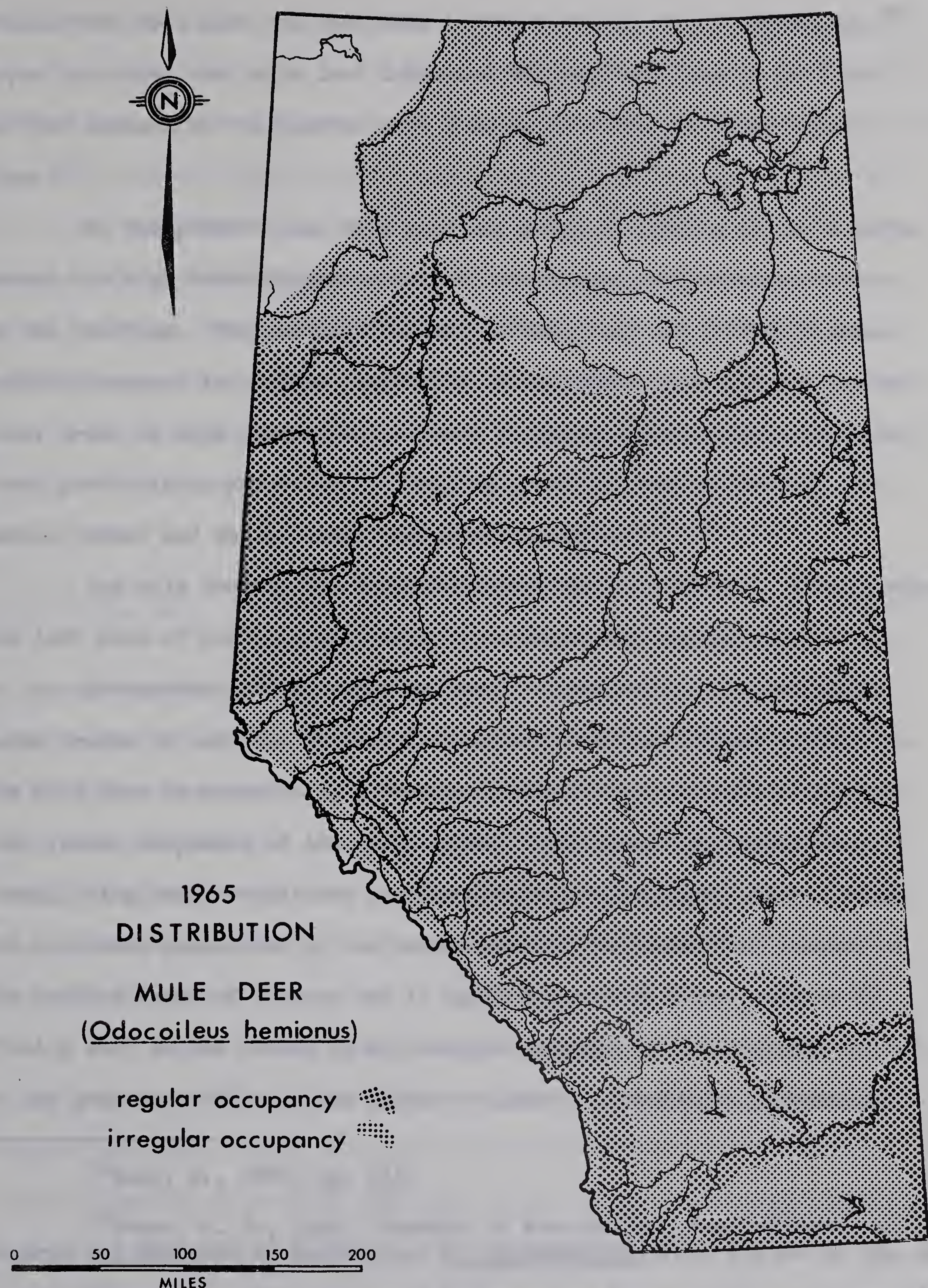

N
1965
DISTRIBUTION
MULE DEER
(Odocoileus hemionus)
regular occupancy
irregular occupancy
0 50 100 150 200
MILES

FIGURE 7

stated that mule deer had been seen in the vicinity of Fort MacMurray.[29] Soper has noted that mule deer inhabited Wood Buffalo Park in 1922 and by 1940 members of the species were seen as far north as Great Slave Lake.[30]

At the present time mule deer are known to inhabit all of Alberta except the high Arcto-Alpine areas and the extreme north-western corner of the province. The parkland forest ecotone, and the foothills areas probably support the highest densities of mule-deer populations today but local areas of high population do occur in the northern coniferous forest areas particularly where fire or logging practices have eliminated the mature forest and where seral stages are prevalent.[31, 32]

The mule deer is the true indigenous deer of Alberta. This species has lost much of its original range in southern and eastern Alberta due to the encroachment of its range by human occupation but it has gained large tracts of suitable habitat in the north and west through migration. The mule deer is essentially a browser and thus this species is an important faunal component of the seral growth. Old burns and logged areas exemplifying seral conditions are particularly favoured habitats. Today the mule deer population is far outnumbered by the white-tail in most of the settled areas of Alberta and it appears that the former species is "losing out" to the latter in all settled sections of the province due to the greater ability of the latter to adapt to conditions associated

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[29] Webb, R., 1966, op. cit.

[30] Soper, J. D., 1940, "Mammals of Wood Buffalo Park of Northern Alberta and District of MacKenzie," J. of Mammalogy, Vol. 23, No. 2, pp. 49-64.

[31] Webb, R., 1966, Range of White-tailed Deer in Alberta, mimeo, 8 pp.

[32] Stelfox, J. G., Personal communication.

with human occupation of the land.

Proper management is a definite requirement concerning the maintenance of mule deer populations in Alberta. Management must particularly take into consideration the fact that future settlement in this province may expand to the north and west and thus encroach upon what is now the species prime habitat. The mule deer is essentially a "wilderness" animal and some aspects of this type of environment are vital for the continued existence of this species in the province. At present the mule deer is an important species on Alberta's big-game check-list. Under proper and long term management this species will no doubt continue to remain one of our prime big-game animals.

White-tailed Deer

In general the white-tailed deer is the smaller of the two Alberta deer species. The body structure of the white-tailed deer is typically deer-like and thus body proportion can be easily designnated by anyone familiar with any members of the Holarctic Cervidae family. In Alberta the mature buck of this species weighs approximately 200 pounds while the doe is normally about two-thirds of this weight or about 140 pounds.

Both sexes of this species exhibit a patterned pelage which changes color tone seasonally and are designated as the summer red coat and the winter blue coat. During the summer the upper parts of the body are reddish brown in color while the belly, inner sides of the legs and the rump patch are whitish in colour. The upper parts of the body take on a greyish tone, which often exhibits a blue tinge, during the winter period.

the large tail of this species, which is of the same colour as the back, is edged with white hairs. The ventral side of the tail is white-haired. When raised, the tail looks like a white flag as aforementioned in the field identification of this species. When close to the body the tail hides a large proportion of the whitish rump patch of the animal. White-tail fawns are speckled with numerous white spots until they are about four months old at which time they begin to exhibit coloration relatively equivalent to that of the mature animals.[33]

White-tailed bucks do not have brow-tines; their annually deciduous antlers project forward and outward from the skull with individual tines arising from the main antler beam. Male fawns may exhibit buttons or knubbins during their first fall. Yearling bucks normally have spike antlers while the growth of tines commences during the bucks' second year. Mature bucks have the normal rondichotomous branching antlers.

White-tailed deer as a species do not exhibit the same herd tendency as is found in the mule deer. During the winter period yarding is normal for white-tails, but in general there is the formation of only small, loosely knit herds led by an old doe.[34] River valleys are the prime wintering range of this species while summer range consists of river valleys and any other areas which offer cover vegetation in the agriculturally dominated areas of the province. White-tails are primarily

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[33]Taylor, W. P., 1951, op. cit.

[34]Ibid.

browsers the year round. Preferred foods are normally aspen, chokecherry, red osier dogwood, saskatoon but numerous other shrubs, grasses and forbs, and agricultural field-crops often play important roles in the diet of this species.

The white-tailed deer is not seasonally migratory as is the mule deer and thus white-tail populations are normally found throughout their total range area in scattered family groups at all times of the year. The fawns, often twins, are born in late May and early June. During the rutting season which takes place from late October well into November the polygamous bucks service as many does as they encounter but do not normally collect a harem as do the bull wapiti or buck mule deer. As is general with the other Cervidae the buck white-tails do not lead a family life and the sexes are thus relatively separate within local ranges except during the breeding season and the critical winter period when yarding occurs.[35]

White-tails were not indigenous to much of Alberta at the time of initial European exploration some two centuries ago. In fact this species except for scattered individuals, probably did not inhabit any areas except local areas of favourable habitat in the southern sector of the province prior to one hundred years ago. White-tails advanced north and west across the province with European induced agricultural settlement which began in earnest less than eighty-five years ago. Numerous people have recorded the rapid range extension of this species, and it is from records we are able to trace the position of the white-tail range at specific periods during the last century. Many individual records have

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[35] Ibid.

been compiled and verified by one authority, R. Webb, formerly a provincial wildlife biologist stationed at Calgary, Alberta.

The first reliable record of white-tailed deer in Alberta was written in 1780 by Umfreville, a French-Canadian fur trader, during his sojourn in east-central Alberta. Umfreville recorded that white-tails inhabited local areas to the south of his fur trading post on the North Saskatchewan River.[36,37] During his expedition into central Alberta in 1810 Alexander Henry noted that white-tails as well as mule deer inhabited favourable localities along the North Saskatchewan River. Henry noted a wolf-killed white-tailed deer carcass several miles west of Rocky Mountain House during the late fall of 1810.[38] Taché wrote that white-tailed deer did not occur north of the North Saskatchewan River at all and were scarce throughout all of the province except a few local areas in southern Alberta during the years 1840 to 1865.[39]

Hector of the Palliser Expedition noted that white-tailed deer were relatively abundant in the montane forest of the Bow River valley area west of present day Calgary and the adjacent grasslands to the east of this area.[40] Denny reported that deer were abundant in the river bottoms and the well wooded sections of the MacLeod-Calgary area when the

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[36]R. Webb, 1966, op. cit.

[37]R. Webb, personal communication.

[38]Henry, A., 1921, Travels and Adventures in Canada and the Indian Territories between 1760 and 1776, London.

[39]Douglas, 1827, Journals Kept by D. Douglas during his Travels in North America, 1823-27, London.

[40]R. Webb, 1966, op. cit.

North West Mounted Police arrived in 1872. In 1876 Denny stated that deer were locally abundant in the vicinity of Devil's Lake nearly Morleyville which was in the same general location as Hector noted them some fifteen years before.[41] Both Hector and Denny give accounts that white-tailed deer or mule deer occurred in specific localities in southern Alberta but they often simply noted "that deer were abundant locally."[42,43] Use of the general term by these authors makes it highly probable that both species "inhabited the MacLeod-Calgary area" in the third quarter of the nineteenth century.

Prior to 1880 members of the Genus Odocoileus did not suffer severe depletions from hunting as both the indigenous Indian and the encroaching white populations were primarily engaged in slaughtering the larger herd ungulates, the bison and the wapiti. Large scale slaughter of deer in Alberta did not commence until after the herds of bison and wapiti had largely been eliminated and settlement began in earnest. Unregulated deer hunting in the last two decades of the nineteenth century combined with extreme low temperatures and deep snows, during a series of severe winters at this period served as death warrants to many deer. Numerous accounts of starving deer within the limits of urban areas in Alberta are noted in written records of the late 1880's. The mid 1890's were no doubt the low ebb years in Alberta's deer populations.

The factors influencing the white-tailed deer population size and distribution in Alberta became favourable to this species about the year

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[41]Hector, Sir J., op. cit.

[42]Denny, Sir C., 1905, Riders of the Plains, Herald Co., Calgary.

[43]Hector, Sir J., op. cit.

1900. Regulations concerning hunting were formulated and enforced shortly after the turn of the century. Amelioration of climatic conditions was noticeable at the turn of the century and the milder winters favoured the white-tailed deer in terms of both population increase and distribution. Subsequent to 1900 the increasing deer population did not have to contend with interspecific competition from herds of bison and wapiti. These latter species had literally been decimated by settlement and hunting, thus, the white-tailed deer spread rapidly into favourable habitats which were not yet under intensive settlement. In 1907 Lawton stated that deer in Alberta were certainly more plentiful than they had been for some years and that they were steadily increasing in numbers and occupying new areas to the north and west of their former haunts.[44]

In 1908 Preble noted that J. S. Edmonton, an Athabasca Region trapper claimed that several white-tailed deer had been killed in the vicinity of Edmonton within the past few years.[45] In 1912 Soper sighted numerous fresh beds of white-tailed deer within a few miles of Edmonton.[46] The earliest sighting of white-tail deer in the vicinity of New Sarepta was mentioned in the Hodgson family diary dated February 13, 1913.[47] Farley does not mention white-tailed deer in his 1925 account of the faunal changes in central Alberta between 1875 and that year.[48] It is not certain whether Farley overlooked the species because he felt there was no change or whether he overlooked them because he did not know the deer present in the area.

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[44] Lawton, op. cit.

[45] Preble, E. A., op. cit.

[46] Soper, J. D., 1921, "Gleanings of Can. West" Part 2, Can. Field Naturalist, Vol. 35, pp. 102-111.

[47] Keith, L., op. cit.

[48] Farley, F. L., op. cit.

The history of white-tailed deer on the East Slope in terms of both population and of distribution is relatively uncertain. It is generally conceded that they did not occupy much of the eastern slope area nor were the populations in the settled areas very high. In 1916 Millar reported that white-tails were not very common along the east slope but were increasing in number due to their tolerance of human settlement.[49] In 1940 Clarke wrote that within the National Parks in Alberta's mountains white-tails were restricted to local areas in the vicinity of the eastern ends of passes linking them with British Columbia.[50] In 1943 Cowan verified Clarke's findings and added a few more local white-tail summering ranges in Banff.[51] Although Soper only saw two white-tailed deer between Waterton and Canmore in various trips he made in this area between 1913 and 1944, he stated that white-tails were relatively frequent in southern Banff and the adjacent area.[52] No white-tails were collected from the mountain or foothill sections of Alberta during the 1941 American Museum expedition.[53] In 1958 Banfield wrote that small numbers of white-tails inhabited the Castleguard and Alexander River valleys, the "Graveyards" on the Saskatchewan and areas adjacent to Howse Pass, Lake Louise, Mt. Eisenhower and Palliser Pass during the

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[49]Millar, W. N., 1916, "Big-game of the Canadian Rockies," Prov. Committee on Fisheries, Game and Fur Bearing Animals, pp. 100-124.

[50]Clarke, 1940, Report on the Mountain Parks, unpublished C.W.S. report.

[51]Cowan, I. Mc., 1943, Reports of the Mountain Parks, unpublished C.W.S. Report.

[52]Soper, J. D., 1947, "Observations on Mammals and Birds in the Rocky Mountains of Alberta," in Can. Field Naturalist, No. 5, Vol. 61, pp. 143-174.

[53]Crowe, R. E., op. cit.

summer. Banfield noted that all white-tailed deer, except those present in "Graveyards" area, which wintered in the lower Saskatchewan valley were annual spring migrants from British Columbia.[54] White-tail deer have long been abundant on the Kootenay Park area of British Columbia and have probably entered the Banff region during the summer for many years.[55]

White-tailed deer probably inhabited the Cypress Hills prior to historical times and have continued to remain in these outliers throughout the settlement period. Williams noted white-tails on the bench area of Cypress Hills in 1924 and in the vicinity of Elkwater Lake in 1926.[56]

Around 1915 the white-tailed deer population of Alberta began to rise noticeably and since that time the rise in population number and the increase in occupied range has been phenomenal. White-tails have progressed north and west along with agricultural settlement and forestry logging activities. Today white-tailed deer, which are one of Alberta's foremost big-game species, are found throughout all settled parts of Alberta and in northern regions adjacent to where agricultural and logging practices are being undertaken. The highest population density of this species occurs in the grassland, parkland and forest-parkland areas of the province but scattered populations are actually found throughout the province with the exception of the Alpine, MacKenzie Lowland and the undisturbed northern coniferous forest areas. The population has constantly progressed northwestward with agriculture, in spite of the fact that white-tails suffer periodic die-offs under extreme winter conditions

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[54]Banfield, A. W. F., 1958, op. cit.

[55]Ibid.

[56]Williams, M. Y., op. cit.

within Alberta's northern regions.[57]

The range of white-tailed and mule deer populations overlap but these two species do not compete overtly nor do they hybridize under normal conditions. The mule deer adapts better to colder winter climates than does the white-tail and so occupies higher altitudes and latitudes. The white-tail adapts better to human settlement and thus is appears that this species may tend to become the dominant deer in much of Alberta.[58] Little management seems necessary for the continued existence of this member of the Cervidae.

Alberta's present day white-tailed deer population is essentially that of an invading species which came into Alberta and is now occupying a large portion of the province in conjunction with agricultural settlement. Today the white-tailed deer is the most abundant of the big-game species in the prairie and parkland sectors of the province. The adaptability of this species in areas under agricultural settlement was noted early in the settlement period of western Canada. Hewitt mentioned in 1921 that utilization of this species as a "wild meat" would no doubt continue for a long time and could enhance the economic well-being of pioneer fringe settlement.[59]

White-tails are primarily browsers and thus a high presence of browse species greatly enhances their numerical status. Their diet often consists of numerous grasses and forbs as well as tid-bits from agricultural crop-lands as well as the basic shrubby foodstuffs. This species prefers a relatively densely vegetated habitat as compared to the

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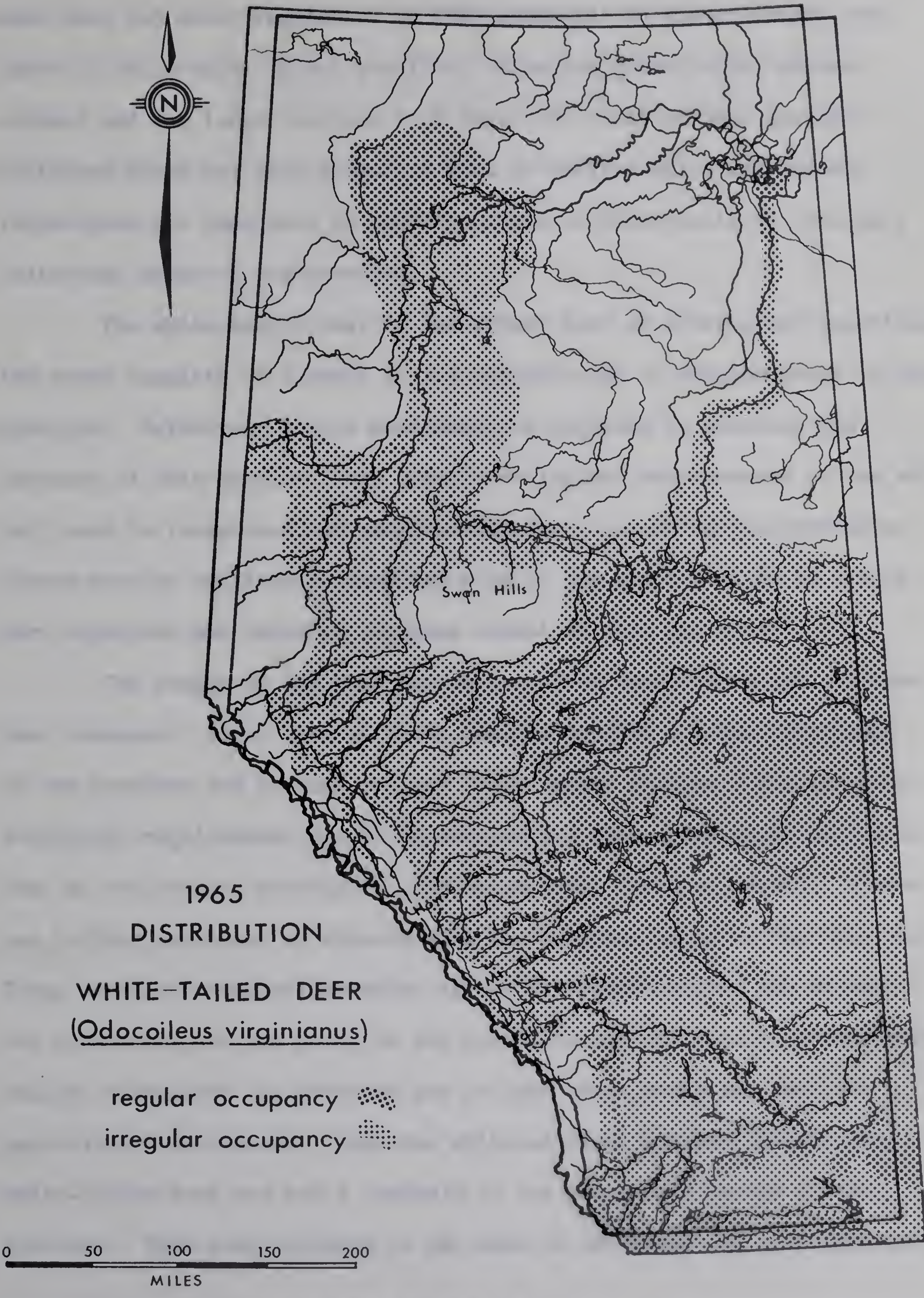
[57] Webb, R., 1966, op. cit.

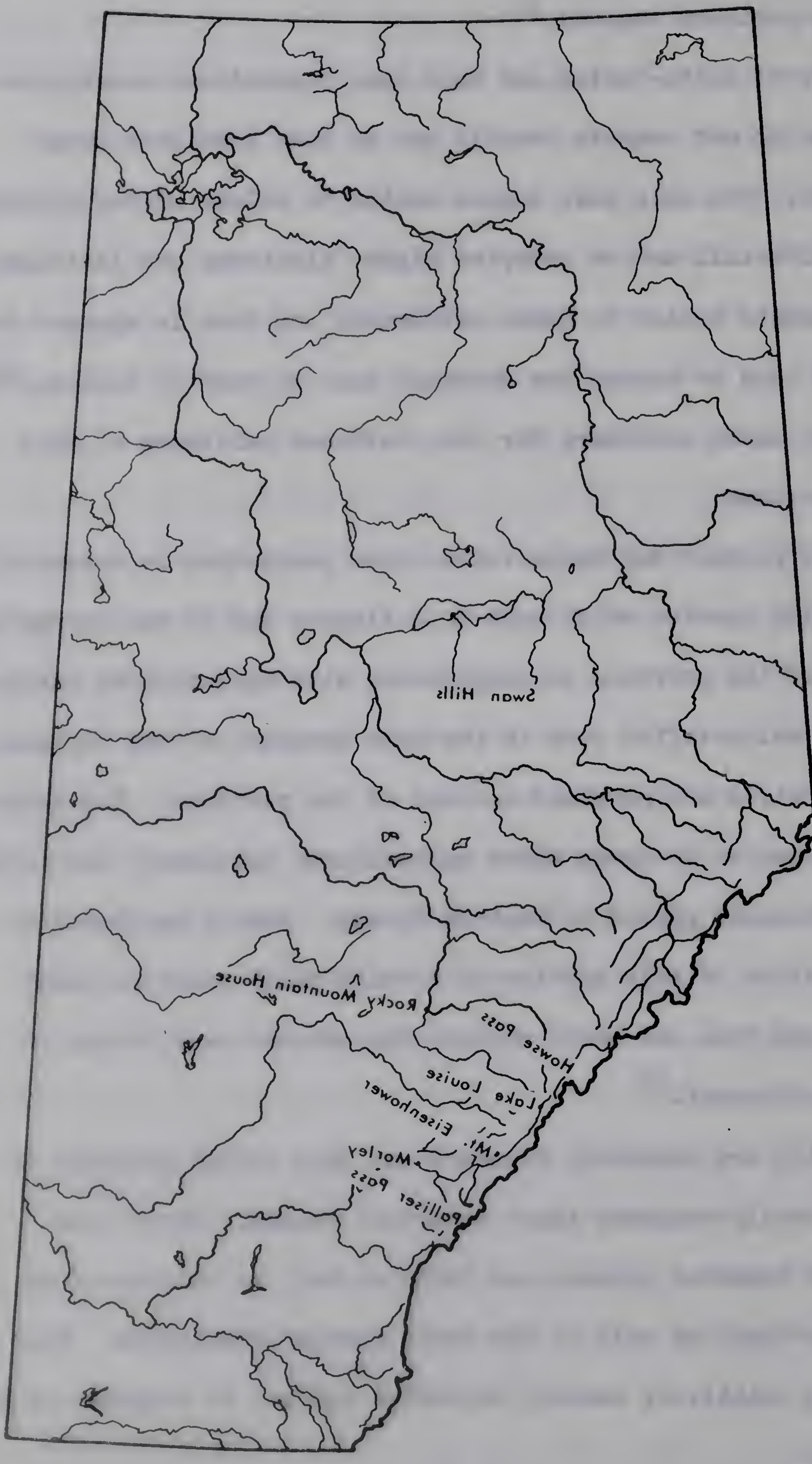
[58] Ibid.

[59] Hewitt, C. G., op. cit.

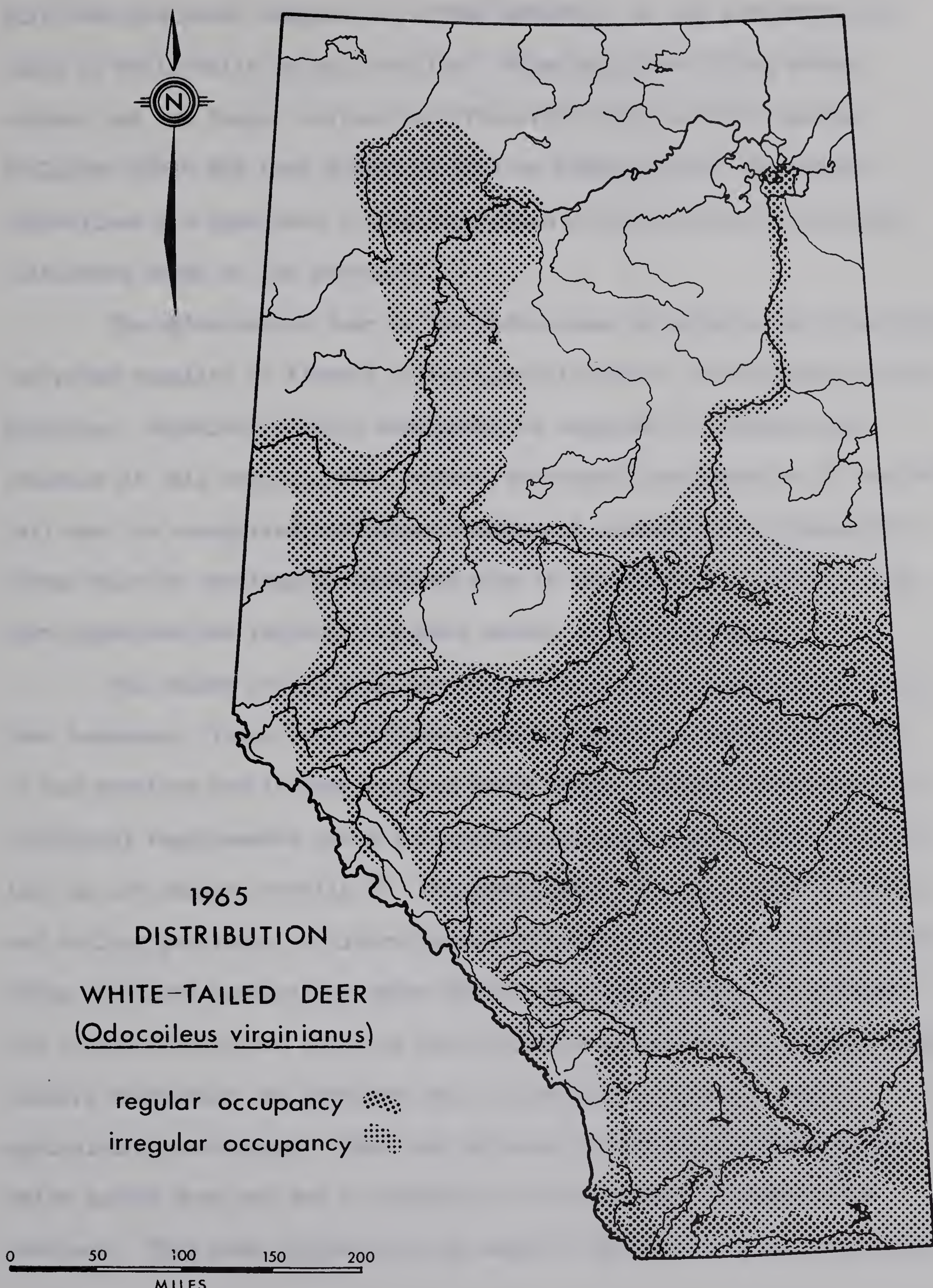


OVERLAY 3

FIGURE 8


Swan Hills
Rocky Mountain House
Howse Pass
Lake Louise
Mt. Eisenhower
Morley
Palliser Pass

OVERLAY 3



1965
DISTRIBUTION
WHITE-TAILED DEER
(Odocoileus virginianus)
regular occupancy
irregular occupancy
0 50 100 150 200
MILES
N

FIGURE 8

mule deer and cover vegetation is thus essential to the continued presence of white-tails in any locality. Riparian growth along stream courses and the larger coulees is a favourite haunt of this species. Uncleared shrub and tree growth as well as shelter belts and shrubby fence-lines are important in the livelihood of white-tails in intensely cultivated areas of the province.

The white-tailed deer is the future deer of Alberta and essentially the prime ungulate of Alberta in the agricultural or settled areas of the province. Relatively little management is required to maintain the presence of this species, but, certain ecological requirements of the white-tail must be recognized and proper management concerning the population status must be continually complied with if the species is to be a long term important and valuable big-game animal of this province.

The ranges of the mule and white-tailed deer within Alberta have been compared. Today both of these species inhabit a large percentage of the province and in many regions their ranges overlap. However their ecological requirements are not identical and thus under most conditions they do not compete overtly.[60] The grasslands, the open foothill slopes and rolling parklands of Alberta were the original range of the mule deer. Today scattered populations exist almost everywhere within the province but concentrations are found in the foothills and outliers in wooded river valleys throughout the province and in open areas north and west of agricultural settlement. When the whiteman first entered Alberta the white-tailed deer had but a foothold in the south-east corner of the province. This deer followed in the wake of settlement as it progressed

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[60] Stelfox, J. G., and Webb, R., personal communication.

across the face of the land. Today this species exists in forest and shrub covered areas throughout the settled sections and scattered populations occur in all but the higher foothill and mountain slopes, the Swan Hills and the as yet undisturbed forest areas of northern Alberta.

CHAPTER 5

DISTRIBUTION AND RANGE OF WAPITI IN ALBERTA

Alberta's second largest indigenous ungulate on the hunting list is commonly known by its Shawnee Indian name, Wapiti. Wapiti, in loose translation from the Hokan-Siouan language of the Shawnee, means "white deer." The Indians recognized this particular species by one of its most diagnostic features, the whitish rump patch. Within the Family Cervidae the North American wapiti, which is the largest round-antlered ungulate in the world, ranks second in size to the North American moose.

The common name, often applied to this species is the European misnomer, elk. The North American wapiti is a close relative of the European red deer rather than of the European elk, which is actually the "Old World" equivalent of the North American moose. When used in scientific publications the name wapiti normally denotes a large group of the genus *Cervus* of which the North American species is only part. Elk usually refers to a more specific category of animals and is used to refer to the European species in particular. It is assumed that in written accounts of scientific value the term wapiti is the most expedient of the two names aforementioned. Notwithstanding, it is best to recognize both terms and accept them as interchangeable nomenclature for the North American species in the context of reports, exploration records, or private communication referring to the species *Cervus canadensis* on this continent.

The genus *Cervus*, of which the North American wapiti is a species, is Holartic in distribution. Central Asia was the original habitat and

dispersal point for the numerous members of this group.[1]

The wapiti of North America is an "old World" migrant of a relatively recent geologic epoch, and as such, exhibits close ties with its Eurasian kindred. The wapiti's closest relatives include Pére David's Deer, the Indian Sambar, the Japanese Sika Deer and the Chinese Spotted Axis Deer as well as the Red Stag of western Europe. These related species are all characterized as being the possessors of a pair of annually deciduous, many-tined, round-beamed antlers set in the skull at an oblique angle and featuring a brow tine. Cervus canadensis also possesses a unique leg bone arrangement which it shares with its Eurasian relatives but which causes this same species to be unique among the deer or Cervidae Family of North America.

The proximal portions of the lateral metacarpel bones have persisted in the limbs of these particular ungulates. Possession of these small leg bones sets the North American wapiti as a species apart in this continent but serves as a bond between the species and its Eurasian affiliates and illuminates the recency of the wapiti's Asiatic origins. Fossil records of this species have been found in numerous locations throughout temperate North America but none of these discoveries antidates the Pleistocene epoch. From its anatomical characteristics and the lack of pre-Pleistocene fossil data for this species in North America it has been concluded that the wapiti is a relatively recent Eurasian migrant via the Bering Land Bridge.

In Alberta mature wapiti males weigh between 800 and 1000 pounds while the females have an average live weight about twenty-five percent less. Calves weigh 25-30 pounds at birth. The heavy yet well proportioned

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[1]Darlington, op. cit.

body of the wapiti is supported by relatively long, slender legs. Body pelage is normally of a buckskin or reddish brown, while the coloration of the neck, head, limbs, and underbelly is a rich, dark brown. The longer, thicker winter body pelage of October to April is of a slightly grayish or lighter tone than is the summer or May to September pelage. Individual wapiti vary greatly in color with mature bulls often possessing a pale tawny body color while many females exhibit a bluish tinged pelage. One of the major diagnostic features of the wapiti is the whitish rump patch possessed by both sexes. All wapiti bear this very apparent field identification feature subsequent to the time the calf loses its mottled protective pelage in the September of its birth year. The short, stubby tail of the wapiti is of the same color as the rump patch and is surrounded by the latter thus giving it a "set in" appearance. Both sexes have heavy neck manes made up of long guard hairs over wooly undercoats. The highest development of the neck mane is exhibited by mature bulls during the fall season.

Wapiti possess one pair of upper jaw canines commonly called tusks. These heavy, rounded, slightly flattened teeth which have no real known function are not apposed by teeth on the lower jaw but wear down at about the same rate as the utilitarian teeth of the animal. Both sexes have these "elk tusks" but those of the bull are usually larger and of a higher polish. These pieces of ivory-like material were highly prized as trophies and decorations in both pre-historic and historic times and entire herds of wapiti have been slaughtered for the sole purpose of obtaining the tusks.

The deciduous pair of antlers possessed by the bull wapiti is a major reason for the inclusion of this species in today's big-game listings. The main beam of the antler sweeps upward and backward from

its skull base. The basal tine of the antlers, which is horizontal and points forward over the face of the wapiti, is known as the brow-tine. All other tines rise vertically from the back-swept main beam.

The wapiti are relatively unselective or unbiased in their diet and may consume fairly large quantities of grasses, forbs, and browse at any one time but they are primarily browsers under Albertan environmental conditions, except in Cypress Hills and Elk Island National Park. This tendency towards utilization of a wide range of food plants as well as their gregarious herding instinct and aggressive nature enables this species to literally "take over" ranges. This general aggressive behavior, their herding instinct and their unspecialized grazing aptitude are important points in the consideration of the future of wapiti in Alberta.[2]

Wapiti are essentially migratory animals and their local routes are travelled according to a seasonal pattern. Wapiti are gregarious and tend to band together in various sized herds throughout the year. Spring finds large herds of wapiti frequenting the lower foothills and mountain valleys. As the winter snows melt the wapiti follow the new green grass growth upslope. The bulls migrate upslope rapidly but the cows tend to move upslope singly at a slower pace until after the calves are dropped in late May and early June. By July the wapiti are near their highest upslope grazing areas. The rut occurs in late September and early October. During this period the polygamous bulls contest each other for ownership or collection of harems. The wapiti migrate downslope as the winter

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[2]Stelfox, J. G., Flook, D., and Dickinson, D., personal communication.

snows commence to cover the upper slopes. As mentioned, in parts of Alberta wapiti are primarily grazers throughout the year.[3] During the winter season they paw through the snow in order to obtain their preferred diet of grasses. As the depth of snow increases the ease of pawing decreases and animals tend to browse to a greater extent thus supplementing their preferred diet.

Under conditions existing when the first European explorers reached Alberta, the wapiti inhabited the widest range of any of the native ungulates. At that time, the latter half of the eighteenth century, the wapiti ranged throughout a great portion of the province, being absent or unrecorded only in the MacKenzie Lowlands, the Alpine Barrens and the northern sector of the Mixedwood Forest.

Written records by the explorers themselves or compilations by later authorities often contain very valuable information concerning the distribution of wapiti and effects of exploration on their range may be gleaned from these writings. In 1754 Anthony Henday recorded elk as being common inhabitants of the plains of southern Alberta.[4] In 1793, after wintering at Fort Fork on the banks of the Peace River, Alexander MacKenzie noted that elk abounded on the plains along the Peace from Fort Vermilion to Fort St. John and frequented the area along the Smoky River for an undetermined distance upstream from Fort Fork.[5] Wapiti were found throughout much of northern Alberta. Daniel Harmon in 1812, after travelling from Lake Athabasca to Fort Dunvegan, stated that elk inhabited

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[3]Dickinson, D.; Cyr, A.; personal communication.

[4]MacGregor, J. G., 1954, Behold the Shining Mountains, Applied Arts Pub. Ltd.

[5]MacKenzie, A., *op. cit.*

the Peace River valley from Vermilion Falls to the foothills of the Rockies.[6]

In 1851 Richardson stated that wapiti were not indigenous to the Lake Athabasca basin or the Slave River valley during pre-historical times but farther west they had ranged as far north as 59°00' North latitude.[7] In 1876 wapiti were sighted by Loring in the vicinity of the confluence of the House and Athabasca Rivers.[8] The northern explorer Petitot, in writings dated between 1876 and 1879, noted that elk were relatively numerous along the Athabasca River as far north-east as two days travel downstream from the junction of the House and Athabasca rivers. The prevalence of wapiti in the northern portion of the province during the period of early exploration becomes particularly credible when one notes that the original name of the Athabasca River was the Elk River.[9]

Prior to European penetration wapiti ranged throughout the greater part of Alberta hence their range covered a variety of habitats. The highest concentrations of wapiti populations no doubt occurred in the Parkland and Foothills biotic zones. Bird, in 1961 stated that prior to settlement wapiti were common throughout the Parkland.[10] In 1894 Whitney, a trapper noted wapiti near Fort Victoria, and stated that at that time it appeared as though the valley of the North Saskatchewan in that vicinity was the north-eastern limit of this species range in Alberta.[11]

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[6]Harmon, D., _op. cit._

[7]Preble, E. A., _op. cit._

[8]_Ibid._

[9]_Ibid._

[10]Bird, R. D., _op. cit._

[11]Preble, E. A., _op. cit._

Numerous wapiti frequented the Cooking Lake Moraine and areas to the immediate north during the late 1890's. David Thompson in his writings between 1808 and 1810, recorded wapiti in the valleys of the South Saskatchewan. Alexander Henry described a wapiti hunt on the Kootenay Plains of the upper South Saskatchewan, which he took part in during his sojourn in the area from 1810 to 1812.[12] Wapiti frequented the valleys of both the South Saskatchewan and Kananaskis Rivers during the initial exploration periods of these areas.

Drastic reductions of wapiti by Indians are recorded as occurring in the late 1890's. Loring stated that these slaughters occurred in winters of deep snow when the Indians utilized their hunting technique known as "crusting."[13] In winters of deep snows when temperatures fluctuate widely snow melts and refreezes causing crusts to be formed at different levels throughout the depth of the drifts. This crusting effect causes undue difficulties for the ungulates as it makes much food unavailable and creates problems in movement. Wapiti are easily stuck in this crusted snow and the Indians took advantage of this phenomena during their winter hunting periods.

As European induced settlement advanced northwesterly across the prairies the available wapiti range retracted westward into the foothills and adjacent mountain valleys. The secluded mountain valleys of the east slope became the refuge for the remnants of the once vast herds which roamed the lower elevations to the east. When the Royal Canadian Mounted Police first established Fort MacLeod in 1872, elk were noted as frequenting the adjacent foothills and mountains with the Porcupine Hills lying northwest of the Fort being their favorite haunt. Thousands of cast-off

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[12]Henry, *op. cit.*

[13]Preble, op. cit.

antlers were noticed in the foothills of south-western Alberta and numerous large bands of wapiti were noted by the early Royal Canadian Mounted Police officers. By 1900 however this species was a very scarce inhabitant of the foothills area south of the South Saskatchewan River.[14]

Although early explorers and traders noted extensive herds throughout much of Alberta and today the wapiti is one of the prime big-game animals of the foothills region of the province the status of this species has not always been so sound. During the 1890's the vast herds of wapiti were drastically reduced. Around the turn of the century, it appeared that the wapiti population of Alberta like that of much of North America was on the verge of extinction. Alberta's remnant population sought refuge in scattered valley locations along the east slope of the Rocky Mountains between the headwaters of the Colorado River in Colorado and the Brazeau River in Alberta. Major refugia for Alberta wapiti were the headwaters of the Oldman, the Highwood and the Brazeau Rivers, and central sectors of the Cypress Hills, the Cooking Lake Moraine and the Frog Lake Moraine. Small bands in these refuge areas were noted by several authors between 1890 and 1910. In a report to the Commission of Game in 1916 Millar noted that the wapiti as a big-game trophy species was second only to the bighorn sheep. He stated that this valuable species had the lowest population of any of the big-game animals of the Eastern Slope. It appears that its extinction had been averted.[15] From the mid-1890's to about 1950 in all but a vew very local areas, the sighting of wapiti was recorded and felt to be a noteworthy entry in any diary or fieldbook.

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[14]Denny, Sir C., 1905, op. cit.

[15]Millar, W. N., 1916, "Proc. Committee on Fisheries, Game and Fur-bearing Animals, 1915,"C. of C. Can., Queen's Printer, pp. 100-124.

Several factors caused the decimation of wapiti to the point of what seemed to be virtual extermination of this species. Not singular or unique factors but a series or combination of factors appear to be associated with the decimation of Alberta's wapiti populations near the turn of the present century. Factors which have been brought forward as influential causes in this extermination are; severe winters, excessive hunting, widespread fires, encroachment of the range by settlers, and disease.[16] Although these factors are most apparent in consideration of the wapiti population they are involved with the historical distribution and ranges of other members of the Cervidae as well and will be discussed further in a later chapter.

The North American wapiti has an almost unexcelled record of former abundance associated with an exceptional population low threatening extinction. This ebb in population was followed by a subsequent rise in population to what today seems to be maximum population size in most range areas. Although the wapiti is a large, herbivorous ungulate which does not normally undergo the rapid population fluctuations common in the populations of many smaller, faster reproducing animals, the pattern of population abundance followed by extreme paucity subsequently followed by a population of relative abundance in local areas has taken place within the past eighty to eighty-five years.

During the first decade of the twentieth century Alberta's wapiti populations reached their lowest ebb since initial European contact some two centuries earlier. Due to this threateningly low ebb in the population

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[16]Stelfox, 1964, "Elk in N.W. Alberta," in Lands, Forest and Wildlife, Vol. 6, No. 5, Dept. L & F, Govt. of Alberta, Edmonton, pp. 14-23.

many people became aware that the wapiti faced extinction unless protective measures were taken. The lesson learned by them from the virtual extinction of the bison as a wild game animal has been brought home to the general public and was understood by them as it was by several government personnel. The wapiti is present today as one of Alberta's big-game species because protection was afforded them by the National and Provincial Governments through protection, transplantation and re-introduction of individuals. The 1907 estimate of 1,000 wapiti in Alberta indicated that the majority of the remnant populations were in four localities, namely; the upper portions of the Brazeau, Highwood and Old Man river basins and in the Cooking Lake Moraine area.[17] In 1907 the Provincial Government enacted a law which completely closed the hunting season on wapiti for the ensuing three years. By 1913 it was noticeable, in local areas along the eastern mountain slope, that the wapiti populations were steadily increasing. The nuclei of these increasing populations were the National Park herds.[18]

The National Parks lying along the east slope at Waterton, Banff and Jasper, set aside in 1897, 1885 and 1907 respectively, became havens for the remnants of wapiti herds. Elk Island National Park, today a seventy-five mile area within the Cooking Lake Moraine area, was originally a sixteen square mile preserve created in 1906 specifically for the conservation of wapiti. This preserve became a National Park in 1921. Shortly after 1900 five wapiti were secured from the Riding Mountain area in Manitoba and placed in a paddock in Banff. In 1915 a herd of wapiti numbering approximately 200 animals was noted near Turret Mountain

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[17] Webb, R., 1959, op. cit.

[18] Stelfox, J. G., 1964 a) op. cit.

in Waterton.[19] This herd was seen several times and its population and location were found to be relatively constant during the next few years. Members of the Geological Survey Team of 1915 and 1916 headed by D. A. Nichols saw bands of ten to twenty-five animals in the vicinity of the headwaters of the Palliser, Spray, Elk and Kananaskis Rivers south of Banff.[20] An absolute closed season on wapiti was maintained for several years and new Game Preserves such as the Carbondale and the Pembina-Brazeau were established adjacent to Park boundaries.

Perhaps the real impetus to the wapiti population increase in Alberta came about, in 1917 and 1918 when large scale re-introduction of the species took place. These transplanted wapiti were brought from Yellowstone National Park in Montana. Between 1917 and 1920 over five hundred wapiti from Yellowstone were shipped to Alberta and released in the three mountain parks. Arrangements between government personnel of the United States and Canada concerning the trade of skins of several Canadian mountain ungulates to the American National Museum in return for the live wapiti were made in 1916. Overutilization of range because of overpopulation caused a crisis in Yellowstone, and Canada's mountain parks got far more wapiti than were originally agreed upon. During the extensive summer drought period of 1917 in Yellowstone 58 wapiti were shipped to Waterton and 57 to Banff. In 1918, 41 animals, which were shipped from Yellowstone were released in Banff near the headwaters of the Brazeau River. Excessively deep snows during the winter of 1919-1920 caused another population crisis in Yellowstone and approximately 350 wapiti were shipped to Alberta resulting in 215 released at Bannf and 85

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[19]Soper, J. D., 1947, <u>op. cit.</u> [20]<u>Ibid.</u>

at Jasper.[21] These releases in addition to later transplants made from within the province itself form the basis of Alberta's present wapiti herds. The province's wapiti are no doubt progeny of a population created by the admixture between the indigenous stock making up the remnant populations in the mountain valleys and the transplanted individuals.

The Provincial Preserves as well as the National Parks acted as wapiti havens of safety and the subsequent population overflow colonized the adjacent foothills area to the east. The 1924 population estimate was 1,200. The increase since that time has been relatively unsteady thus making an actual census difficult. By the early 1930's the overflow from Jasper, Banff, Waterton and Elk Island was populating the adjacent provincial lands and wapiti were definitely re-invading some of their former mountain valley, foothill and river valley haunts. By the mid-1930's several feeding grounds in southern Alberta and Banff were thought to show overgrazing by wapiti.

In 1933 the first wapiti season under provincial regulations was opened in Alberta with the licensee being allowed one male elk with a 10-point-or-over head in the south-western part of the province.* In 1940 a new regulation was enacted, allowing licensees an 8-point-or-over head. The annual Banff Park slaughter of 500-600 animals commenced in 1944 due to the threat of a population crisis caused by the excessive overgrazing in parts of the Bow Valley. The first province-wide wapiti season came into effect in 1949 and hunter kill has averaged between 2,500 to 3,500 animals per annum since that time.

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[21]Banfield, A. W. F., 1958, op. cit.

*points may be defined as the number of tines per rack or antler pair.

The northward and eastward migratory trend set by the established Park herds has continued throughout the past twenty years. The population movement which was initiated as an "overflow safety valve" caused the population to move outward from the various high density nucleus areas into adjacent areas of favourable habitat. Natural population increases and population migratory tendencies since 1910 cause the present distribution pattern of wapiti in Alberta. There are five general areas in Alberta which may be examined individually for the role they held in the re-population of this province by wapiti. The five areas are the North-western foothills area, the North-eastern or Frog Lake Moraine region, the Cooking Lake Moraine area, and South-eastern or Cypress Hills outlier area and the South-western foothills.

The North-western nucleus area for the wapiti lies in Banff and Jasper National Parks and the adjacent provincial lands. In 1944 Soper noted a herd between the headwaters of the Wapiti River and its confluence with the Narraway. This was the first record of wapiti north of 53°30' since the late 1880's.[22] In this same report Soper noted a relatively large number of wapiti scattered all along the eastern slope from Waterton (49°00' North latitude) to Torrens Mountain (53°30' North latitude). By the mid 1940's wapiti were frequent and locally abundant from Waterton northward into Jasper. Jasper wapiti, due to latitudinal influence, were more inclined to frequent the lower elevations and populations were concentrated more in the mountain valleys of this area than they were in the more southern parks. Elk were encountered frequently in the mountain valleys and foothills east of the three mountain parks and were particularly

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[22]Soper, 1947, op. cit.

plentiful in the area drained by the Nordegg, Brazeau and Pembina Rivers during the 1940's.[23]

In a 1956 report on northern Alberta's wildlife populations J. G. Stelfox says "Elk remain scarce in the north but there is a general migratory trend northward. They are reported as far north as Beaverlodge and have been seen crossing the highway near DeBolt. They are found along the Athabasca River and its tributaries between Entrance and Whitecourt and south of Grande Prairie in the vicinity of Simonette, Cutbank and Narraway Rivers."[24]

By the mid 1950's wapiti were scattered throughout the area around Edson and were found well east of the MacLeod-Athabasca confluence. In 1952 a transplant of 27 elk was made west of Whitecourt and by 1955 the introduced population had met with members of the indigenous population migrating eastward along the Athabasca River. By 1962 the combined population had moved along the river as far east as Fort Assiniboine. In 1960 wapiti were noted north of the confluence of the Wapiti and Big Smoky Rivers. By 1965 wapiti were found along the Peace River from the Alberta-British Columbia border almost as far as the confluence of it, to the Smoky River drainage basin and northeast of the Little Smoky River to Cadotte Lake, At this time they were found along the major water-courses in the Swan Hills but, were not as yet known to be as far north as Lesser Slave Lake. Wapiti have been frequently in the Pembina River as far northeast as the Evansburg, Entwistle area since late 1964.[25] Within

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[23]<u>Ibid</u>.

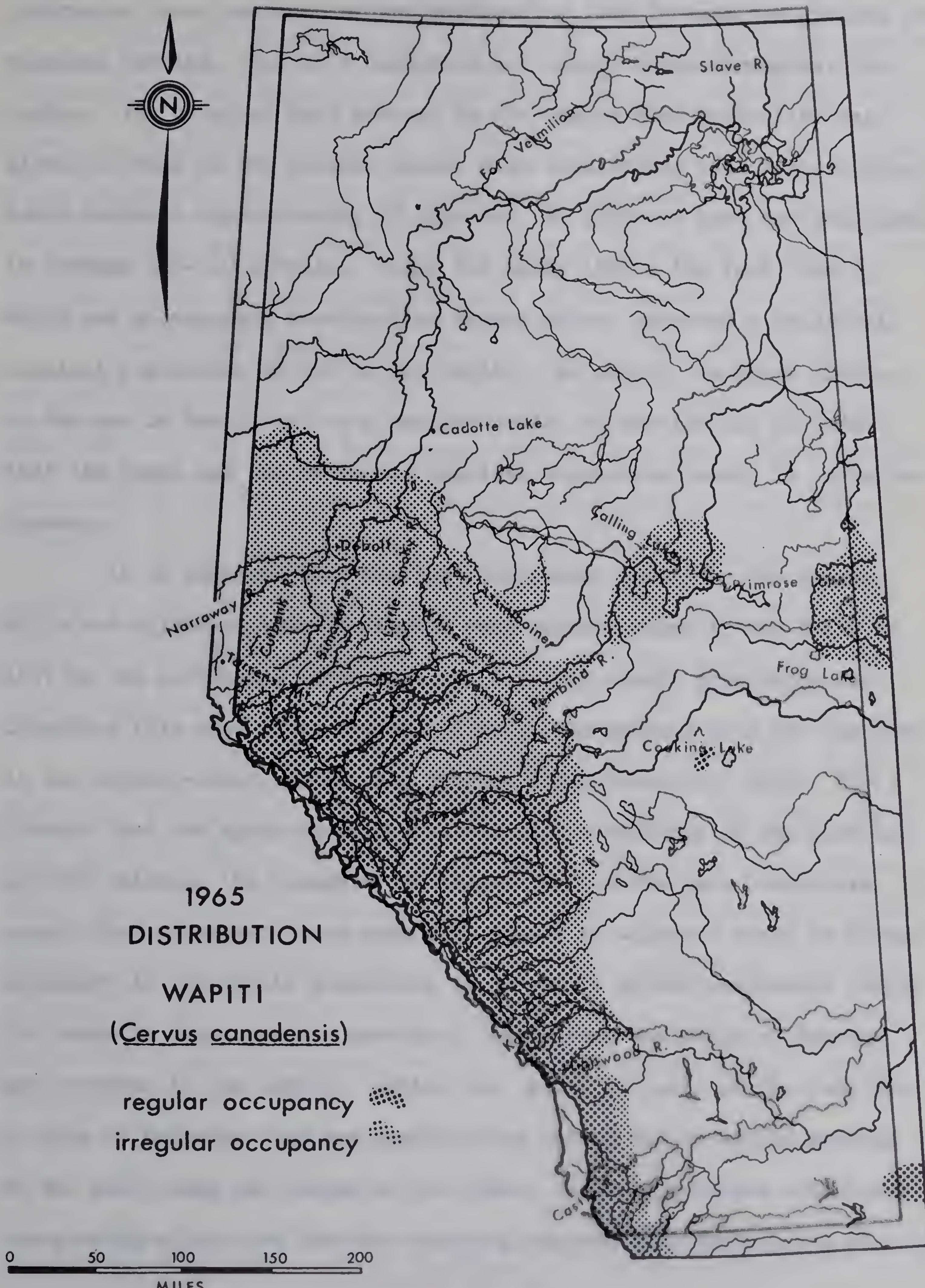
[24]Stelfox, J. C., 1956, "Progress Report," Prov. Govt., Dept. of Lands and Forests, unpublished F. & W. report, p. 4.

[25]Stelfox, J. G., 1964a, <u>op</u>. <u>cit</u>.

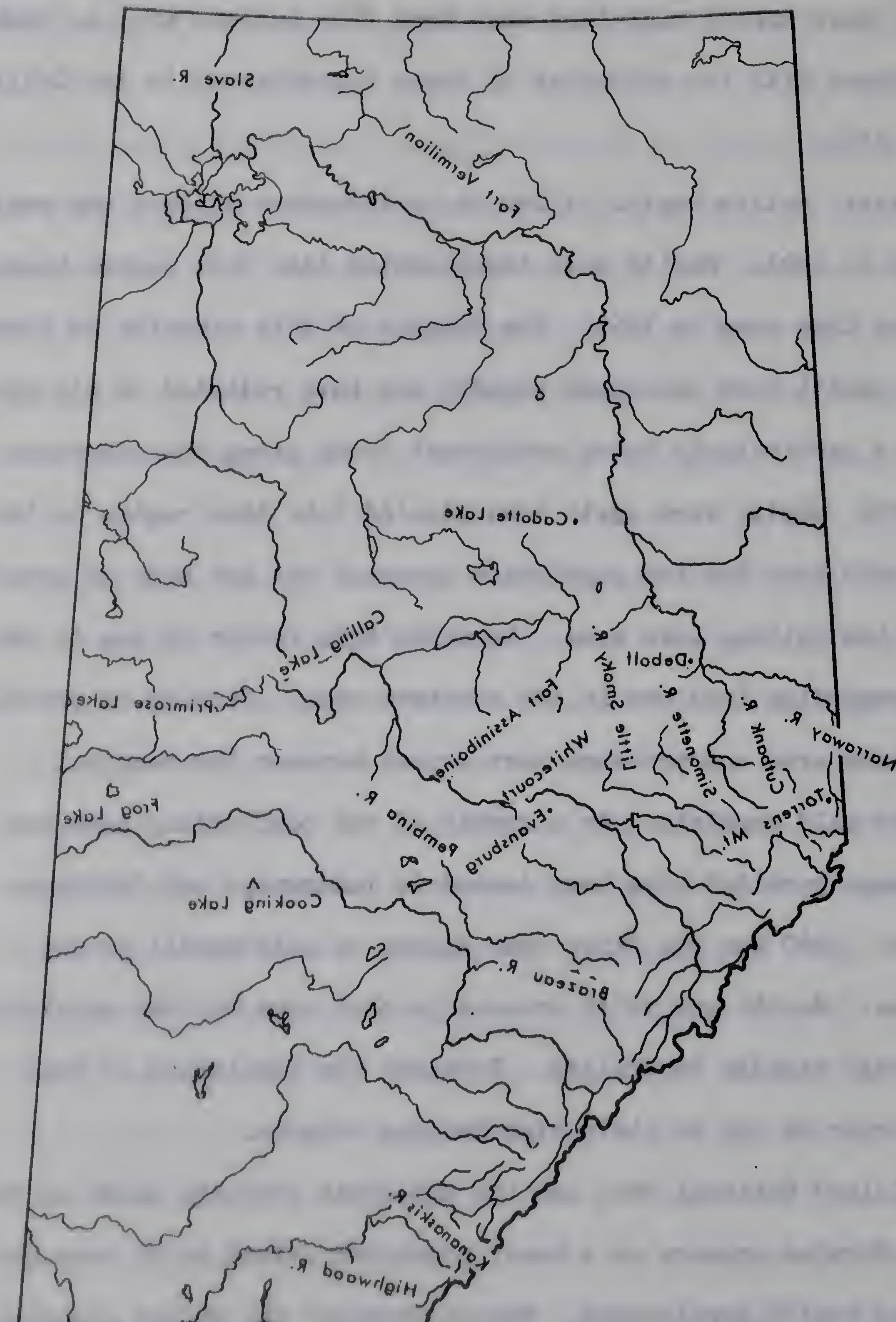
the next few years wapiti migrating east from this nucleus will no doubt come into contact with the offspring of those transplanted in the Calling Lake area in 1953.

The last native wapiti killed in northeastern Alberta was west of Primrose Lake in 1921. Wapiti were transplanted into this region known as the Calling Lake area in 1953. The habitat of this vicinity is favourable and the wapiti have increased rapidly and have radiated in all directions with a particularly heavy south-west trend along the Athabasca River. In 1956 wapiti were again transplanted into this region in the vicinity of Cold Lake but the population increase has not been as great as it was in the Calling Lake area. No doubt this factor is due to the competition regarding land use in the southern area. Farming is practised in the Cold Lake area and problems have arisen between the marginal farmer and the wild ungulate. As a result of the conflicting land use problems "damage permits" have been issued to landowners and "nuisance elk" are shot. 1960 was the first open season on male wapiti in the Cold Lake area. Wapiti are still present in this area but the population has been fairly rigidly controlled. Probably the population of this region will never be one to yield high hunting returns.

Elk Island National Park and the immediate vicinity known as the Cooking Lake Moraine appears as a heavy populated island in an area generally lacking wapiti populations. Wapiti frequent the entire morainic area but are particularly prevalent in the area south of Elk Island National Park. As aforementioned this part was specifically set aside in 1906 for the conservation of wapiti. The landscape area is one of a stagnant dead-ice moraine and thus well suited to the needs of wapiti within the Parkland. The Park area is sufficient to support a relatively high population of



OVERLAY 4
FIGURE 9


Slave R.
Fort Vermilion
Cadotte Lake
Calling Lake
Primrose Lake
Frog Lake
Cooking Lake
Fort Assiniboine
Whitecourt
Little Smoky R.
Debolt
Simonette R.
Cutbank R.
Narraway R.
Torrens Mt.
Pembina R.
Evansburg
Brazeau R.
Kananaskis R.
Highwood R.
Castle R.

OVERLAY 4

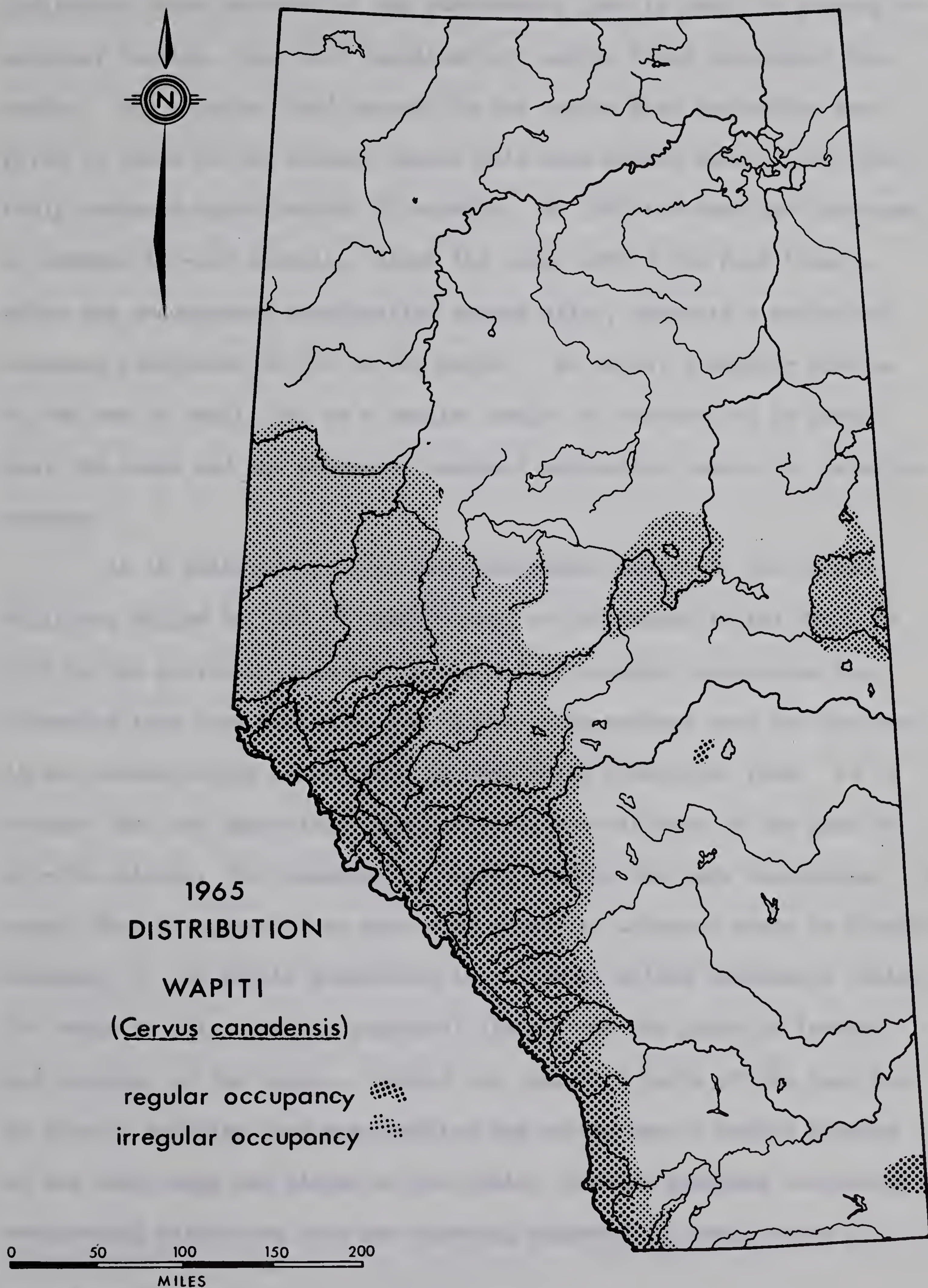

1965
DISTRIBUTION
WAPITI
(Cervus canadensis)
regular occupancy
irregular occupancy
0 50 100 150 200
MILES

FIGURE 9

indigenous fauna and much of the surrounding land is used for grazing or marginal farming, thus wild ungulates are easily found throughout the region. The original herd present in the region when protection was given to those in the sixteen square mile area around Lake Astotin probably numbered approximately 50 animals. By 1920 the herd had increased to between 100-110 animals. Since the early 1950's the Park itself, which now encompasses seventy-five square miles, supports a relatively constant population of 500 to 600 wapiti. An annual slaughter similar to the one in Banff, but on a smaller scale, is carried out in order that the range and the protected ungulate population remain in relative harmony.

It is believed that the last indigenous wapiti in the Cypress Hills was killed in 1909.[26] Wapiti were re-introduced to the Hills in 1927 by the provincial government and a fairly static population has inhabited this area since the mid-1940's. The nucleus area for the herd is the seventy-eight square mile Cypress Hills Provincial Park. It is thought that the approximate population in the vicinity of the park is 125-150 animals. No slaughter is allowed within the park boundaries. An annual Park slaughter or an open fall season in adjacent areas is thought necessary if the wapiti population is to remain within reasonable limits for range in this area and practical limits from the point of farmers and stockmen in the region. Cattle are grazed in parts of the park but to date no definite land-use conflict has arisen due to wapiti grazing on the bench area and slopes of the Hills. However problems concerning overgrazing within the Park are becoming apparent and small herds of

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[26]Soper, J. D., 1964, op. cit

wapiti are wintering on ranchlands outside the Hills.[27]

The wapiti population in southwestern Alberta was never completely eliminated and the Highwood and Oldman River populations were two of the remnant populations noted in the initial 1907 census. These two nucleate populations plus the native and transplanted Waterton herds and migrants from southeast British Columbia, which came in during the first two decades of this century, were the progenitors of today's herds in this region.

The Torrens Mountain herd was no doubt a remnant herd just as were the herds in the headwaters of the Brazeau and Oldman. Wapiti were first noted in the Castle River area north of Waterton in 1927 and were first seen in the Tod Creek area, midway between Waterton and Highwood, in 1943.[28] It is well known that wapiti formerly frequented much of the foothills area east of the Livingstone and Highwood Ranges but during the 1930's and 1940's they did not frequent the area east of the trough of the Highwood range.[29]

In 1954 the Carbondale Game Preserve was abolished as it was felt that the animals could "hold their own" in this area. The first Alberta open season on females was held in the South Castle area that same year.[30] Today wapiti frequent the mountains and foothills of southwestern Alberta and are occasionally found along the major river valleys well out into the parkland area. Wapiti food habits have been of concern to livestock men in this region particularly during the past several years. It is felt

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[27]Dickinson, D., personal communication.

[28]Morden, J. and Skella, J., personal communication.

[29]Fowler, R. L., 1937, "Changes in the Natural History of the High River District, Alberta," Can. Field Nat'l., 51(2) pp. 15-16.

[30]Webb, R., 1959, op. cit.

by many private land-owners that wapiti are actually jeopardizing the ranching industry.[31] It is perhaps in this southwestern sector of the province where the wapiti are ecologically "very well off" that the strongest land-use conflict arises between man's domesticates and the indigenous wild ungulates. The wapiti herds in this sector of the province are substantial in size and the annual increment is relatively high. Hunters have not been effectively cropping the wapiti of this region. Numerous reasons are responsible for the lack of cropping and several aspects of the ecology of faunal components in the region are associated with this particular wild ungulate versus man conflict. The wapiti of this area follow an annual migration pattern. If the fall snow is late the wapiti do not come downslope early enough to succumb to any heavy hunting pressure. Lack of hunter enthusiasm concerning "elk hunting" accounts for the lack of effective cropping. Wapiti in this region as well as in other sectors of Alberta are definitely a harvestable crop which are not being utilized to the fullest extent.[32]

The wapiti was an important faunal component of the Alberta scene during pre-historic times. After suffering a drastic drop in the wake of European induced exploration and settlement the population has revived with almost phenomenal rapidity. Formerly the highest wapiti populations prevailed in the Parkland and Foothills regions, but, today since the greater part of parklands has been taken over by man and his associated works the elk tend to range in the mountains and adjacent foothills to the west and north of their former haunts.

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[31] Cross, J., personal communication.

[32] Stelfox, J. G., personal communication.

The wapiti as one of Alberta's prized big-game species has a relatively certain future within the province providing management of the habitat is enacted to some degree so that suitable environment is allowed this species. The "elk problem" of today is not one of possible extinction such as Preble wrote of in 1911, but, rather one of particular local areas of over-population. Over-population causes self-inflicting hardships on the animals themselves and any upset caused by these aspects needs time for re-adjustment before any normal population numbers can again be maintained in the same area.

In order to eliminate the possibility of wide fluctuation in numbers caused by over-population the excess animals should be hunted. Through survey work, wildlife biologists realize the huntable quota and hunting seasons and regulations may be set accordingly. Present day census methods were devised in the early 1950's under the auspices of G. J. Mitchell, Alberta's first wildlife biologist. Annual counts have been taken since this time. In 1952 and 1953 Mitchell carried out browse surveys in southern Alberta. Since 1954 both aerial surveys and checking station hunter-kill data have been collected and utilized in elk population counts and associated research work. During the past several years wild-life investigation reports written by provincial wildlife biologists note the constant eastward and northward movement of our wapiti populations and subsequent re-population of former ranges.[33]

The re-invasion of ancient range by wapiti is causing some problems in land-use conflict because man it utilizing some of these areas for agriculture purposes. The private landowner or the holder of a stock

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[33]Webb, R., 1959, op. cit.

grazing lease often comes into conflict with this species when concerned with either or both summer or winter forage for his livestock. Permits to kill "nuisance elk" and forage protection techniques are utilized but these are not the final answer as wapiti continue to mauraud the marginal agricultural areas.

The management of big-game populations is constantly progressing and a better understanding of the problems concerning these populations is emerging. The decimation and subsequent revival of wapiti in Alberta is a highly interesting phase of Alberta's big-game picture and the dramatic return of this species to former haunts leads one to believe the status of wapiti as a game animal will remain as is or rise in the future.[34] The wapiti is not an exotic species, it is an indigenous species which offers challenge to the hunters who appreciate the chase and the sport of the kill itself, or, to the general public who appreciate the opportunity to see a large ungulate roaming freely within its natural habitat.

There are approximately 30,000 wapiti outside the National Parks in Alberta thus allowing 5,000 to 7,500 sportsmen to be successful annually. Man has claimed much of the natural range of the wapiti for his own use, has changed much of the remaining environment and at the same time has removed their major predators, the wolf and the plains grizzly. Under such conditions one cannot expect the wapiti population to maintain equilibrium in accordance with our wishes in reference to their population size and range or distribution. Through management man must create and maintain an equilibrium balancing the native wapiti populations with his

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[34]Stelfox, J. G., and Mitchell, G. J., personal communication.

agricultural land-use practices, but, on the other hand he must not eliminate one side of the balance-scale for the sake of the other.

CHAPTER 6

DISTRIBUTION AND RANGE OF MOOSE IN ALBERTA

The largest and one of the most widely dispersed members of the Cervidae in Canada is the North American Moose, a major faunal component of the Boreal Forest biome. The genus Alces is Holarctic in distribution. This species has close ancestral affiliation with the European elk, but, the early explorers from France and England were not familiar with the elk of the Scandinavian forests and thus did not recognize it. The French voyageurs called this mysterious forest animal, "l'original," a name derived from the word Orenac meaning deer in the Basque language. The word Moose is the English translation of Mooswa, which means twig eater, from the Algonquian language of the Cree and Ojibwa Indian tribes of Eastern Canada.[1]

The North American Moose is the largest living member of the Family Cervidae and is the most widely distributed member of the genus Alces. The moose, is a large dark animal, rather ungainly in gait and appearance. The average mature bull of this species is between 1,000 and 1,200 pounds while cows average about three-quarters of this size. The head, back and flanks of the adult moose are normally very dark brown to black in colour blending to a lighter shade of brown to gray on the legs and belly. The long, somewhat horse-like head of the moose, with its characteristic pendulous upper lip and wide nostrils, is borne on a relatively short, thick, muscular neck. The short back of the moose slopes downwards from the humped front shoulders to the narrower hind-

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[1]Seton, E. T., 1929, Lives of Game Animals, Vol. 3, Parts 1 and 2, Doubleday, Page & Co., N.Y.

quarters. The long body hair on the shoulder hump and along the back is erectile.

Perhaps the most characteristic body feature of the moose is the presence of the bell or dewlap, a pendulum-like growth of skin covered by long hairs, which hangs from the neck at the base of the head. No particular function has yet been attributed to this curious skin structure which all moose possess. It appears that the bell decreases in size as the individual moose ages. Moose have long, loosely jointed legs which enable the animal to travel lengthy distances in a long-paced, swinging lope. Somewhat spreading hooves and long legs enable the animal to easily negotiate wet muskeg areas in summer and deep snow cover in winter. The moose is an able and strong swimmer as well as an excellent long-distance runner.

The most distinctive feature of the bull moose is the large, palmate antlers which are in prime condition during the fall and are shed after each breeding season. The palmate antlers which are slightly concave and spread sideways and backwards from the head show a characteristic notched or scalloped border of small spikes. Young bulls develop spike antlers during their first two years of life. The characteristic palmate antlers are developed in the bull's third year and reach their greatest proportions during its prime years between ages seven to nine. The antlers become flatter and more palmate as the animals age until in senility the outer edges are merely scalloped. Although the eyesight of the moose is discredited as being relatively poor, the senses of smell and hearing are very acute. The large nostrils and ears of the moose are far from being useless body appendages.

Moose are not migratory animals of a gregarious nature nor do they have a herd organization such as wapiti and caribou. They tend to be solitary animals and individuals act independently throughout much of their lives. The moose is the least gregarious of the North American Cervids and generally has no herd groupings except in winter yard areas during periods of deep snow when a few adults and several immature individuals may occupy the same yard. Moose tend to remain in a particular yard area as long as browse species are available, with willow being the species of their major concern. When the browse is consumed in one yard the group of individuals may move into another yard area as a unit or may break up and unite with animals in other yards.

Once a critical winter period is over and vegetation commences its spring growth the moose scatter throughout the forest area favoring areas of seral forest growth, pond and shallow lake edges. Calves, normally one per cow, are usually born in early June. Moose calves are not spotted, as are the young of deer and wapiti, but have a dull reddish-brown coat which is lost about three months after birth when they attain coloration similar to the adult moose. The young usually remain with the cows throughout their second summer if she bears no calf in spring and may follow the cows throughout the summer even if another calf was born. Late September through early October is the rutting season of the Alberta moose. The bull moose is the most monogamous of the male Cervidae; he collects no harems and may remain with the same cow for a week to ten days during this period.

The moose is primarily a browser with aquatic plants supplementing the diet during the spring and fall periods. The specialized food habits

of this species cause it to be confined to or to favour particular types of habitat. The shrubs of seral growth stages of a coniferous forest present the best habitat conditions for moose. Forest fires and logging are two major factors in creating and maintaining favourable environment. During the summer moose consume aquatic and some herbaceous vegetation as well as browse, but, during the critical winter period moose rely solely on browse and therefore must live where the required or favoured browse species are available. Willow twigs and leaves are the year round mainstay. Other favoured foods include numerous aquatic plants such as mare's-tail and Potamogetons, twigs and the leaves of both aspen and balsam poplar and those of alder, birch, and willows. The moose is an animal of relatively specialized food habits and it is partly because of this factor that the individuals of this species tend to lead solitary lives. The body structure of the moose enables it to browse vegetation at relatively high levels and to consume aquatic plants with relative ease, but at the same time causes grazing to be difficult. In order to graze the moose must either spread his front legs apart or kneel down as does the giraffe. Browse plants, for the most part, are perennial shrubs, thus overbrowsing creates serious problems for future growth and associated plant productivity. The solitary lifeways of the moose serve to lessen the problems posed by over-browsing and eliminate the consequences of severe mass starvation unless a definite concentration or overpopulation in any one area occurs.

Through time moose tend to follow food sources or move into areas of suitable habitat but they do not appear to follow any regular migratory pattern of either a season or diurnal rhythm or of any dietary requirements. Solitary moose have been sighted well out of their normal

range. Moose may follow major water courses out into the parkland, prairie or tundra as they browse along stream banks and wade in shallow quiet water areas seeking aquatic vegetation.[2] This seemingly erractic movement by moose was called "drift" by Seton in 1929.[3] It appears that this pattern, that of movement by individuals to areas of suitable habitat through time, may be the pattern which moose have followed in their post-Pleistocene redistribution period in North America.

As is well known, Alberta was ice covered during the Wisconsin Period in the later part of the Pleistocene Epoch. During the period of maximum glaciation the ancestors of the Alberta species of North American moose inhabited two forest areas bordering the southern extremity of the continental ice sheet and the forest of unglaciated central Alaska. One southern forest area was situated along the eastern slopes of the Rockies south of Alberta, while the second was located south-west of present day Lake Michigan. Due to the pattern of glacial ice retreat in western Canada and subsequent post-Pleistocene habitats this large, rugged ungulate, moose, came into Alberta from three different directions, from the north-west from the south and from the east as shown in Figure 10. When the Continental Ice Sheet of the Wisconsin period retreated moose, whose ancestors sought refuge in the forested area south-west of the Great Lakes, migrated north-west as their forest habitat spread and therefore came into the boreal forest region of Alberta through north and central Saskatchewan. The Cordilleran Ice Sheet which lay over the Canadian Rocky Mountains did not recede as rapidly as did its continental counterpart lying over

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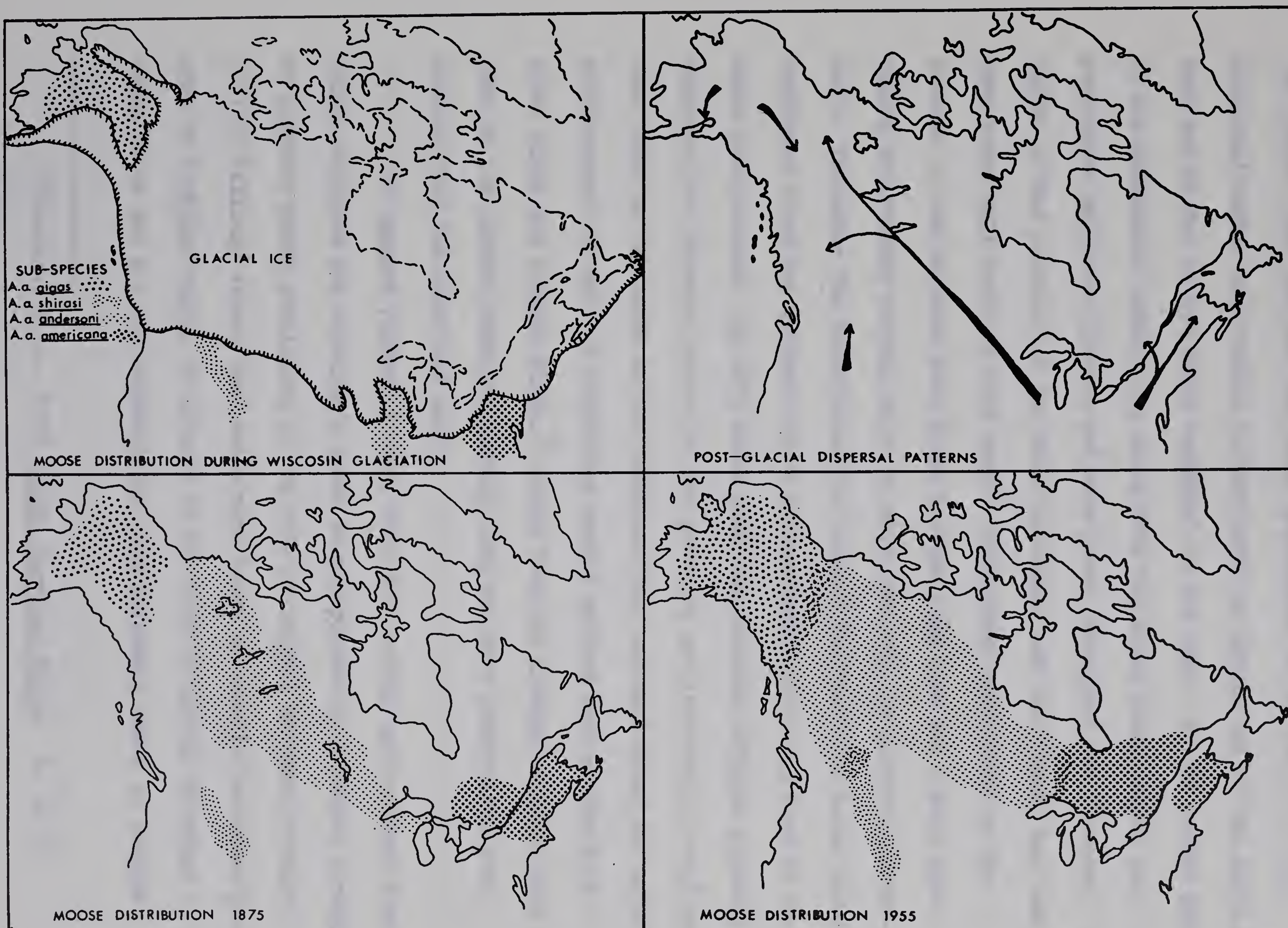
[2]Skov, personal communication.

[3]Seton, E. T., op. cit.

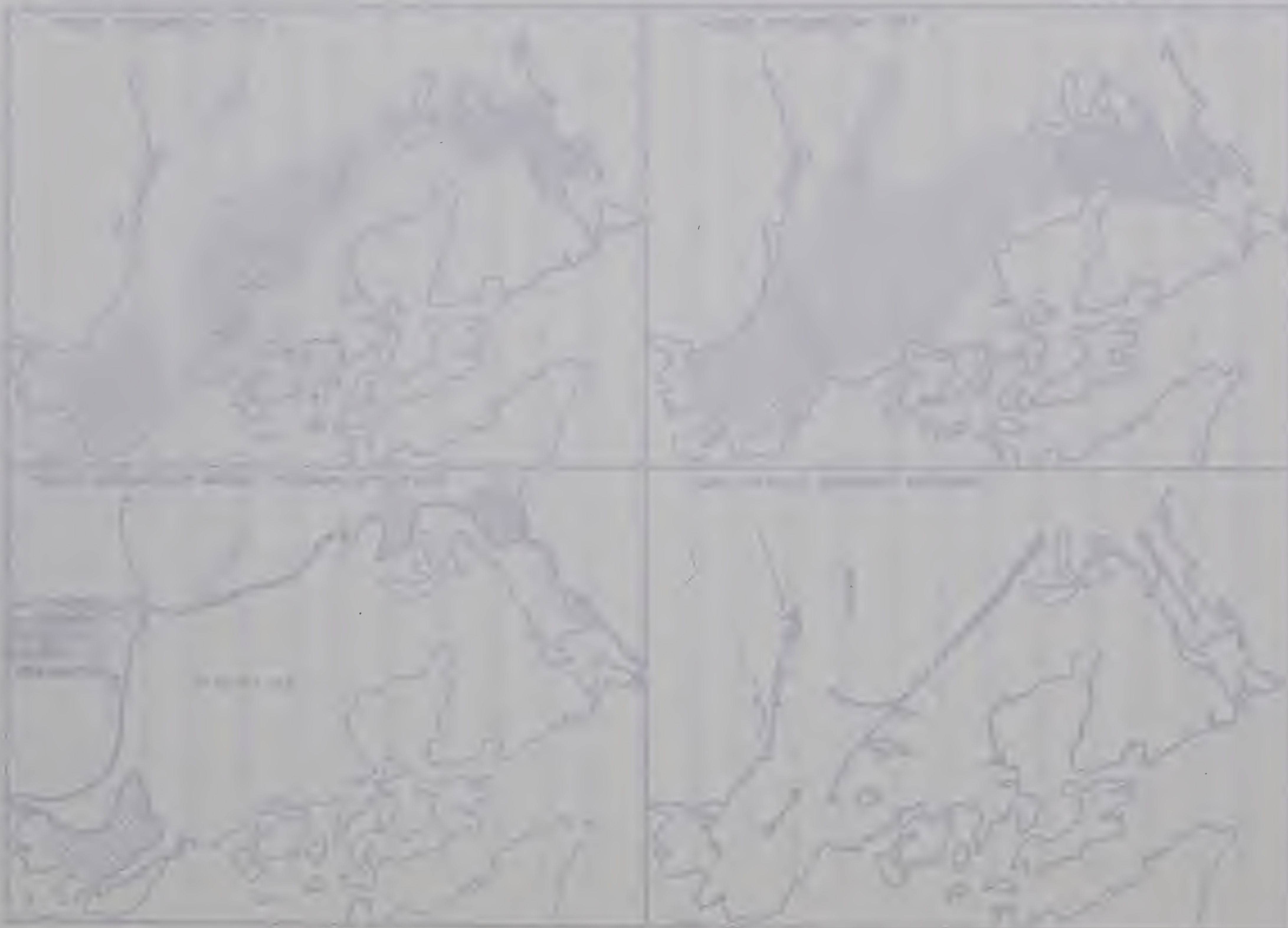


ADAPTED FROM PETERSON, 1955

FIGURE 10

POST-PLEISTOCENE MOOSE DISPERSAL IN NEOARCTIC

FIGURE 10



the Great Plains and thus the moose population to the south of this glaciated region were unable to move north or spread out to the north as fast nor as far as did their "cousins" to the east. By the latter half of the nineteenth century the moose from the Great Lakes region had penetrated well into Alberta and were found throughout the forested region of the province as far south as Jasper and individuals may have been noted well south of this area.[4] The refuge population in the forests of the southern East Slope has had less time and a much more rugged environment through which to move than did its eastern counterpart. Following the Cordilleran Ice retreat the foothills moose moved northward along the eastern slopes and probably east along some of the major watercourses. By 1815 moose from the southern refugium probably inhabited the Waterton sector of the province and individuals could have been found as far north as the Crowsnest Pass and east along the major watercourses, as well as inhabiting wooded sectors such as the Milk River Ridge and Cypress Hills.[5] Moose from the Alaskan refugium have come on the Alberta scene relatively late and have inter-mixed with animals from the south and east.

It appears plausible then, that the central and southern foothills, outliers and sub-alpine areas were populated by a rather irregular or sporadic moose populatinn at the time of initial European contact. In 1937 Halliday stated that moose were known to inhabit the aspen grove area or Parkland region of Alberta at the time of initial European exploration but all the evidence for this statement tends to include

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[4]Peterson, R. L., 1955, North American Moose. U. of T.

[5]Ibid.

only the northern edge of the Parkland area adjacent to the Boreal or Mixedwood Forest. Moose, no doubt, inhabited the Cypress Hills prior to the influx of European exploration and settlement, as the coniferous vegetation of these hills is the natural habitat of this species. Moose present in the Cypress Hills, the Milk River Ridge and the central portion of the eastern slope from the Banff-Jasper area to the Castle-Carbondale area were the latest arrivals of their species on the Alberta scene and thus were probably a relatively unstable and highly scattered population when Europeans first came in to contact with them. From the above notes one may conclude that the moose has always been associated with the forest and that its population was in the throes of post-Pleistocene re-distribution and therefore not stable during the period of early European explorations.

Numerous authors, particularly of the early phases of exploration in Alberta, differ in their presentation of data concerning moose populations. Authors of historical texts written often disagree on the status of moose in particular areas of the province during the exploration and the subsequent settlement period. Numerous writers never mention that moose inhabited the Cypress Hills or Milk River Ridge. Several writers attribute the lack of moose south of the 54° parallel to epizootic caused depletions as well as man induced slaughters. Some other authors deny moose suffered heavy population depletions near the end of the nineteenth century.[6] Taking the post-Pleistocene re-distribution factor into account one may review some of the historical records concerned with the moose populations of Alberta during the past two centuries.

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[6]Webb, R., 1966, op. cit.

At the time of initial European contact the moose inhabited the greater portion of forested Alberta and individuals may have penetrated well into the Parkland and Prairie areas occupying suitable habitats along the edges of major watercourses. According to records handed down during the past two centuries moose were utilized by the Indians of much of forested Alberta and was the staple food and clothing of these people at the time of European contact in the north-west.

Samuel Hearne recorded moose along the Slave River in 1771 while on his Churchill to Coppermine expedition.[7] During his 1792-93 expedition from Lake Athabasca to the Pacific Coast Alexander MacKenzie sighted numerous moose along the edges of the Peace River.[8] Moose was the staple diet of David Thompson's winter camp at Lac La Biche in 1798.[9]

During his 1800-1816 sojourn in "Indian Country," as he called what is now central Alberta, Daniel Harmon noted numerous moose. Harmon, during his journeys, noted that numerous Indian tribes, in what is now northern Alberta, used moose hide extensively in clothing and moose meat was a staple in their diet.[10] In 1841 moose tracks were noted at Simpson Pass in the Banff area. During a hunting trip between Lac Brule and Smoky River in 1855 Moberly saw numerous moose. In the five year period 1855-1860, when Moberly was in the Smoky River-Jasper House area, he saw many moose and stated that they appeared to be quite plentiful in the region.[11]

In the Palliser Expedition reports of 1858-60 Dr. Hector recorded that moose were seen in the Kananaskis Valley and throughout the Bow

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[7]Preble, E. A., op. cit.

[8]MacKenzie, A., op. cit.

[9]Thompson, 1916, Narrative of his exploration in Western America, 1784-1812, Toronto.

[10]Harmon, D. W., op. cit.

[11]Preble, E. A., op. cit.

Valley.[12] During a hunting trip in 1859 the Earl of Southesk killed three moose in the vicinity of Lake Louise.[13] Lockhart reported that moose were relatively common throughout his 1865 journey along the Peace and Slave Rivers.[14] In 1882 MacCoun noted that moose were present in the Milk River Ridge and Cypress Hills areas as well as in the northern and western forests of Alberta but that within the previous four years they had suffered population depletions everywhere except in the Peace River region where they still formed the staff of life for a great percentage of the natives and company personnel.[15] During the winter of his 1895-96 journeys in the vicinity of the headwaters of the MacLeod River and between the Smoky River and Jasper House Loring reported that he saw numerous individuals and many tracks.[16]

Preble noted in 1908 that moose were found throughout the Athabasca-MacKenzie region.[17] He recorded having seen individuals at Boiler Rapids, Poplar Point and Smith Landing in Alberta.[18] In his 1913 survey Soper noted high moose populations from the Wildhay River to the headwaters of the Clearwater.[19]

When Millar gave his report on Big-game of the eastern slope to the Commission on Conservation of Fur and Game in 1916 he stated that the moose was not a major faunal component of the eastern-slope but was an animal more of the northern or boreal forest and foothills. Millar said that moose were present in the eastern slope region in the forest area

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[12] Hector, Sir J., _op. cit._

[13] Banfield, A. W. F., 1958, _op. cit._

[14] Preble, E. A., _op. cit._

[15] MacCoun, _op. cit._

[16] Preble, _op. cit._

[17] _Ibid._

[18] _Ibid._

[19] Soper, J. D., 1947, _op. cit._

north of the headwaters of the Clearwater, and a few individuals resulting from migration from Glacier National Park in Montana could be found in the vicinity of Waterton in the extreme south-western portion of Alberta.[20] In 1916 Tyrell noted that moose were very rare in the Stoney Indian areas, but he made no reference as to former populations in this area.[21] The last two authors point out that moose were not common in the central foothills and mountains of Alberta during the early part of the twentieth century.

Morden recalls that moose were commonly seen during a hunting trip in the vicinity of the headwaters of the Smoky River in 1921 but that they were almost unknown in his home area, the Pincher Creek region, at that time.[22] Moose were encountered almost daily in the vicinity of the Thoral Creek camp near Entrance during the American Museum of National History fieldtrip in 1935.[23]

Numerous authors have written on the history of various areas in the province and their works help create a rough mosaic of the welfare of Alberta's moose populations during the latter half of the nineteenth and first half of the twentieth century. Denny, one of the original members of the North West Mounted Police recorded that moose were present in the foothills of southern Alberta in 1872 and appeared to "have held their own" in the well wooded portions of the Oldman Drainage up to 1925.[24] In 1921 Soper noted that moose had been common in the Islay area prior to

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[20] Millar, W. N., op. cit.

[21] Webb, R., 1966, op. cit.

[22] Morden, personal communication.

[23] Crowe, op. cit.

[24] Denny, Sir C. , 1956, op. cit.

1910 but had since become very rare in the immediate vicinity and could only be found north of the North Saskatchewan River in Eastern Alberta.[25] In 1925 Farley stated that prior to 1900, moose had been killed in the vicinity of Dried Meat Hill south-east of Camrose but did not frequent this area since the turn of the century although they were still occasionally taken in the timber land area surrounding the Hay Lakes north-west of Camrose.[26] Soper, in 1929, stated moose were present throughout the eastern slope sector of Alberta, but that they were more plentiful from Jasper north than they were in the rest of the slope area.[28] In 1937 Fowler noted that prior to 1900 moose frequented the foothills some twenty-five miles west of High River but since that time they were commonly found some thirty-five miles west of their former ranges although forest fires would drive them as far east as Sentinel Ranger Station. He mentioned that moose appeared to be increasing in number in the first trough on the Highwood Range west of High River.[27]

In his 1942 report on Wood Buffalo Park, Soper noted that moose were common throughout the Park area.[29]

It is probably correct to state that moose, like several of our other indigenous ungulates, did reach a low in historically recorded population numbers about 1900. Excessive hunting, extensive fires and encroachment, and destruction of their habitat by man certainly caused depletion in accessible moose populations but it appears that natural

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[25] Soper, 1921, op. cit.

[26] Farley, 1925, op. cit.

[27] Fowler, 1937, op. cit.

[28] Soper, 1947, op. cit.

[29] Soper, 1942, op. cit.

causes too may have aided in this decimation of the overall population. Numerous authors note a possibility of a thirty-year cycle affecting moose populations. This concept can be relatively well fitted into what is known concerning Alberta moose populations since about 1900 to the present day.

It appears that Seton wrote his Lives of Game Animals in 1929 about the time of the peak moose populations in the north-western North America. He noted that moose were at a low ebb in population about 1900 and attributed this to excessive hunting and encroachment of their territory by man. Alberta's moose population appears to have been at a low about 1900 too, however, European settlement had not yet penetrated deeply into the area normally inhabited by moose in this region. Widespread fires swept through northern Alberta in the late 1800's. At this time numerous reports of dead moose with the apparent causes of death being starvation and parasite infestation occurred.[30] Fires may have wiped out populations and immediate habitat; and starvation in local areas was no doubt due to over-population in situ.

In 1933 Anderson stated that general Alberta moose population was increasing and appeared to be moving northward thus increasing its range.[31] In 1943 moose were seen in the Tod Creek area north of the Crowsnest Pass.[32] This marks a northward trend of moose from the Waterton area along the east slope. In 1949 Hatter noted that the North American moose population was generally above that of the 1920's and was

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[30] Millar, J. B., op. cit.

[31] Anderson, R. M., 1933, Proc. 5th Pacific Sc. Conf., Vol. 5, Victoria, B.C., U. of T. Press.

[32] Skella, J., personal communication.

increasing and thus inhabiting former ranges which had not been populated in recent years.[33] A local Alberta cycle concerning moose range was cited in Millar's 1953 thesis on this species in the Rock Lake area. Moose seem to have been absent in the Rock Lake area in 1913 when the area was first explored. In 1919 the first moose appeared in the Rock Lake area from the north-east and a peak population was realized in the immediate vicinity by the early 1930's. The 1940's were years of a low moose population in the area but by 1953, the year of his study, the population was again relatively high.[34]

A brief resume of the highlights involved in moose hunting seasons in Alberta from 1913 until the instigation of the zoning system in the late 1950's may help to clarify the position of known moose populations during this time. In 1913 a six-week long, provincial wide moose season allowed each hunter to bag one bull moose. In 1929 the entire area east of Highway No. 2 south of Edmonton was closed to moose hunting, but the rest of the province was open. Although the population was low hunting of this species was allowed throughout the 1930's and 1940's. In 1950 there was no open season on moose in Alberta. In 1952 each hunter was allowed one bull moose or one bull wapiti per bag, but in 1953 there was no open moose season in the province. In 1955 a hunter was allowed one bull moose, or wapiti or buck deer per bag. In 1957 the first cow moose season was opened in Alberta.[35] Since the mid-1950's when it was initially introduced, the zoning system concerning the hunting of big-game has been

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[33]Hatter, J., 1949, "Status of Moose in North America," 14th Annual N.A. Wildl. Conf. Trans., pp. 482-501.

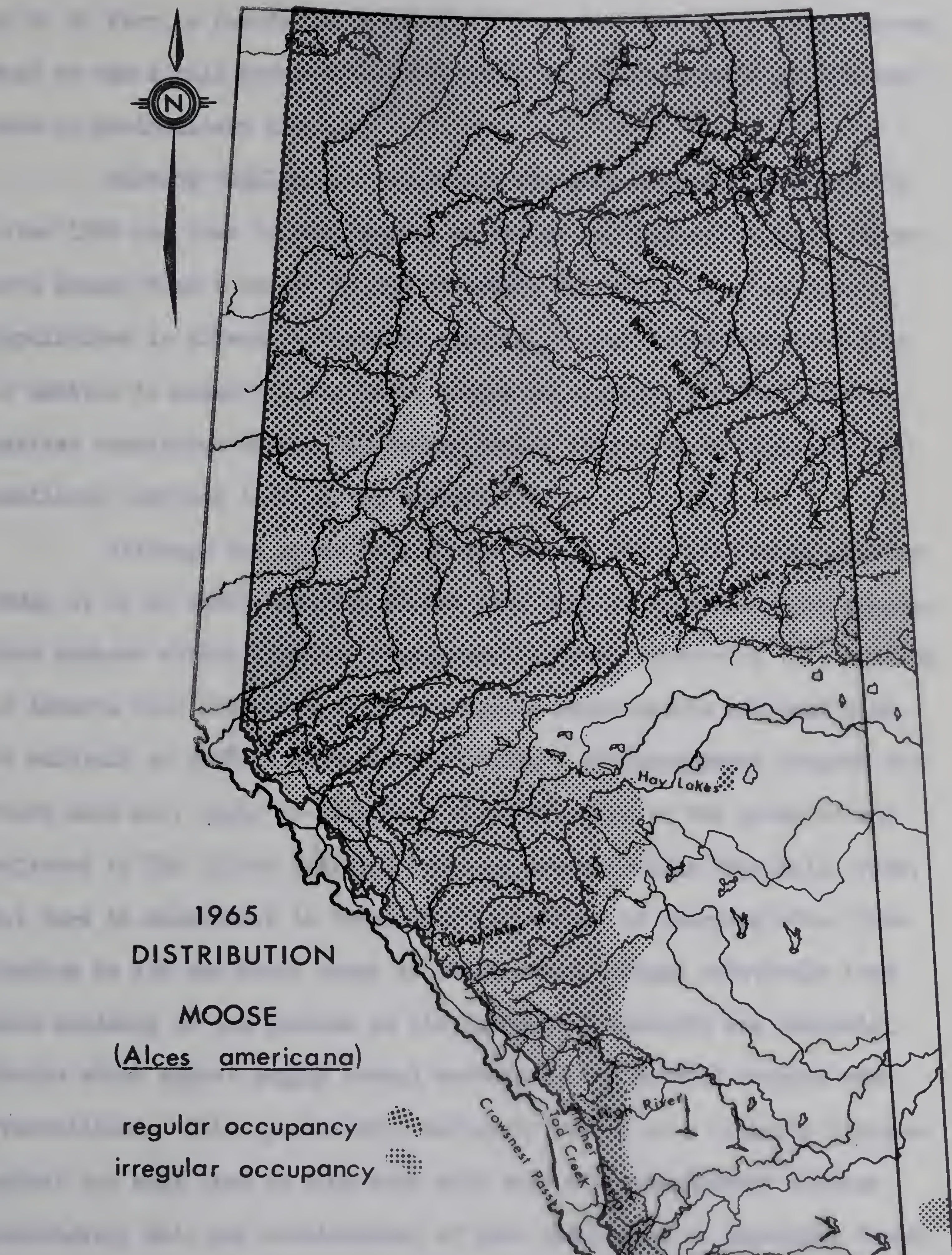
[34]Millar, J. B., op. cit.

[35]Webb, R., 1959, op. cit.

refined and adjusted so that hunting can be regulated and management programs by areas or zones can be instigated and carried out.

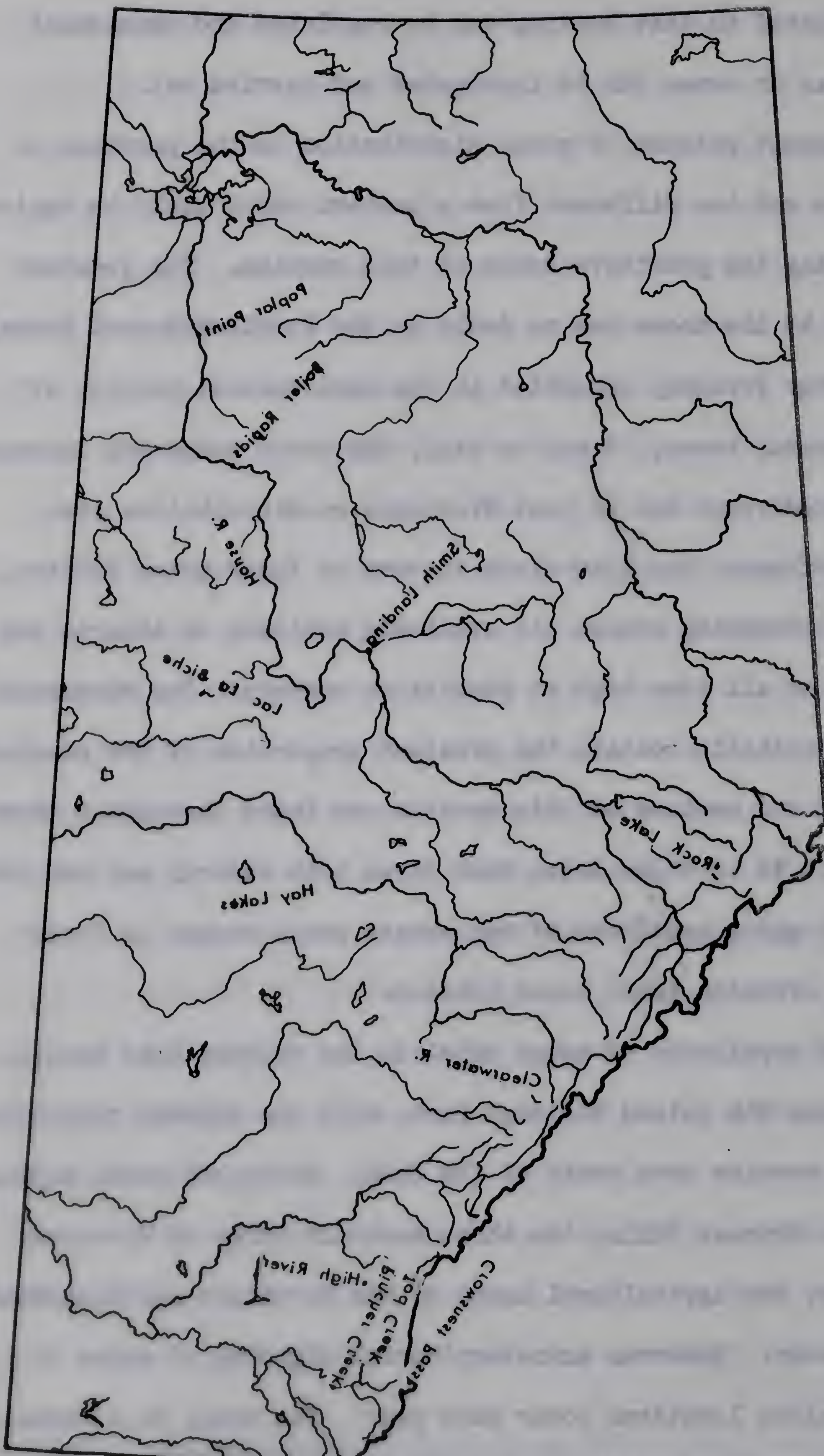
The present pattern of moose distribution in the province of Alberta today is not too different from a pattern which would be depicted on a map outlining the primitive range of this species. The greatest range area lost to the moose was no doubt in the Parkland-Boreal Forest ecotone which they formerly inhabited in the east-central portion of Alberta. In general terms, it may be said, the moose range has increased in the two hundred years due to post-Wisconsin re-distribution even though human settlement has laid claim to some of their prime habitat. Today moose are occupying almost all available habitats in Alberta and are probably at an all time high in population numbers. The Mixedwood forest and the foothills contain the greatest proportion of the provincial moose population and members of this species are found throughout these biotic zones. It is in these areas that fires both natural and man-induced, as well as the logging practices of man create seral stages in forest vegetation thus offering ideal moose habitat.

A heavy population of moose exists in the Cooking Lake Moraine area in and around Elk Island National Park, with the highest population frequenting the moraine area south of the Park. Scattered moose populations occupy the Cypress Hills, the three mountain Parks of Waterton, Banff and Jasper, the agricultural lands of the Foothills and Mixedwood Forest respectively. Numerous extraterritorial sighting of moose in parkland and prairie locations occur each year. The moose is a forest animal and these unusual sightings are generally of individuals which have followed watercourses downstream eventually "coming out" in open parkland or prairie sites. An example of the above was noted in 1965

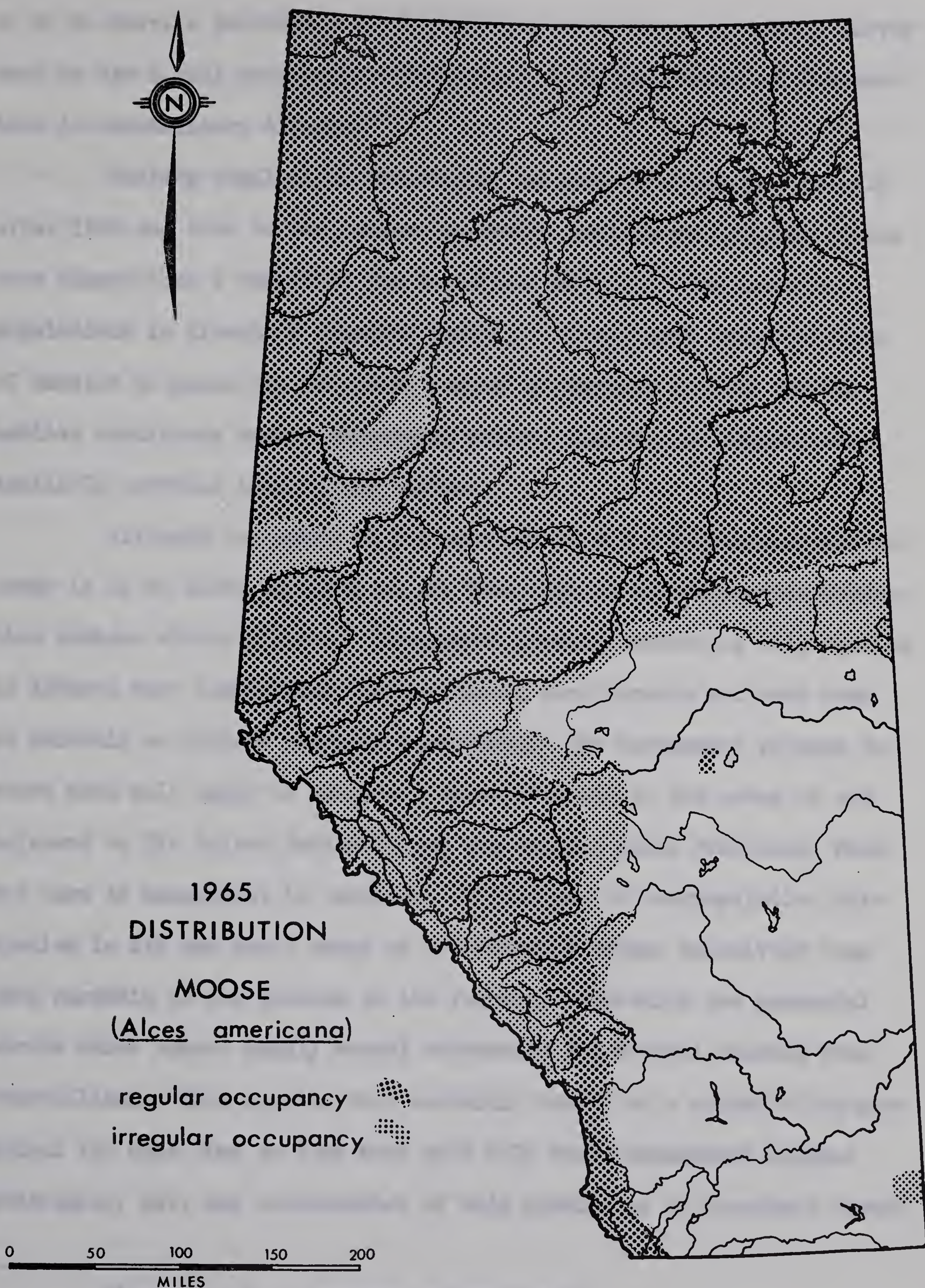


OVERLAY 5

FIGURE 11


Poplar Point
Boiler Rapids
House R.
Smith Landing
Lac la Biche
Rock Lake
Hay Lakes
Clearwater R.
High River
Pincher Creek
Tod Creek
Crowsnest Pass

OVERLAY 5



N
1965
DISTRIBUTION
MOOSE
(Alces americana)
regular occupancy
irregular occupancy
0
50
100
150
200
MILES

FIGURE 11

by G. R. Kerr, a provincial Wildlife Biologist, during an aerial survey when he saw a bull moose within ten miles of the west shore of Pakowski Lake in southeastern Alberta.[36]

Hunting regulations concerning big-game were enforced shortly after 1900 and thus to some degree excessive hunting was curbed. Fires have always been a threat to the immediate welfare of the ungulate populations in Alberta's forested regions. Fires cause immediate loss of habitat to moose but the seral stages of regrowth provide optimum habitat conditions during subsequent years. Regrowth on logged areas similarly provides ideal moose habitat.

Although the moose is a forest animal and a wilderness species today it is no doubt enjoying an all time high in Post-Wisconsin population numbers within Alberta. Management schemes concerning this species in Alberta must acknowledge the ecological requirements and must seek to maintain an optimum huntable population. The management program for moose need only apply to Alberta's Green Area and to the areas of and adjacent to Elk Island National Park and Cypress Hills Provincial Park, but care in management is required. In periods of overpopulation this species is its own worst enemy as overbrowsing brings relatively long term hardship to the species as its favoured foodstuffs are perennial shrubs which cannot supply normal sustenance for several seasons when overutilized. This species will certainly remain as a cropable big-game animal for some time to come even with only minor management schemes undertaken, but, any continuation of this species as an important faunal

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[36]Kerr, G. R. - Personal communication.

component of the forest areas of Alberta requires long term, properly instigated study and the implementation of definite management schemes. As the population stands today the moose is a major faunal component of Alberta's forested land.

CHAPTER 7

DISTRIBUTION AND RANGE OF CARIBOU IN ALBERTA

Perhaps the most internationally known species of Cervidae, indigenous to Alberta, is *Rangifer tarandus*, commonly known as the caribou or reindeer. The genus *Rangifer*, completely Holarctic in distribution, is composed of numerous closely related subspecies or races. Because of the broad distributional pattern of this genus various races of *Rangifer* have evolved as faunal components of particular ecologically defined regions and are thus peculiar to that region which they inhabit. The concept of these closely related yet ecologically specific races was noted relatively early by modern day zoologists. In 1898 Lydekker stated: "in spite of the existence of more or less well marked geographical races, reindeer from all parts of the northern hemisphere present such a marked similarity in general appearance that it seems preferable to regard them all as belonging to a single wide-spread species of which most of the characters will be the same as those of the genus."[1]

Caribou or reindeer have long formed a basic mainstay in the economy of arctic and sub-arctic peoples. Fossils of both man and caribou appear in mid-Pleistocene deposits in much of the Holarctic region. Numerous cave drawings by Paleolithic man attest to the fact that reindeer became a dominant indicator species of the cooler late Pleistocene periods in Europe. Although North America's Paleolithic inhabitants left no drawings behind affirming the presence of particular animals during this time, archaeological finds in this area confirm Holarctic

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[1]Banfield, A. W. F., 1961, *Revision of the Reindeer and Caribou, Genus Rangifer*, Nat'l. Mus. of Can. Bull. No. 177, Bird Series No. 66, Queen's Printer, p. 30.

distribution for man and reindeer in the late Pleistocene periods.

Initially, reindeer and caribou served as the basis of arctic and sub-arctic primitive hunting cultures in both Eurasia and North America. Nomadic peoples of north Asia domesticated the reindeer and this practice of utilization eventually spread to northern Europe. North America's inland Eskimos and northern Indians depended on the migratory caribou as their basic mainstay of life throughout much of the pre-historic period and well up to the present but they never domesticated this species.

Early explorers encountered the caribou of North America and recognized it as being akin to the reindeer of Eurasia. The name reindeer or its shortened form the deer occur in the notes of the early English explorers. It was the French "voyageurs" who adopted the typical North American vernacular for this species. The French created the name caribou from the New Brunswick Micmac Indian's name Xalibu, meaning the pawer or shoveller in reference to the animal's habit of pawing through the snow in the winter to reach fodder.[2]

The caribou is a medium sized member of the family. It is somewhat blocky in body structure and sturdier in appearance than what is normally thought of as being deer-like. Size varies greatly amongst individuals as well as amongst the ecotypes of the species. Perhaps the most apt description of the general appearance and structural deportment can be quoted from Banfield who wrote the following in 1961. "Medium to large deer, possessing a number of physical adaptations to an arctic or sub-arctic environment, muzzle large, squarish, rather bovine in appearance and well furred; nostrils valvular; ears short, well furred,

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[2]*Ibid.*

erect and broad, somewhat crowded behind the antlers, and not particularly mobile; tail short and well furred; hoofs black, large crescentic, well protected by tufts of fur; pelage long and dense, composed of long brittle guard-hairs and a close fine curly underfur; a long ventral mane on the throat; both adults and young unspotted, color generally clove brown above, white below; a clicking sound made in the foot when walking by sesmoid bones rubbing against the foot bones."[3] The smaller caribou inhabit the high arctic zones while those ecotypes of larger body structure, in general, inhabit the lower arctic and arctic-alpine areas. The general body color is, as mentioned, clove brown but the pendant-like ventral neck mane, the inner sides of the legs, the rump patch and the short, erect tail are white in color. Calves often show a faint whitewash coloration on their back and sides until several weeks old.

Caribou are physically well adapted to withstand the rigors of cold climates. The short, stocky body possessed by members of this species shortens the general circulation of blood and a minimum of body surface is exposed to cooling winds. The ears, tail and muzzle of the caribou, besides being short, are well furred, and thus doubly protected from the rigorous winter environment. Winter pelage is essentially of two layers; the outer, brittle, erectile hairs offer an effective windbreak, and, the closely spaced, short hairs serve as excellent insulation. The above physical or external body adaptations of the caribou are generally known as cold-adaptations and comply with the general rule known as Allen's Rule.

One unique possession of this species of the Cervidae Family is

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[3] Ibid., p. 31.

the autumnal development of back fat, a winter storage of food reserve. Back fat is a solid slab of tallow lying along the backbone between the superficial muscles of the skin from the shoulders to the rump. This tallow which serves as a food reserve during the critical winter food period is highly prized as a food by the native Eskimos and Indians.

The Caribou is the genuine antler bearer of the Cervidae Family. Members of both sexes normally develop antlers, although those possessed by the female are generally smaller and often misshapen. Caribou antlers are extremely variable in appearance, and no member of a pair is ever the mirror image of its mate, but a general pattern is apparent in all. The general profile appearance of the antlers is that of a bow in that from the burr the beam sweeps dorsally and laterally over the shoulders then curves upward and forward so that the beam tip normally points forward. Generally, two main anterior tines branch off close to the base and one posterior tine branches off at the point where the beam curves forward midway in its length. Both the anterior tines known as the brow and bez generally expand in a vertical palmation and overhang the facial area of the animal but the posterior tine is normally simple. At its peak the beam normally divides into a variable number of backward-falling terminally scalloped or palmated tines. Considerable variation occurs in the antlers of any one individual.

Caribou hooves show a remarkable annual development. During the summer season the foot pads which are relatively enlarged and soft rest on the ground and the surrounding edges of the hooves are worn relatively flat. Both the traversing wet boggy ground and the swimming of open waters are easily carried out using this broad soft foot. During the winter period the hooves grow to a remarkable length; the foot

pad shrinks or is absorbed and becomes quite firm; the hair between the hooves grows and forms tufts which cover the pad. The animal thus walks on the thin crescent which is the horny rim of its hooves and is able to paw through snow for foodstuffs with these sharp crescentic, widely splayed hooves during the winter. The long dewclaws and associated fetlock point provide additional support on snow and ice.[4]

Caribou are relatively gregarious and individuals normally live as members of a loose herd organization. The extent of the herd, its development and organization depend largely on the ecological area in which the subspecies has evolved. Caribou are very specialized eaters and the basic mainstay of their diet, the slow growing, easily destroyed lichens and mosses of the tundra and mature northern coniferous forest areas are very sensitive to overbrowsing. Caribou are generally known as migratory animals. It is felt that the migratory behavior of the caribou, particularly those of the barren grounds has permitted the largest possible stable population of the species to exist without damaging the environment. During the critical winter period caribou subsist almost solely on lichens and mosses. These foodstuffs are available only in mature coniferous forest stands and thus fires, logging, clearing and land settlement all act against the continued existence of this ungulate.

Single calves, the most precocious of all cervid young, are born in late May and early June. During this period and well through summer, members of the species are loosely organized into herds or sex bands of

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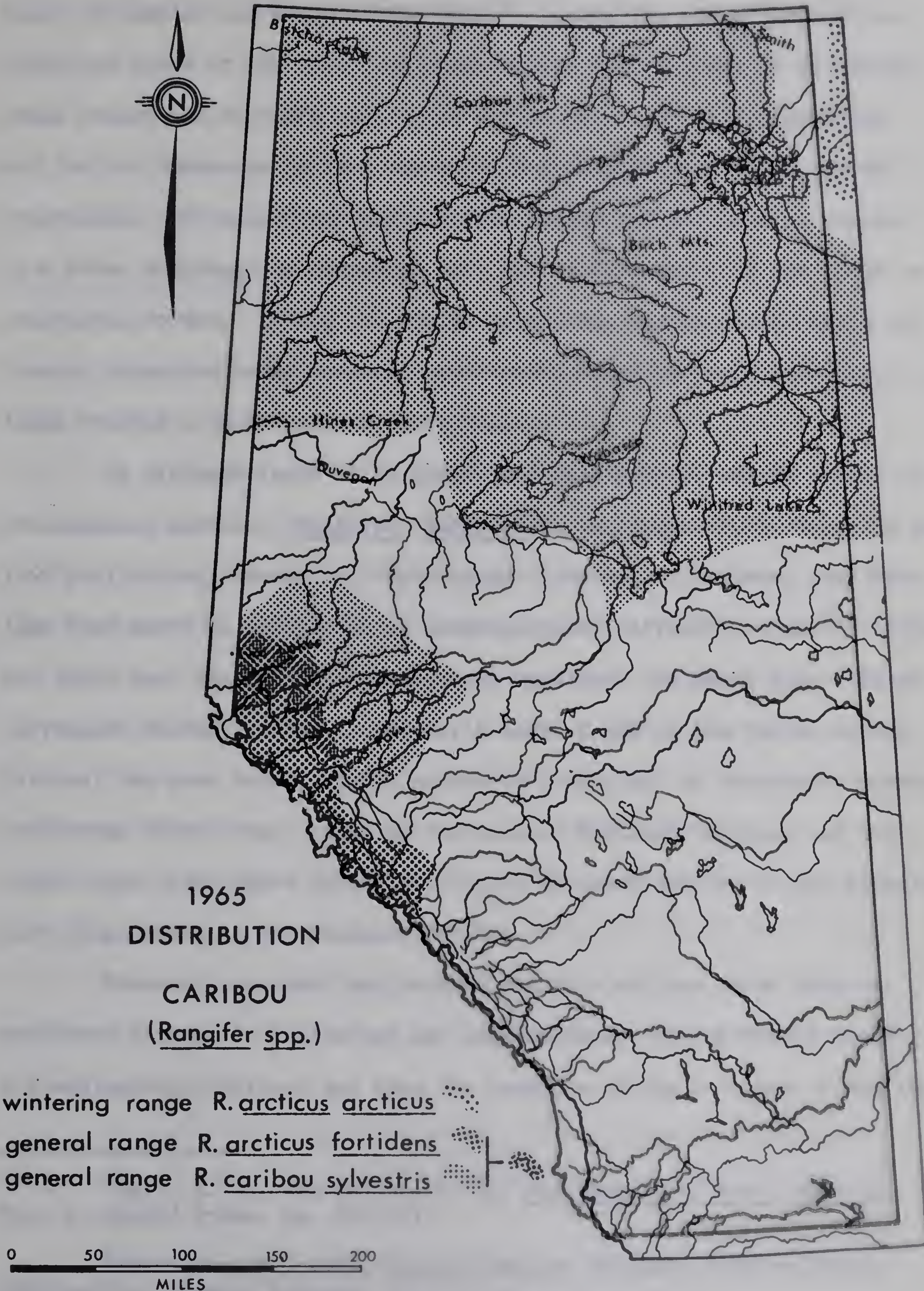
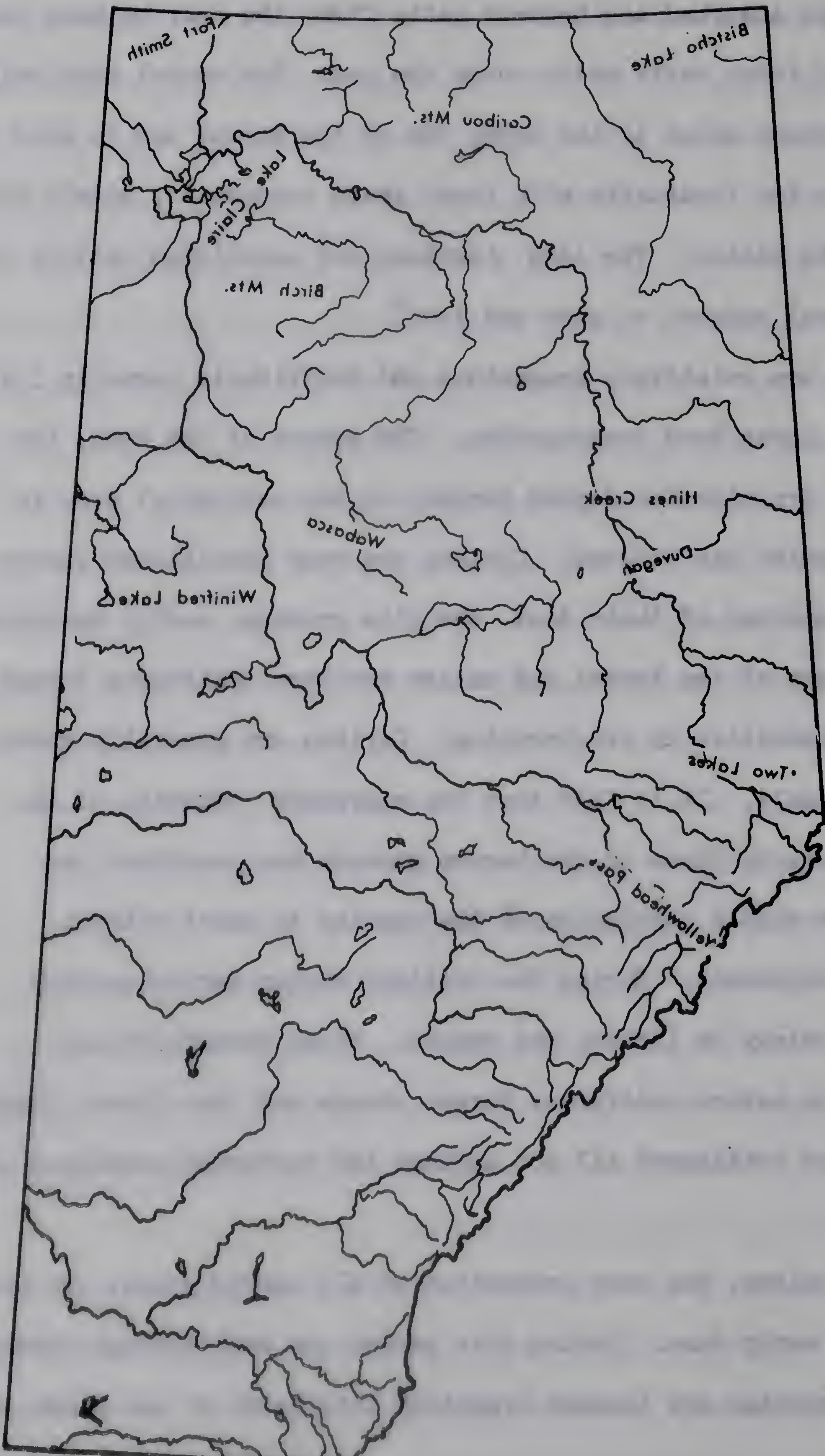
[4]Seton, E. T., op. cit.



OVERLAY 6
FIGURE 12


Fort Smith
Bistcho Lake
Caribou Mts.
Lake Claire
Birch Mts.
Hines Creek
Wabasca
Dunvegan
Winifred Lake
Two Lakes
Yellowhead Pass

OVERLAY 6

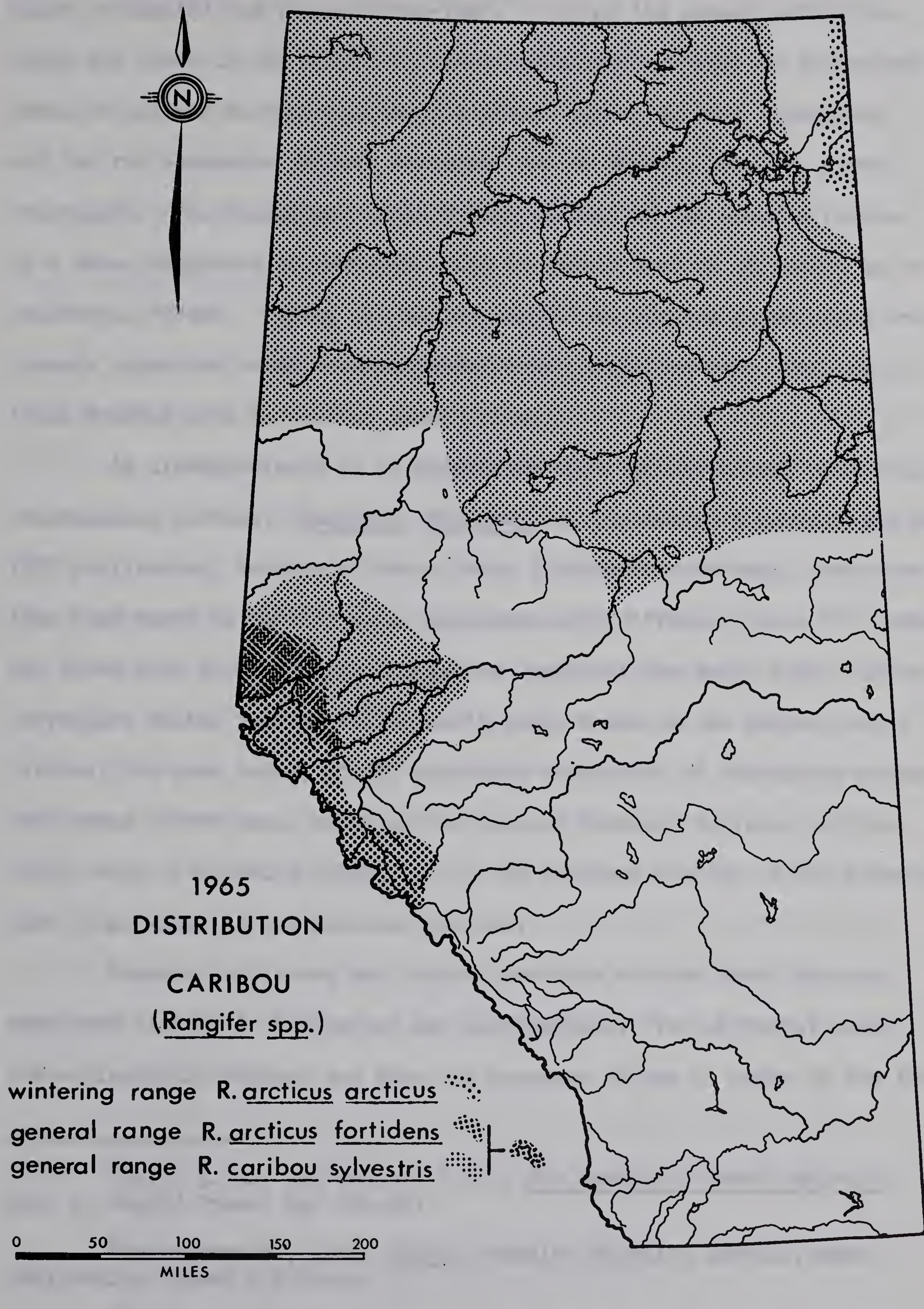

N
1965
DISTRIBUTION
CARIBOU
(Rangifer spp.)
wintering range R. arcticus arcticus
general range R. arcticus fortidens
general range R. caribou sylvestris
0 50 100 150 200
MILES

FIGURE 12

males or females and young-of-the-year.* During the summer period the herds are found in the arctic or arcto-alpine tundra areas or in upslope areas within the northern coniferous forest zone. As fall approaches and the rut commences in late September and on through October, herds congregate. The polygamous males gather harems and the general population moves southward or downslope into favorable regions of the taiga or coniferous forest. During the winter period the various sized herds are loosely organized under somewhat matriarchal lines and move from one local feeding area to another sporadically.

As aforementioned it is understood that caribou belong to one all encompassing species, (Rangifer tarandus) in accordance with Hall and Kelson's 1959 publication, because of their broad distribution pattern, they have long been known as subspecies or geographically different races.[5,6] Alberta has three such races of this indigenous ungulate: the small pale colored, infrequent winter visitor of the north-east, known as the Barren Ground Caribou; the year round, highly scattered inhabitant of the mature northern coniferous forest zone, known as the western Woodland Caribou, and the large, dark, year round inhabitant of the northern portion of the Albertan East Slope known as the Mountain Caribou.

Numerous explorers and authors who have written about Alberta, mentioned caribou in fieldnotes and publications. The different races are ecologically defined and thus the presence of one or other of the three

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[5]Hall, E. R., and Kelson, K. R., The Mammals of North America, Vol. 2, Ronald Press, pp. 492-501.

[6]Symington, F., 1965, Tuktu, Canadian Wildlife Service, Spec. Publication, Queen's Printer.

*this means that the bands are of one sex or that the cows and calves are basically separate from the bulls and non-breeding stock.

types can be relatively easily assumed if the author has just noted "caribou" in his work. For the sake of simplicity and easier understanding of caribou distribution in Alberta historically, the species has been divided into races in accordance with Anderson's 1946 publication as was followed by Soper in Mammals of Alberta in 1964.[7]

Barren Ground Caribou

The barren ground or American Tundra Reindeer (*Rangifer tarandus groenlandicus*) is the classic or typical caribou brought to mind when this species is mentioned. This relatively small, pale colored sub-species is the migratory herd animal which moves seasonally from the Arctic tundra of the far north to the northern coniferous forest area in central Canada. The barren-ground caribou has a circulatory route which is very constant in time but is not necessarily so in space so that areas of the tundra and taiga may naturally lie ungrazed for several seasons. The barren-ground caribou is not a constant inhabitant of northern Alberta but is rather an infrequent winter visitor to the north-eastern corner of the province. Settlement, as yet has done little to deter this ungulate from its Alberta range. It appears that historically the barren-ground caribou was always an infrequent winter visitor to the Shield area of north-eastern Alberta and has never migrated very far south or west of this geologic region.

In 1908 Preble said that barren-ground caribou had been seen within one half day's journey of Fort Smith in the winter of 1900-1901.[8]

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[7]Anderson, R. M., 1946, Catalogue of Canadian Recent Mammals, Nat'l. Mus. of Can. Bull. No. 102, Biol. Series No. 31.

[8]Preble, *op. cit.*

Natives told him that this animal had migrated as far south as Fort McMurray in previous years. In 1921 Hewitt stated that barren-ground caribou were the most abundant of North America's large mammals since large scale slaughtering had eliminated the bison.[9] Soper, in 1942, noted that barren-ground caribou inhabited the northern and eastern portions of Wood Buffalo Park during the southern extension of their migration between November and April. He stated that in former times, according to the natives, the caribou had travelled as far south as Fort McMurray.[10] During the severe winter of 1942-43 barren-ground caribou migrated as far south as the immediate vicinity of Fort McMurray.[11] Banfield, in 1949, stated that the barren-ground caribou inhabited north-eastern Alberta during the winter and could be found in the vicinity of the Clearwater and Athabasca Rivers, Lake Claire and Wood Buffalo Park during that season.[12]

Few figures are available for the winter population of barren-ground caribou in Alberta, but in 1957 it was estimated about 1,500 followed the annual route south-easterly across Lake Athabasca.[13] In 1965 Soper summed up the range of barren-ground caribou within Alberta when he noted they were present in "the extreme northeast corner of the province, west to eastern borders of Wood Buffalo Park, east of Slave River in Tazin Highlands, south to Lake Athabasca, on some occasions, irregularly south of the lake."[14] Barren-ground caribou prefer the rocky,

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[9]Hewitt, C. G., op. cit.

[10]Soper, J. D., 1942, op. cit.

[11]Yanik and Stewart, J., personal communication.

[12]Banfield, A. W. F., 1949, "Present Status of the North American Caribou," 14th Annual N.A. Wildl. Conf. Trans., pp. 477-491.

[13]Webb, R., 1959, op. cit.

[14]Soper, J. D., 1964, op. cit., p. 359.

rough terrain of the Shield Area. This is mainly barren of heavy tree growth by comparison with the heavier coniferous forest to the southwest. As long as no changes in land use are enacted in this region it appears that no definite problems concerning the loss of their preferred range will arise in the immediate future.

Woodland Caribou

The American Woodland caribou (Rangifer tarandus caribou), a medium sized member of the species, is a year round inhabitant of mature forest stands in the northern coniferous region of Alberta. The woodland caribou has definitely suffered range depletion due to human encroachment of its range. Historically the woodland sub-species ranged throughout the northern coniferous forest region of Alberta. Today the remnant populations occur in particular areas scattered within the general region.

The majority of caribou encountered by Harmon during his sojourn in "Indian Country" in the first two decades of the nineteenth century were no doubt woodland caribou. In 1851, Richardson found woodland caribou inhabiting the Birch Mountains, southwest of Lake Athabasca.[15] In 1892, Tyrell encountered numerous woodland caribou south of Lake Athabasca, just outside the eastern border of Alberta.[16] In 1902, MacFarlene noted that woodland caribou were nowhere common, but, that they were scattered throughout the country lying between the Peace River and Great Slave Lake, and thus inhabited a large portion of what is now Northern Alberta.[17]

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[15]Preble, E. A., op. cit.

[16]Ibid.

[17]Ibid.

Preble did not encounter any woodland caribou in his expedition in Alberta but he did state that they had frequented the area in the vicinity of Fort Smith during the winter of 1902-03, and that they had been seen near Sandy Creek, twenty miles south of Athabasca Landing between 1903 and 1907.[18] In 1908 Preble thought that the woodland caribou may have still been inhabiting particular favourable spots along the North Saskatchewan River.

In 1921 Hewitt stated that woodland caribou were thinly scattered throughout the northern coniferous forest of Alberta.[19] He thought that these caribou were not particularly abundant in any part of their known range but that herds had been seen in the basins of the Slave, Athabasca, and Liard Rivers and within the vicinity of Edmonton between 1905 and 1915.

In 1942 Soper noted that woodland caribou were scarce in the south-eastern sectors of Wood Buffalo Park, but, he said that prior to 1934, they had ranged throughout the Park.[20] In the same report Soper noted that the caribou in the central portion of Wood Buffalo Park migrated upslope into the Caribou Mountains during the spring and downslope to the adjacent lowlands during the fall season. When Banfield reported on the status of the North American Caribou in 1949 he noted that this woodland race occupied numerous areas in Alberta. Banfield stated that woodland caribou inhabited the regions known as Caribou Hills, Birch Mountains, Swan Hills, Hines Creek vicinity, the foothills northwest of Edson, and the western one-half of Wood Buffalo Park.[21]

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[18] Ibid.

[19] Hewitt, op. cit.

[20] Soper, 1942, op. cit.

[21] Banfield, 1949, op. cit.

In a preliminary survey report dated 1956, J. G. Stelfox, provincial wildlife biologist stated that caribou were scattered throughout northern Alberta north of Lesser Slave Lake.[22] Stelfox noted reports of woodland caribou in the vicinity of Bistcho Lake, between Utikuma and Wabamun Lakes, between Christina and Athabasca Rivers, in the area west of Lake Athabasca and in the Fort MacKay area. He said that caribou were probably scattered throughout the muskeg regions of northern Alberta because it was in these regions that their preferred diet of mosses and lichens existed. Stelfox stated that there was a steady harvest of caribou by resident populations throughout the year.

In a 1959 report summarizing the status of big-game species in Alberta, R. Webb, provincial wildlife biologist, stated that there were five major herds of woodland caribou in Alberta.[23] Webb's five caribou-inhabited regions were areas in the general vicinities of Wabasca, Winifred and Bistcho Lakes, the Heart Hills and the Caribou Mountains. He noted that caribou required extensive areas of natural coniferous or mixedwood forests, particularly during the critical winter season in which they subsisted solely on lichens and mosses. No comprehensive data concerning populations was available in 1959 but Webb felt that the woodland caribou probably numbered around 1,000 and this low population level was being maintained. In 1965 Soper repeated Webb's 1959 findings and stated that general settlement, unregulated slaughter, fires and logging had largely been responsible for the gradual loss of population during historical times.[24] Soper noted that although woodland caribou were

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[22] Stelfox, 1956, op. cit.

[23] Webb, 1959, op. cit.

[24] Soper, 1965, op. cit.

considered to be non-migratory, a definite spring migration upslope and subsequent fall migration downslope occurred in the Clear Hills and the Birch and Caribou Mountains.[25]

Woodland caribou like other members of this species is a wilderness animal and any disturbance ecologically upsetting to its habitat acts against the general population. Caribou range in North America has always been in terrain little frequented by man, but, with the constant search for mineral wealth and the increased logging operations in the north, the range is being constantly encroached upon. Mature coniferous forest areas are of paramount importance to woodland caribou and if the population, low as it is, is to remain stable proper management of favorable available habitats for this ungulate must be included in the Alberta general wildlife management scheme.

Mountain Caribou

The large, dark caribou inhabiting the northern sector of Alberta's East Slope was originally classed as a separate race and is often still thought of as such. Banfield in 1961 classified this year-round mountain dweller as a sub-category of the woodland caribou (*Rangifer tarandus caribou*)[26] The large dark caribou which Harmon mentioned in his field-notes, written between 1800 and 1816, was no doubt the mountain caribou of western Alberta.[27] In 1908 Preble noted numerous accounts concerning mountain caribou.[28] J. A. Loring told Preble that in the fall of 1895 he had killed three caribou in a herd in the timberline region in the

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[25]Soper, 1965, *Ibid*.

[26]Banfield, 1961, *op. cit*.

[27]Harmon, *op. cit*.

[28]Preble, *op. cit*.

vicinity of Jasper House and that during 1896 he had seen caribou tracks south of Henry House, en route from Jasper House to Smoky River and west of Henry House.

Hollister described and classified the sub-species fortidens, thought to be unique to the Moose Pass area, which was discovered during the Alpine Club Expedition in 1911.[29] Hollister stated that mountain caribou had formerly been common downslope from this area in the eastern foothills as attested by the skins noticed in numerous abandoned cabins, but, that in 1911 they had been noted only in the vicinity of Moose Pass, Smoky River headwaters, Yellowhead Lake and Moose Lake.

In 1916, in his report to the Commission, Millar stated that mountain caribou were distinctly a British Columbia ungulate due to food and habitat preferences, but occasional stray herds inhabited Alberta's East Slope during the summer.[30] He said that the occurrence of caribou on the east slope south of 53° N. was limited to the west side of the Athabasca River from Miette south to Fortress Lake. Millar stated that up to ten years prior to his 1916 report caribou had been much more numerous on the east slope and had been seen well down the Athabasca below Jasper Park but fires and unregulated hunting pressure had reduced the populations.[31] In the December 1918 edition of Field and Stream under the title "Game in Alberta" the editor wrote "William Rindfoos has recently left Jasper on an expedition to the Wapiti River country west of the railroad, drawn by the remarkable amount of game he saw last year

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[29]Hollister, op. cit.

[30]Millar, W. N., op. cit.

[31]Ibid.

when he was in shooting distance of 165 sheep, 60 caribou, 80 moose, 19 goats, 2 grizzly bears, 6 deer, 14 coyotes and 2 foxes."[32] Seton felt that the Field and Stream account was representative of an abundance of game as it occurred under primitive conditions.

In 1928 Kindle noted that mountain caribou had responded to the protection afforded them in Jasper Park and the general population in that region was increasing.[33] Two caribou were collected at Thoral Creek by the National Museum in 1935.[34] During his expeditions of the East Slope in 1944 Soper did not see any caribou in the mountains southwest of Grande Prairie but local Indians informed him that members of this species were common in the high alplands and mountain passes in the head-water areas of the Smoky River and its tributaries. A survey party in 1944 saw approximately 100 caribou near Two Lakes in June and several smaller bands in the vicinity of Cecilia Lake during mid-July. Soper personally noted cast-off antlers en route from Pinto Creek to Nose Creek meadows and in the vicinity of Two Lakes.[35] In 1949 Banfield stated that herds of mountain caribou inhabited alpine ranges north of and throughout Jasper Park.[36] He felt that the southern limit of the sub-species range was the northern portion of Banff National Park at this time.

There has been a noticeable increase in the population of Alberta's mountain caribou in the past two or three decades. Numerous authorities feel that Alberta is a subsidiary range to that of adjacent British Columbia and that the population in Alberta fluctuates seasonally and is

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[32]Seton, op. cit., p. 143. [33]Kindle, op. cit.

[34]Crowe, op. cit. [35]Soper, 1944, op. cit.

[36]Banfield, 1949, op. cit.

being built up through migration from the west rather than through reproduction.[37] Between 1959 and 1965 the average hunter harvest of mountain caribou fluctuated between 25 and 35 animals. John Stelfox estimated the 1965 population of mountain caribou in Alberta to be about 1,500 animals.[38]

Mountain caribou have not suffered any major range depletion since the initiation of settlement in Alberta. Jasper National Park serves them as a haven from both habitat destruction and hunting pressure but provincial hunting lands cannot rely solely on the National Parks for provision and maintenance of favorable habitats for this species. The coal fields discovered in a former portion of Wilmore Wilderness Area and the railway associated with the development of these fields recently destroyed a prime wintering area for both mountain and woodland caribou.* Once a particularly favorable portion of the habitat is destroyed the species must adjust to a new region and such new regions are not easy to acquire since this species is a specialized feeder and requires mature or undisturbed forest stands for utilization. The general population suffers from habitat destruction and its status will be drastically reduced if access to critical wintering areas is impossible or if the wintering areas are destroyed. Management must take into consideration the long term status of the caribou as well as the immediate economic gains whether it be from hunting or from habitat destruction due to a mineral discovery or other short term economic enhabcement for industry.

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[37] Ibid.

[38] Stelfox, J. G., 1965, Progress Report (Unpublished)

*refers to Wilmore Wilderness - set up as a Wilderness area originally in 1959. Orders in Council can remove any part of this area as was done in 1965 in order to develop coal reserves.

CHAPTER 8

CONCLUSIONS

"Wilderness is the raw material out of which man has hammered the artifact called civilization.

Wildness was never a homogeneous raw material....the resulting artifacts are very diverse. The rich diversity of the world's cultures reflects a corresponding diversity in the wilds that gave them birth."[1]

History in western Canada, or for that matter recent history in any region, is generally concerned with the progress of modern day civilization - man and his technological innovations - across the landscape. This thesis has attempted to trace the changes in the distribution or range patterns of Alberta's indigenous Cervidae during historical times - roughly 1750 to 1965. Data gleaned from review of available literature allows one arbitrarily to divide this historical period into three portions: 1750-1880 Exploitative Phase of exploration and unchecked slaughter; 1880-1905 Settlement Phase predominated by both encroachment upon the pristine range and continuation of heavy slaughter; post 1905 Legislative Phase notable as a period of public awareness and governmental attempts at conservation.

The 1750-1880 economy was based directly upon the exploitation of resources, both renewable and nonrenewable, of the "newly discovered lands." During this phase of history Alberta's indigenous Cervidae suffered in terms of both direct loss of population numbers and loss of available favourable range lands.

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[1]Leopold, A., 1964, A Sand Country Almanac, p. 188.

About 1880 settlement in the western sector of the prairies began in earnest. Unchecked slaughter was still the practice. This fact coupled with direct loss of habitat through agricultural encroachment into pristine environments effected what could have been the death-knell for indigenous Cervidae species.

Species of wild or indigenous animals have not often been appreciated by man until they became relatively rare or at least noticeably difficult to obtain by individuals. Shortly after the turn of the century private individuals and government personnel became aware of, in most cases, what appeared to be a phenomenal loss of Cervidae populations which had occurred during the late nineteenth century. Legislation was passed to establish sanctuaries or preserves for species, and to specify hunting seasons and bag limits. Much of this awareness in Canada was directly associated with the awareness on such matters in the United States under the Roosevelt administration.

Several factors were influential in the initial loss of recorded Cervidae populations and their subsequent revival. Civilized man as he advanced northwestward across the Canadian landscape was both directly and indirectly responsible for much of the decimation. Wanton slaughter, encroachment upon pristine range by European induced exploration and settlement and unchecked large-scale fires were important decimating factors. A series of severe winters during the latter portion of the nineteenth century and epidemic disease factors coupled with this direct influence by man contributed to the overall population losses.[2]

"The west" was opened up by the adventurous. These partakers of

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[2]Stelfox, J. G., 1964, a) op. cit., and Stelfox, personal communication.

the spoils knew no laws; what was present was theirs for the taking. The large mammal species probably suffered the most drastically. Much of the slaughter was not utilitarian or of necessity, but was rather for the sake of the sport of the kill itself, or for specific bits or parts of the body such as the two upper canines or tusks of the male wapiti. Excessive hunting by native peoples as well as by immigrant and transient white populations was the "order of the day" in eighteenth and nineteenth centuries in Alberta. Guns replaced the age old bow and arrow hunting methods and excessive hunting for trophies and sport as well as food occurred. There were no laws or regulations concerning the maximum amount of game slaughtered or the season in which species could be taken, so that all individuals that could be killed at any particular time according to the circumstances were slaughtered.

Wildlife forms have always been an important food source to pioneering peoples but excessive killing has led to extinction of the very species subsistence depended upon. As man became more numerous as well as more mobile and aggressive in his hunting techniques the range of Cervidae retracted as the animals withdrew north and west ahead of the encroaching predators. Populations were eliminated from prime ranges and came to subsist on poorer quality foodstuff as well as within less favorable environments.[3] Initially encroachment was often of a temporary nature but long term encroachment in the form of agricultural practices began in earnest by the early 1880's. It was the concentration of continuous settlement that drove the remaining Cervidae populations into their final refugia in the western foothills and mountains, the northern mixedwood forest and the

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[3] Albrecht, A., 1957, "Soil Fertility and Biotic Geography," in Geog. Review, Vol. 47, pp. 86-105.

secluded river valleys scattered throughout the province. Heavy settlement, as is seen, happened to coincide with severe winters with high precipitation near the turn of the century. The most noticeable influence which settlement had on Cervidae populations of this period was the virtual elimination of the wapiti and even today this species exists only in a remnant of its former range.

Fires were an ever constant threat to the immediate welfare of Cervidae populations under pristine conditions but civilization induced far greater holocausts than had ever been experienced previously. Prairie fires swept over the brown and black soil zones of the province while forest consuming flames spread through northern and foothill forest-lands. Agriculture succeeded the prairie fires, thus general range was directly and irrevocably modified in the prairie and parkland regions. Forest fires threatened immediate welfare but the seral stages of growth in these affected regions later gave impetus to revived specific populations. As late as the 1920's stumps of large trees scorched in 19th century fires were recognizable in the Rocky Mountain House, Willow Valley and Porcupine Hills areas.[4]

The climate too dealt severely with indigenous Cervidae populations near the turn of the nineteenth century. In general temperatures were unusually low during the final two decades of the nineteenth century and precipitation particularly winter snowfalls were relatively abundant.[5] Data on climate appears in journals of many of the early explorers but it

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[4]Skella, J., Morden, J., Stelfox, H., and Stelfox, J. G., personal communication.

[5]Thomas, M. K., *op. cit.*

was not until Palliser's expedition that scientific personnel reported on such conditions, thus exact information for the complete historical period is not available. Local conditions of climate are notable in some localities and in some cases probably contributed extensively to population decimation.[6] Cervidae in southwestern Alberta suffered drastic population losses during the winter of 1882-1883 which is known locally as the Cochrane Winter because of the high livestock losses suffered on the Cochrane Ranch. Although extreme snow-conditions were general throughout the province around the turn of the century the Rocky Mountain House and Edson districts did not have excessive snow conditions coupled with their abnormally low temperatures.[7] Probably one of the most noteworthy winters for extreme low temperatures throughout Alberta was the winter of 1906-1907.[8] Indigenous Cervidae species no doubt suffered their greatest population decimations during winters of deep snow and highly fluctuating temperatures for it was during these times that the Indians utilized their hunting technique known as "crusting."[9] Ungulates were caught in crusted snow, unable to run and they were thus slaughtered in wholesale fashion.

Under pristine conditions indigenous Cervidae existed in direct relationship with availability of high protein foodstuff which was allied with soil fertility. These animals thus showed an ecological pattern in relation to soil fertility and as such occupied the most favourable areas of the overall range available to them.[10] Agricultural encroachment upon

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[6]Stelfox, 1964, a) op. cit.

[7]Stelfox, H., and Stelfox, J. G., personal communication.

[8]Thomas, M. K., op. cit.

[9]Seton, E. T., op. cit.

[10]Albrecht, A., op. cit.

the more fertile lands eliminated much of the rangelands of the province and caused indigenous Cervidae to be pushed on to less fertile areas. The species are in adjustment at all times with their environment and if the environmental factors such as food and living space are not favourable to the animals, epidemic disease and widespread organic disorders may break out. Indigenous Cervidae came to subsist on marginal lands and some crowding of species in these unproductive areas was no doubt responsible for some population losses, particularly of wapiti, near the turn of the century.[11]

During the final decade of the nineteenth century both government personnel and the general public became ever more concerned at the phenomenal loss of Cervidae populations. Concern for this loss was aroused and by the turn of the century decisive steps toward the elimination or at least the "slowing down" of the unchecked slaughter had been taken. During the first decade of the twentieth century several preserves were set up within Alberta, on both a local and a national scale, fire commissions were set up for the suppression of widespread fires and laws concerning the slaughter of Cervidae both in terms of number and time were enacted. Awareness of the phenomenal loss of populations which had occurred during the last century brought about a general regard for and a more amiable attitude towards the remaining animals. Climatic amelioration was apparent shortly after the turn of the century. This latter environmental factor and the alteration of Cervidae-human relationships were the prime factors which swung the pendulum in favour of the continuation of these species within the provincial boundaries.

Today the answers to questions regarding utilization of the

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[11]Stelfox, J. G., 1964, a) <u>op</u>. <u>cit</u>., and Morden, personal communication.

species by man, and the maintenance of the species themselves is basically the concern of the Fish & Wildlife Division, a branch of the provincial Department of Lands & Forests. This management should be considered in essence as being the science of maintaining the indigenous species in relation to their total environment. At present all indigenous Cervidae members are relatively stable in population; they have taken over lost ranges or have become established in new locales within the past two decades and their future survival appears favourable. Cervidae exist for the most part in the forested regions of Alberta but numerous wapiti are found on the grassy foothill slopes and deer, both white-tailed and mule deer are present in favourable habitats throughout the prairies and parkland regions.

Management is a vital factor in Alberta's Cervidae picture. A prime factor of this management is the Cervidae-man relationships. In many localities it is not lack of individuals nor rareness of the species but rather the presence of too many thus causing land-use conflict. Deer, both white-tailed and muley can co-exist with agricultural lands providing an escape habitat is present. Moose tend to remain in the forest areas. Wapiti are grazers as well as browsers and some of the most direct land-use conflicts occur when this large ungulate is present in competition for grazing or farming lands such as on the Winnifred Lake region.

It appears that in many localities the cropable population of wild ungulates particularly those of the Cervidae Family is higher than the harvest taken in the annual fall hunting seasons. At present Alberta has relatively high bag limits as the Cervidae populations are all high in most sectors of the province in which favorable habitats are present.

TABLE 2 - ECOLOGY OF INDIGENOUS CERVIDAE

SPECIES	GENERAL HABITAT	DISTRIBUTION	FORAGE	INTRASPECIFIC RELATIONS	INTERSPECIFIC RELATIONS
Mule Deer (*Odocoileus hemionus*)	-stream courses & hill-slopes in open prairie and parkland -General parkland & foothills habitat -Seral stages of mixed-wood forest	-Throughout Alberta except for extreme north-west corner. -Highest populations in foothills & local areas of seral forest growth	-Browse	-Loose aggregations -Family bands -Seasonal migrant in foothill & mountain habitats	-aggressive if bands are relatively stable
White tailed Deer (*Odocoileus virginanus*)	-Wooded stream courses in prairie & parkland -General parkland & foothill habitat -Seral stages of mixedwood forest areas in close proximity to settlement	-Throughout settled Alberta, predominantly south of 55°N -Highest populations in areas with good escape cover, stream courses, ecotones	-Browse	-loose aggregations Family bands	-can be aggressive if in herds
Wapiti (*Cervus canadensis*)	-foothills, parkland, mixedwood forest	-once found throughout province except for extreme north-east corner, now predominantly in foothills & lower mountain slopes	-Browse -Grass (Versatile forage habits)	-herd animal -seasonal migrant	-aggressive
Moose (*Alces alces*)	-mixedwood forest -stream courses -aquatic and muskeg habitats	-found throughout forested areas of the province	-Browse -Aquatic vegetation	-solitary	-generally non-aggressive
Caribou (*Rangifer spp.*)	-mature & overmature forest stands -muskeg areas	-scattered throughout northern forested sector and in favourable mountainous habitats	-Browse (lichen)	-herd animal -seasonal migrant	-normally not aggressive

Sources: Taylor, W. P., 1956, Soper, J. D., 1964, Seton, E. T., 1929.

Albertans are not hunting to the extent they are allowed by legislation. Many larders are not to any extent dependent on "wild meat" as all their required meat products are bought across the retail store counter.

Throughout Alberta's recent history populations of indigenous Cervidae have fluctuated widely in direct relationship to the man-Cervidae interrelationships prevalent during particular periods. This pattern could continue in the future too unless management of these populations is based on scientific data forthcoming, and unless these animals are looked upon as definite and necessary assets to the continuation of the total picture of life in the province. No longer can we think in terms of one species of animal and its continuation or elimination in a particular area, but, we must look at the species in relationship to its total environment, both the biotic and abiotic components.[12] Various aspects concerning the ecology of indigenous Cervidae are shown in Table 2. One can easily note the general range patterns of these species within the Albertan environment by using Table 2.

Sanctuaries, refuges, management of hunting preserves alone are not the answers for the future existence of indigenous Cervidae in Alberta. Man has the ability to modify or completely destroy favourable habitats of members of this Family and as such must undertake the responsibility of maintaining some of the very environment he is constantly encroaching upon. The environmental approach must be applied in the management scheme concerning indigenous species and since distribution is an integral factor of the ecology of an organism it must be taken into account as must all other aspects of an organism's lifeways.

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[12]Odum, E. P., 1966, Ecology, Mod. Sc. Series, Holt, Rinehart & Winston Inc.

Distribution, as a part of ecology or as a factor on its own, is a fascinating aspect of biogeography. When considering the distribution the total environment must be taken into account in order to fully understand the life of the organism. This thesis, although mainly a literary review, attempted to document the distribution of indigenous Cervidae from the historical point of view. A field study complete with photos and range data would be extremely helpful for the present day distribution of these species. It is hoped that this review may serve to bring many interesting and highly valuable study possibilities to the attention of interested students of ecology.

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