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Wildlife of Manitoba

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THE WILDLIFE OF MANITOBA

by

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INTRODUCTION

The Province of Manitoba

The Canadian province of Manitoba as established in 1870 is bordered on the east by the Province of Ontario, to the south by North Dakota and Minnesota along the 49th parallel, to the west by the Province of Saskatchewan and to the north by the Northwest Territories and Hudson Bay on the Arctic ocean.

Manitoba is 160.6 million acres in area, of which 135.5 million acres is land and 25.1 million acres fresh-water; 76.8 percent of all land is crown land under provincial jurisdiction and 1.5 percent crown land under federal government control. Only 21.8 percent of the land is privately owned by individuals and corporations. This portion is found mainly in the southern agricultural areas of the province.

The privately-owned land is organized into municipalities if a sufficient tax base exists or as local government districts if the population will not support a workable municipal tax assesment (7, 112).

Due to recent glaciation, the land mass has a relatively flat or undulating topography (maximum elevation 2,727 feet) which is poorly drained. Drainage, which is normally slow, is mainly northward towards the Arctic ocean (53). Extensive freshwater areas (lakes, potholes, marshes, rivers) cover 25.1 million acres (160).

The southern part of Manitoba is overlain by a deep, fertile deposit of glacial soils and this region is moderately to intensively farmed. Agricultural cultivated land approximates 9,000,000 acres in these regions. North of the farming area the country is forested and the soil is infertile (120, 55).

The climate of Manitoba is characterized by long cold winters and

cool, sunny summers. The frost free period ranges from 120 days in the southern areas to less than 70 days in the extreme north.

Annual precipitation is moderate (16 to 22 inches) and most of it falls as rain during May and June. Average annual snowfall is 45 to 60 inches (53).

Manitoba's 1964 population census was approximately 958,000 people (3.83 per square mile), the majority of whom live within 80 miles of the United States border.

Scope and Objectives of the Present Paper

The Province of Manitoba is a large and dynamic area undergoing great changes in its increasing human populations, intensive and extensive land use practices, economic and cultural development and natural resource utilization and abundance.

Wildlife populations have been and are still being affected by all these changes. Under the influence of civilized man and his innumerable activities, some wildlife species have become extinct and others greatly reduced; still others have been introduced or arrived by natural immigration. There have also been abrupt and fluctuating changes of ranges, distributions and abundances of different species. It is my contention that the welfare, distribution, diversity and abundance of wildlife cannot be effectively explained, managed for, or separated from man's use of and influence on the vegetation, landscape, soil and water.

Many studies have been completed and data compiled regarding the Province's wildlife; some are scientifically based and others are layman's impressions and predictions. These studies, while valuable contributions, have seldom presented wildlife as affected by man's land use. Such a

synthesis is the object of the present report.

Only E. T. Seton (128) in "Lives of Game Animals" and R. D. Bird (19) in his "Ecology of the Aspen Parkland of Western Canada" have attempted to provide an overall unifying approach to wildlife populations as related to man's changing of the land and its associated natural resources.

This thesis is, therefore, presented not primarily as a compendium of information regarding wildlife biology in the Province of Manitoba, but as a correlated presentation of recorded information on wildlife in Manitoba supplemented by personal research, evaluations and experience in land use practices.

Information contained herein is intended to provide a reference for wildlife biologists and managers, resource planners, conservation agencies and private citizens interested in or entrusted with the welfare of wildlife in the Province. It will also be useful, it is hoped, in education.

It is recognized that the facts required to rationally manage and regulate wildlife populations are not all known. However, perhaps this admittedly imperfect document will provide some stimulation to a few to attempt to add further to our knowledge of the relationships of wildlife resources to the land and man.

With regard to wildlife and land use, modern progress is often rapid and unruly. Sauer (123) stated: "Locomotion should be slow, the slower the better; and should be often interrupted by leisurely halts to sit on vantage points and stop at question marks." In wildlife and land-use relationships in Manitoba, there are many such remaining question marks but little leisure.

The term wildlife implies many different things to different people; game, fur, recreation, pest, bird watching; but in this paper a basic assumption is made that most wildlife is a necessary and valuable resource and is important to the citizens of the Province and to others who come to Manitoba to partake of the aesthetic, recreational, scientific and economic values that it provides.

Current trends in conservation include a multiple use approach to natural resources of the land. It is hoped that private citizens and agencies to whom the responsibility of land usage and its products are entrusted will consider wildlife in its proper perspective and make decisions and lay plans whereby the many animal species will continue to survive or flourish.

The scope of this paper is restricted to game birds and animals, fur-bearers and non-game species of economic importance, omitting oceanic species.

For those interested in classical faunal accounts, the following references will prove valuable:

J. Dewey Soper, 1961. The mammals of Manitoba. The Canadian Field Naturalist. Volume 750. October, November, and December.

E. S. Thompson, 1891. The birds of Manitoba. Proc. U.S. Natl. Mus. 13:457-643. Washington

R. M. Anderson, 1946. Catalogue of Canadian recent mammals. Natl. Mus. Canada Bull. No. 102.

B. J. Hales, 1927. Prairie birds. MacMillan Co. of Canada, Ltd., Toronto.

V. W. Jackson, 1934. A manual of vertebrates of Manitoba. Winnipeg. University of Manitoba. pp. 26-41.

V. E. Shelford and A. C. Twomey, 1941. Tundra animal communities in the vicinity of Churchill, Manitoba. Ecology 22:47-69.

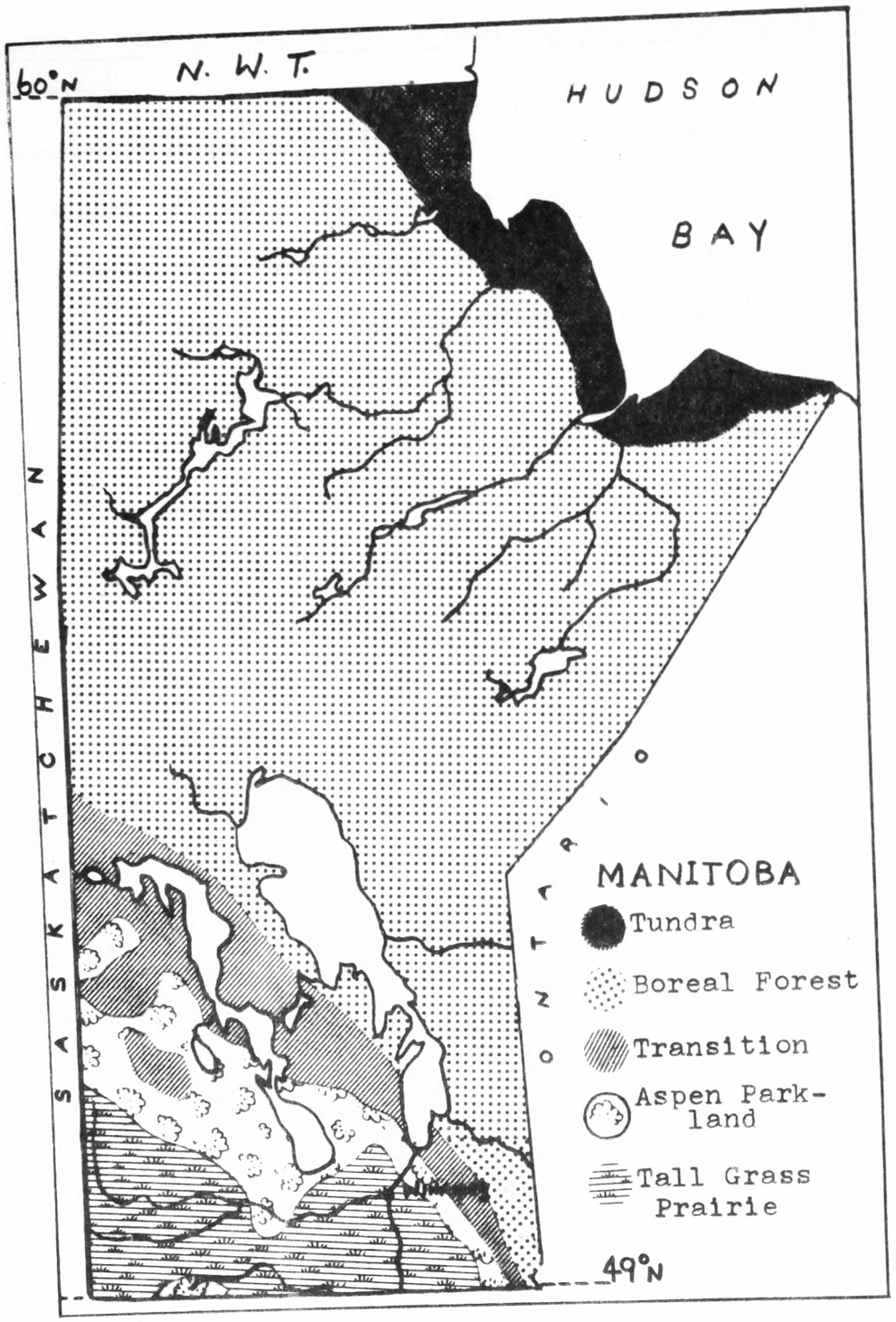


Fig. 1. Vegetative Zones

(19, 53)

II. NATURAL VEGETATIONAL ZONES OF MANITOBA AND THEIR MODIFICATION BY LAND USE.

Vegetative zones in Manitoba are not clearly separated; they are simply general regions of similar plant growth. These regions are the result of variable interactions of the climate, edaphic conditions and plant species. The local plant composition within a zone is frequently altered by fire, control of fire, animal populations and land use practices. Environmental gradients are gradual, and zonation boundaries are irregular and quite often constituted, in fact, by ecotones or ecological gradients. However, the following five major vegetation zonations of Manitoba occur as we proceed northward from the southern boundary of the Province to the Arctic ocean: Tall grass prairie, aspen parkland, transition zone, boreal forest and tundra.

1. Tall Grass Prairie.

Area location in Manitoba	extreme south
Approximate percent of area covered . .	5-8
Human habitation	high density
Ownership	private, corporation, municipalities
Land use changes of major importance . .	extensive and intensive cultivation, overgrazing, use of controlled fire, use of herbicides and pesticides, urbanization
Approximate percentage cultivation . . .	85-100

The extreme southern area of Manitoba adjacent to the U. S. border has been classified as the tall grass prairie zone (19). This area was originally a northern expression of the true prairie (Stipa-Sporobolus

association) (19). Prior to settlement, the original prairie was held as a tall grass subclimax due to the regular occurrence of extensive fires; in the absence of fire (and with sufficient moisture) western snowberry and wolf willow invaded these areas, weakening the grass cover and allowing the establishment of the aspen poplar, willow and shrub associations characteristic of the aspen parkland (19). Seton's vegetational map of 1907 indicates far more extensive areas of grassland than subsequently existed twenty years later, this was because of fire suppression in the interim (126, 19).

Water courses, potholes and lakes in the tall grass prairie zone are bordered by various trees and shrubs; principally willow, cottonwood, aspen poplar, green ash, oak and elm.

The spread of these trees and shrubs to the grassland was originally checked by the repeated fire but with the advent of agriculture, fire was suppressed (1870 to 1900) and succession progressed toward vegetation characteristic of the aspen parkland (19).

Almost all of the original tall grass prairie zone is under extensive and intensive cultivation, so very little of the true grassland remains (19). The glacial soils of this zone are deep, black and fertile and produce abundant yields of both cereal and forage crops (55). Widespread cultivation has resulted in a shortage of cover, a tendency accelerated by the trend toward clean farming. This results in low carrying capacities for most wildlife. Wildlife persists in light densities throughout the area mainly in conjunction with the shrubby cover found along scattered watercourses, drainage ditches and field shelterbelts (19).

2. The Aspen Parkland.

Area location in Manitoba	south, south central
Approximate percent area covered	10-15
Human habitation	high to moderate
Ownership	private and corporation (municipalities)
Land use changes of major importance	extensive cultivation, moderate acreages of intensive cultivation, drainage, overgrazing, wide use of herbicides, urbanization, controlled fire
Approximate percentage cultivation	50-80

The aspen parkland zone lies between the tall grass prairie and the more northerly transition zone. The soil, of glacial origin, is deep, black and fertile but in many places poorly drained. This area is liberally interspersed with small potholes and shallow glacial lakes (91).

In contact with prairie, aspen is considered climax but the plant succession of grassland vegetation to forest is usually slowed by climate and edaphic conditions and may be reversed in times of drought (19).

With settlement and the subsequent check of the regular prairie fires the aspen parkland zone spread southward and for a short period of time occupied the former tall grass prairie (126, 19). At the present time, land clearing for agriculture has checked this southward invasion. Further, agriculture now progresses northward, destroying the vegetation of the aspen parkland at a rapid rate (19).

Vegetation in the parkland zone is dominated by the aspen poplar; associated with it are willow and a variety of fruit and berry producing

shrubs. The aspen-willow associations are normally clumped in an uneven distribution mixed with grassland and potholes; however, solid stands of aspen do occur in the northern regions of the zone (19).

Within the aspen bluffs is a well-marked shrub stratum composed of willow, hazelnut, red osier dogwood, cranberry, chokecherry, pincherry, saskatoon, snowberry, and wild raspberry (124, 19). These shrubs provide excellent food and cover for game birds and animals.

The aspen parkland zone is presently the habitat of abundant populations of waterfowl, sharp-tailed and ruffed grouse, and white-tailed deer.

3. Transition Zone.

Area location in Manitoba	south central, south eastern
Approximate percent area covered . .	5-8
Human habitation	moderate to light
Ownership	limited private, mostly crown land under provincial jurisdiction, some local government districts
Land use changes of major importance.	limited agricultural cultivation, extensive overgrazing, fire controlled and uncontrolled, limited pulpwood and timber logging, limited recreational development
Approximate percentage cultivation. .	5-15

The transition zone, a wide ecotone of the aspen poplar and white spruce associations, lies along the northern edge of the parkland (120). This zone is characterized by diverse flora which, as we proceed northward, changes into spruce associations characteristic of the boreal forest zone (5, 124). Plant succession is from aspen poplar to white spruce but is often slowed by the feeding effects of rodents and deer

and may be completely reversed by cultivation or fire (19). Irregular patches of grassland are scattered throughout the transition zone where repeated fires or cultivation have killed both aspen and white spruce.

In association with aspen and white spruce are birch, cottonwood, tamarack, jackpine, black spruce and juniper. Shrub species similar to those of the aspen parkland occur throughout this area (124). The transition zone is moderately interspersed with wetlands in the form of potholes, marshes, lakes and deltas.

4. Boreal Forest.

Area location	extensive area in central, eastern and northern Manitoba
Approximate percent area covered	60-70
Human habitation	extremely light
Ownership	crown land under provincial control
Land use changes of major importance	extensive, annual, uncontrolled fires, limited pulpwood logging, limited mining, limited recreational development
Approximate percentage cultivation	0

The boreal forest zone (open and closed) covers an area estimated at 112,000 square miles in central and northern Manitoba (120). It is an infertile, poorly drained region and many lakes, swamps and muskeg occur throughout the area (5b). Ritchie (120) described the boreal forest as a general climax consisting of white spruce except in the wetter areas where black spruce predominates. The boreal forest is relatively open, and characterized by low annual precipitation and long hours of sun during the summer period when high air temperatures (80°-100° F.) normally occur. The winters are long, extremely cold and dark.

Trees in the boreal forest are of low stature, bearded with lichens and associated with a heavy ground cover of moss, lichens and small shrubs (92, 120).

The ground cover in the boreal forest zone is highly inflammable and in Manitoba fires are common, with an average of 500,000 acres burned annually (5b). Fires (since settlement) have become more frequent in this area and, due to lack of roads and limited equipment, are under only limited control. The clear cut harvesting of pulpwood is common in the boreal forest zone and the ecological effect is similar to that of fire (5a, 19); namely a replacement of an open, mossy forest with a profuse growth of deciduous shrubs (146). In Manitoba, due to extensive annual fires and limited logging, much of the boreal forest remains continually in a subclimax condition (5a, 120).

5. The Tundra.

Area location in Manitoba	extreme north
Approximate percent area covered	8-10
Human habitation	extremely light to none
Ownership	crown land under provincial jurisdiction
Land use changes of major importance	limited fire
Approximate percentage cultivated	0

When scattered tree growth of the open boreal forest is finally suppressed by a combination of severe climatic and shallow, infertile soil conditions, there occurs an open, undulating, rock strewn and boggy area covered by mosses and lichens. The tundra in Manitoba is located adjacent to the Arctic ocean along the coast of Hudson Bay (120). Shrubs

and trees (willow and white spruce) in the tundra are limited to the lower alluvial slopes and sand eskers found along the rivers and streams (120). Ritchie (120) hypothesized that the occurrence of tree growth along the watercourses of the tundra indicate that the almost complete absence of trees over the rest of the area is not controlled directly by climate but probably by a combination of the lack of suitable soil, climate and permafrost. Fire has influenced the nature of the vegetation to only a limited degree.

The climate of the tundra region is characterized by short, cool summers (70 frost free days) and long, dark, cold winters. Precipitation is moderate and many wetlands (bogs and marshes) occur along the coast of Hudson Bay.

BACKGROUND TO CHANGES IN LAND USE

Prior to settlement, the tall grass prairie was an extensive area of grasses and forbs interspersed by tree-lined watercourses. The grasslands were maintained primarily by the frequent prairie fires and the grazing of large herds of buffalo and elk.

The aspen parkland and southern transition were characterized by an intermingling of grassland and groves of aspen poplar and associated shrubs. Trees grew most abundantly along watercourses and on the margins of the potholes and marshes. The tall grass and forbs furnished luxuriant pasture and the aspen excellent cover for abundant game herds of buffalo, antelope and elk; aquatic communities supported high populations of waterfowl and furbearers (19, 33). Fires, which occurred both naturally and were also set by the native Indians, periodically overran and opened the forest communities of both the aspen parkland and transition zones (19).

In short, the present agricultural prairies and parkland originally contained two major plant communities, forest and grassland. Within these were many aquatic communities. The vegetative pattern was an intermingled mosaic of irregular patches and solid stands of grasses and trees (19).

Slow changes began with the fur trade, but the early trade (1670 to 1800) did not notably change the land or the wildlife. However, from 1800 to 1870, severe competition among rival fur companies severely reduced most wildlife populations (see section on Furbearers).

Periods of rapid change began with settlement and subsequent agriculture. The rich alluvial soil of the southern regions was admirably suited to cultivated crops and the climate, while bitterly cold during winter, was cool, sunny and moist during the summer, ideal for cereal grain and forage crop production (94, 19).

From 1870 to 1890, large scale agricultural immigration took place. Early immigration was by steam boat on the Red and Assiniboine rivers; later, railroads were important. By 1881, the transcontinental rail system had crossed the Province (19).

The period 1870 to 1900 can be termed the period of horse-subsistence agriculture. This era saw the initial plowing of the virgin prairie, the introduction of cereal grains, weeds and livestock and the continued depletion of most game animals by unregulated killing at the hands of the settlers. Prairie fire control was initiated. Agriculture was of the subsistence type. The horse was the main source of power.

In reviewing Seton's map of 1905, one notes that the shrublike parkland vegetation was moving southward during this period. Particularly noteworthy are changes in the "Big Plain" grassland areas described by

Seton (126) as extending from Carberry located in south-central Manitoba to Russel on the Saskatchewan border. This area, once devoid of trees, is now either cultivated or covered by flora typical of the aspen parkland zone (126, 128).

The era 1900 to 1925 can be termed the period of horse-commercial agriculture. The horse was still the main source of farm power, settlement of the tall grass prairie and aspen parkland was completed, the land was in private ownership and fire was controlled. This period of agriculture was moderately beneficial to most wild game because food and cover were increased by intense interspersions of grassland, aspen bluffs and small irregular fields of cereal crops (19).

The period of 1925 to the present time may be described as the era of tractor-commercial agriculture. Mechanization started slowly but has increased in momentum. As an indication; in 1932 only 195 tractors were sold in Manitoba; by 1938, in contrast, 3,008 were sold and in 1949, 7,441 (19).

Tractors provided the necessary tool for forest land clearing and wetland drainage, and during the period 1946 to 1952, an average of 46,000 acres of new land was cleared and broken annually for the production of cereals, hay crops and cattle. The prosperity of the post-war era (1945 to the present) reduced the value of the aspen poplar as a fuel resource, since other purchased fuels replaced it. Aspen is now classed as a weed species and cleared bluffland is burned and cultivated. This clearing continues and the size of fields and farms increases. Over 9,000,000 acres of the former prairie and parkland zones are now under cultivation (95).

Under mechanized agriculture, tall grass prairie and woody cover is replaced by cropland, most suitable wildlife habitat decreased and wind and water erosion of the soil increased. The expanding human population, the improved road system and extensive use of the automobile has increased the hunting pressure on all game birds and animals (19).

This privately-owned agricultural land was originally Manitoba's most productive habitat base for wildlife. The establishment of an agricultural economy brought about great changes in wildlife diversity and abundance; these changes can be directly related to the effects of civilized human habitation and to changes in the plant community which supplied food and cover for wildlife. Some species became extinct in the Province (antelope, grizzly bear) while others were greatly reduced (mule deer, buffalo, elk, timber wolf, black bear, fisher, marten). In addition, some species that were not native to the Province immigrated into the area from the south (white-tailed deer, magpie, western white-tailed jackrabbit) and became established.

Species dependent on man's creation of a suitable habitat were accidentally (Norway rat, house mouse, house sparrow, starling) or intentionally (Hungarian partridge, ringnecked pheasant) introduced.

In the north, vegetation in the northern transition, boreal forest and tundra zones has been significantly altered by extensive fires, mining, limited logging and road development over the last 100 years. Recreational use of these areas has also increased.

The chart on the following page illustrates the trends.

Land use practices such as cultivation and fires or control of fires have changed the land base habitat. This has altered the range, distri-

bution and abundance of native wildlife species (19). In addition, the human population of Manitoba is still increasing rapidly. The current increase, while mainly restricted to urban areas in the southern part of the Province, will add to the recreational use and conservation problems of the Province's wildlife resource. Manitoba is also centrally located and will experience increasing recreational demands on its wildlife by an ever-increasing, mobile North American population. Conservation and land use planning for Manitoba's wildlife resources would do well to recognize future demand by both resident and non-resident populations.

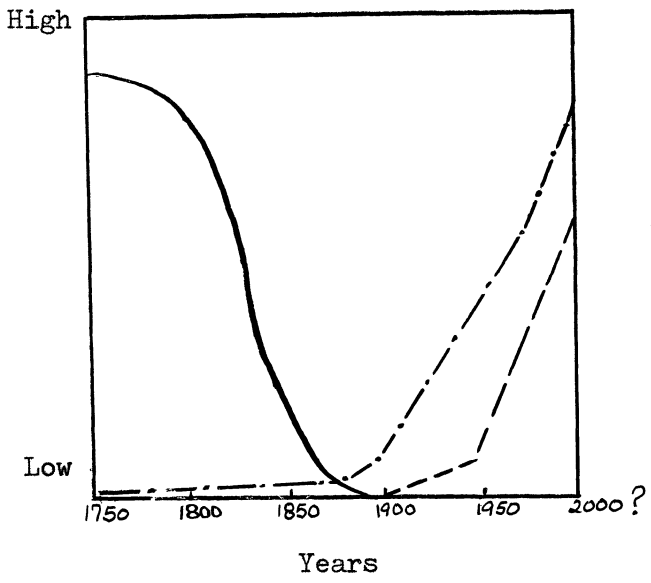


Fig. 2. Trend Chart.

——— Buffalo
------ Mechanization and Cultivation
-.-.-. Human Populations

Figure 3 illustrates the present farmland and potential farmland.

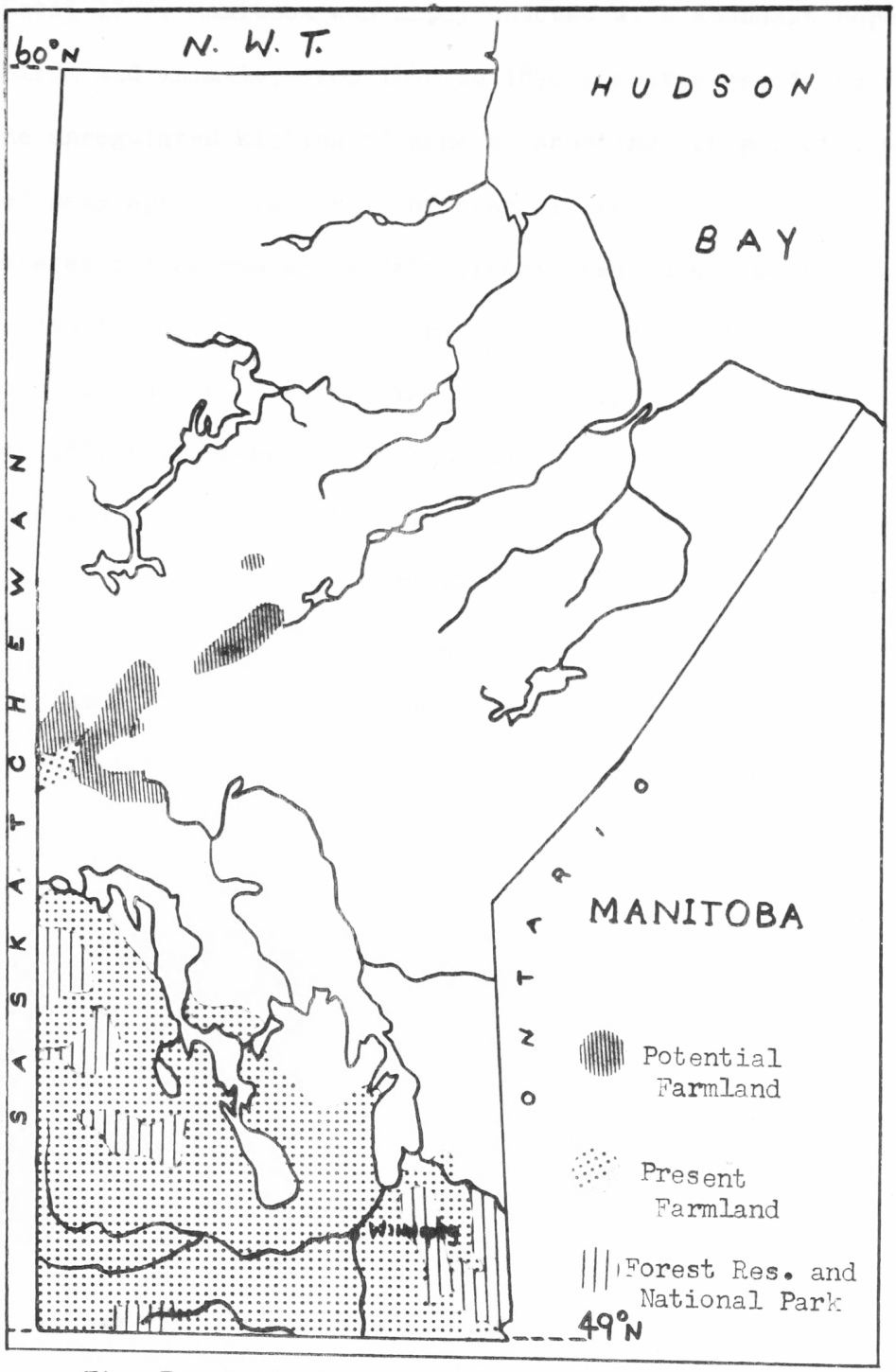


Fig. 3. Agricultural Areas of Manitoba.

III. GAME LAW ENFORCEMENT AND GAME MANAGEMENT.

Until 1840, Manitoba was amply endowed with abundant populations of game birds and animals; from 1840 to 1870 competition of the fur trade and the unregulated killing of game by shooting, traps, fire and poison reduced many species to levels of near extinction (19).

Wherever firearms are widely distributed among the people, some regulation of hunting is necessary to avoid over-killing of wildlife. Enforced regulations are the first sound step in game management. From 1670 to 1876 there were no regulations. In 1876, six years after the Province was established, the first game act was passed. From then until 1930, there were game laws, regulations and frequent revisions extending the closed season and imposing bag limits but through lack of public support these regulations were not enforced and had little effect on the continued year-round exploitation of game (19).

No management programs, however good, can succeed unless the regulations enacted to maintain the resource are obeyed or can be enforced. It is only since 1930 that more effective game law enforcement and management has come into being.

Table 1 compares the regulations (for species listed) of 1876 with those of 1964.

In addition to recognizing the need for enforcement of regulations, Manitobans have recently become aware of the need for habitat conservation and scientifically based wildlife management. G. W. Malaher (from Bird, 19), Director of the Wildlife Branch, Manitoba Department of Mines and Natural Resources, summarized this change in attitude as follows:

"There has been a growing recognition of the place of research in

management....Protection alone will not enable a species to survive if the environment in which the species thrives no longer exists. ...It is gratifying to report that during the period under review (1940 to 1953) research has taken an increasingly important place in the management of our fish and wildlife resources."

Table 1. Comparison of 1876 and 1964 Game Law Regulations.

Species	Length of season in days	Limits	Length of season in days (app.)	Day	Possession	Season
Sharptailed grouse	229	*	22	4	8	N
Pinnated grouse	229	*	NO SEASON			
Waterfowl (ducks)	284	*	98	5	10	N
Waterfowl (geese)	284	*	98	5	10	N
Deer	244	*	12		One Deer	
Elk	244	*	NO SEASON			
Moose	244	*	63		One Moose	

* No limits (daily, possession or seasonal).
N indicates "None"

The public has also become interested. For example, the Manitoba Federation of Game and Fish Associations--a co-ordinated, private group of conservation-minded sportsmen and interested citizens--was incorporated in 1945. The 1965 membership stands at 10,500, a figure representing 1.3 percent of the Provinces' total population and over 20 percent of its sportsmen (142).

The Royal Canadian Mounted Police and the Wildlife Branch of the Provincial Department of Mines and Natural Resources enforce game laws. In addition, the Wildlife Branch is entrusted with the responsibility of research and management of Manitoba's wildlife resources. Many private individuals and scientists in other fields have contributed substantially to current knowledge. Reference to these are in Literature Cited.

SUB-INDEX #1

THE UPLAND GAMEBIRDS

Upland gamebirds in Manitoba can be broadly divided into two main groupings; those native to the area and those introduced either artificially or by recent natural immigration. Native species include the sharp-tailed grouse, ruffed grouse, and spruce grouse; there are also two species of ptarmigan (rock and willow) which are found in the northern regions of the Province.

Upland gamebirds non-native to the Province include such species as the Hungarian partridge, the ringnecked pheasant, wild turkey and the pinnated grouse or prairie chicken.

In Manitoba the general distribution of each upland species can be broadly related to the classified vegetative zones occurring in the province. A description and general discussion of each of these zones is included in Section II.

Manitoba's upland gamebird populations are violently cyclic; this creates special management problems (76, 19). However, to allow the "highs" of the population cycles to remain "high" requires the constant maintenance or creation of near optimum habitat (food and cover) conditions. With regard to upland game, land use practices which reduce or remove habitat are detrimental; those practices which create habitat are beneficial. This discussion will point out that the vegetative type (form and extent) of the area a game manager is dealing with will determine which of these factors (beneficial or detrimental) are exhibited by any specific land use practice on a given area.

Maintenance or creation of good habitat is an essential game management requirement. Leopold (87) stated, "If there is any breeding stock

at all the one and only thing we can do (as private citizens or wildlife managers) to raise a crop of game is to make the environment (habitat) more favorable."

Since the advent of agriculture (1880) land use practices have affected the gamebird habitat of Manitoba. Changing land use practices such as brush clearing, burning and intensive cultivation benefit a few species but are detrimental to many. In this section habitat changes, relative importance, management, present range and possible future of each upland gamebird species will be discussed.

1. Sharp-tailed grouse.

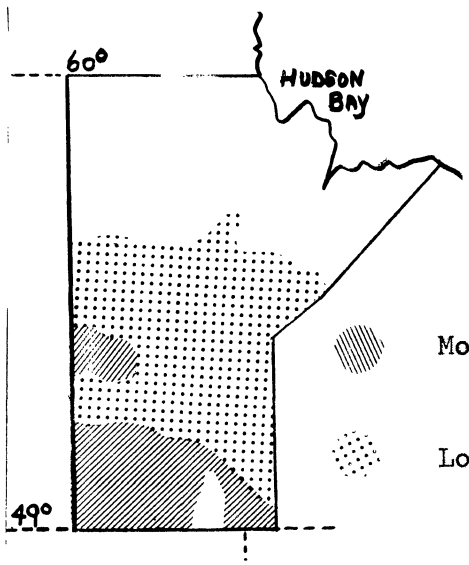


Fig. 4. Distribution of sharp-tailed grouse.

The sharp-tailed grouse is the most important upland gamebird in Manitoba; light to dense populations of these birds occur throughout the parkland, transition and southern half of the boreal forest zones (19, 156d,e,f,g).

The areas of maximum sharp-tail abundance are characterized by

aspen parkland vegetation; they include such districts as the Riding Mountain area, the periphery of Lake Manitoba, the extreme south-west section of the Province, the southern Interlake area and the Shoal Lake-Russel area. Abundant sharp-tail populations also occur in eastern Manitoba in the conifer zone; an area interspersed with grassland and limited cultivation (156g).

Sharp-tail populations are violently cyclic in Manitoba and highs of these cycles have been recorded in the years 1931, 1942, 1952 and 1963; indicating an approximate 10 year cycle. Managing cyclic species poses special problems, for example: In the peak year of 1952, 80,980 sharp-tails were recorded killed by hunters during the regular fall season; in 1962, the next peak, the kill exceeded 100,000 birds. In contrast, in the period 1944 to 1948, the season was closed due to a scarcity of sharp-tails and the future persistence of this species as a gamebird was in doubt (156f).

Sharp-tailed grouse management in Manitoba has included increased bag limits in years of high density and reduced bag limits or complete closure of the season in the decline and low density years (156g). The maintenance of wide-spread, optimum habitat, which is the key to sustained annual sharp-tailed grouse production, is the major problem facing upland gamebird managers in Manitoba (156f).

Food Habits. Sharp-tailed grouse chicks, like the young of most upland gamebirds, feed largely on insects during their first four weeks of life. Grasshoppers and crickets are important sources of insect foods in Manitoba (19).

During summer and fall, sharp-tail food consists largely of the

seeds of wheat, oats, barley, flax, buckwheat, and sunflowers but the wild fruits and berries of shrubby vegetation such as the wild rose, chokecherry, saskatoon and poison ivy are also important (19). The plant portion of the summer-fall diet consists mainly of the leaves of grasses, alfalfa, clover and annual weeds (19, 66, 97).

Winter diets are largely made up of the buds of the aspen poplar and willow and fruits of the wild rose and snowberry (66, 19). The use of this low quality, winter food is an important adaptative feature of the grouse as it insures an ample supply of food above the snowline during winter months (147). Waste cereal grains are also utilized during the winter; especially if made available by high winds blowing bare patches in otherwise snow-covered grainfields.

Bird (19) considered sharp-tails as important agents in the dispersal of seeds such as snowberry. Krefting and Roe (83) found that viable seeds do occur in sharp-tail droppings and passage through the digestive tract may aid in breaking seed dormancy. In their study, poison ivy seeds taken from sharp-tail droppings exhibited good germination; rose and snowberry seeds (undamaged by the gizzard) showed improved germination. It appears that sharp-tails are distributors of some of their own food plants.

In Manitoba, winter food is not considered as important a limiting factor as winter cover (156e). Cyclic irruptions and depressions of the sharp-tailed grouse population occur regardless of the availability of either food or cover (19).

Habitat and History. In southern Manitoba, when moisture is sufficient and fire infrequent, aspen poplar and associated shrubs such as

willow invade tall grass prairie (19). Areas of high interspersion of aspen-willow bluffland, grassland, prairie and grainfields are excellent for sharp-tail habitat (144). Since the early 1880's, the suppression of fire by settlement (allowing such succession and interspersion) has increased the extent of sharp-tail grouse habitat in southern Manitoba (127); conversely, fires in the more northerly transition and boreal forest zone remain common (5) and in these areas are important in creating early succession grass and shrubland which improves sharp-tail habitat.

Both sharp-tailed and pinnated grouse increased during the 1920-1940 era of "horse" agriculture in Manitoba (19). This type of agriculture, relatively non-mechanized, non-intensive and wasteful in its grain harvesting techniques (threshing) provided increased food and cover conditions. Grainfields were liberally mixed with young aspen and willow bluffs, and grain from strawpiles and stocks was an important source of food. Bird (19) stated that in this habitat (1920-1940) all-time peak abundances of sharp-tails were recorded. The drought conditions, mild winters and widespread grasshopper outbreaks of this period undoubtedly contributed to these high populations.

Since 1940, intensified cultivation (70 percent or more of total acreage) has reduced the farmland habitat. Buss and Dziedzic (27) studying sharp-tail habitat in Washington noted that populations increased as the percentage of cultivated land increased to 70 percent of the total acreage. Sharp-tails declined as land use intensified beyond this point. In general, Manitoba sharp-tail population trends agree with this land use correlation.

Presently, large areas of excellent sharp-tail habitat remain in areas of eastern, central and western Manitoba (8). Much of the area indicated as supporting dense populations consists of only 40 to 60 percent total cultivated acreage (19). It is evident, however, from the recent acceleration of bluffland clearing, extensive cultivation, increased mechanization and clean farming, that these areas will, in the future, have reduced carrying capacity for sharp-tailed grouse (95).

Special Habitat Requirements. Sharp-tailed grouse have special habitat requirements. Bird (19) and Edminster (54) consider patches of bare ground (used as dusting areas) as essential.

In the spring, dancing grounds (sites of courtship) are necessary and normally common. These areas consist of grassy hills or rises. In the Shoal Lake area of Manitoba, knolls in cultivated summerfallow fields or located in closely cut or grazed grassland were favorite spring dancing grounds. In late October the birds returned to these areas and morning concentrations of 20 to 40 birds were not uncommon. Fall gatherings did not exhibit the "dance", and normally only remained for a short period of time before flying to feeding areas (personal observation).

Nesting cover consists of open brushland or grassland interspersed with bluffs; nests are frequently found near clumps of aspen poplar (54). Edminster considered renesting as rare in sharp-tailed grouse, but Cartwright (28) stated that in western Canada renesting is common and may be an important safety mechanism in staggering the hatch. Widespread, severe chick losses due to the short but frequent periods of inclement weather commonly occurring during hatching time are thus avoided.

Resting cover in the fall (Shoal Lake) depended on cloud conditions. It was frequently noted that on sunny days in the late fall (October) sharp-tails concentrated in areas of overgrazed pastures containing mature willow and aspen bluffs but very little understory. In this open habitat the birds may detect danger more readily and may also more fully utilize the warmth from the feeble rays of the fall sun.

On cool, cloudy days the birds avoided such open areas and preferred tall grass and dense willow bluffs.

Fall and winter night cover in Manitoba is natural tall grass or more frequently the dense stands of dry bullrush, phragmites and sedge-grass found in relatively dry or frozen sloughbeds. The sharp-tails move into these areas at dusk and emerge at dawn (19).

Combinations of dense stands of willow and aspen, tall grass and deep snow provide winter cover. The sharp-tail is admirably adapted to survive the rigorous winter conditions of Manitoba; scales on the edges of their feet and toes grow out enabling snow walking and winter plumage is dense and well developed (19). These grouse frequently burrow under the snow especially at night, in blizzard conditions or during extremely cold weather. The lack of adequate winter snow may increase mortality.

If, during the winter, a heavy snowfall is accompanied by sleet or rain, a crust of snow and ice may form. If sharp-tails are burrowed in at this time, the crusting may prevent emergence. In situations such as this, severe local mortality may occur (personal observation).

Land Use Practices Encouraging Sharp-tails. Limited cultivation (in agricultural areas) and controlled burning are essential in providing optimum sharp-tailed grouse habitat (65, 27). Relatively little is

known about summer cover requirements but Hamerstrom (66) believes woody or brushy cover and the edge effect of bluffs (willow, aspen, hardwoods) are important; land use practices that create such edge are beneficial.

Cultivated cropland sown to alfalfa and perennial grasses or left in oat or wheat stubble is used by sharp-tails throughout the year (66).

The creation of open meadows (particularly in dense forest areas) by fire, logging, mowing or grazing is helpful as open areas provide nesting cover and abundant insect populations important to the chicks as food (19). Controlled burning opens the forest canopy and stimulates the production of berry-producing shrubs. Amman (3) working in Michigan found that the elimination of forest openings (by natural succession or planting) was extremely detrimental to sharp-tail habitat.

In central and western Manitoba, the loss of cover by the bulldozing of the aspen bluffs and the increased cultivation of natural grassland is of more importance to habitat than closure of the forest but in the transition and boreal forest zones closing of the forests could be an important detrimental factor. It appears that practices are beneficial or detrimental to habitat depending upon the vegetative type and extent of the cover under consideration.

Land Use Practices Discouraging Sharp-tails. Closed, climax forest growth in the boreal forest zone and over 70 percent total acreage cultivation combined with the removal of bluff-edge and heavy grazing in the aspen parkland and transition zones, are all factors reducing or eliminating the productivity of sharp-tail habitat (97, 27).

In Manitoba, mechanized agriculture, which has encouraged intensified and increasing cultivation and land clearing is a major contributor

to loss of habitat. It may also cause direct mortality (19, 95). Baird (10), working in Saskatchewan, considered agricultural practices such as late spring burning of stubble or grasses, early cultivation, and mowing as major sources of nest losses. Marshall and Jensen (97) suggest that a significant reduction in nest loss can be achieved by delayed hay cutting, late fall stubble cultivation (instead of early spring) and the restricted late burning of grassland and stubble. The Manitoba Department of Agriculture strongly opposes stubble burning, considering it detrimental to soil conservation. Farmers, however, normally burn at will; the extent of fall or spring burning depends largely upon weather conditions (95). It is significant to note here that with sharp-tailed grouse production (as with many other forms of wildlife production) good soil conservation practices and good wildlife management practices can be entirely compatible if wildlife needs are incorporated into such practices.

Predation. Bird (19) lists the winter resident goshawks and snowy owls as efficient predators of sharp-tailed grouse. Foxes, skunks and coyotes probably take a small toll each year but predation is probably not a major annual mortality factor. Predator control can be classed as a "back door" approach to sharp-tail management; the maintenance of suitable sources of food and cover is far more important in maintaining a high level of annual sharp-tail production.

Management and Future. To maintain large sharp-tailed grouse populations on private farmland, the presence of at least thirty percent of the total acreage uncultivated is essential (27). In the privately-owned agricultural area of southern Manitoba indications are

that cultivation will reduce this percentage and ultimately eliminate sharp-tailed grouse (19).

The Game Branch of Manitoba fully realizes the necessity of good habitat to sharp-tailed production, and since 1960, regular habitat evaluations have been made in the agricultural districts (156c). The Game Branch, however, is powerless to limit brush clearing and cultivation on private land and it is only through the co-operation of the local landowners that the habitat can be maintained. In future, the Agricultural Rehabilitation and Development Act and its multi-use approach to land use management may be influential in acquiring and preserving some key habitat areas in the agricultural zone.

As a basis for annual hunting regulations, permanent sharp-tail range transects have been laid out and followed each spring to census the breeding population. In addition, 135 dancing grounds have been identified and annual spring counts made to determine population trends (156f). Wing samples from hunter-killed birds are also processed to determine age, sex ratios and annual productivity. The annual bag limits and length of season are established from results of these censusing techniques (156d,e,f).

Recently, in attempts to determine mid-summer populations and movements, provincial biologists have worked with the professional dog trainers (U.S.) who utilize Manitoba's large sharp-tail ranges to train their dogs (156g). In agricultural areas, reduced quality habitat created by increased bluff removal and subsequent cultivation will ultimately result in the reduction or elimination of the sharp-tail from much of southern and central Manitoba. This will happen unless the

production of gamebirds on private land becomes commercially important to the landowner.

In these areas of increased clearing and cultivation, the Hungarian partridge, a bird of the open fields, may succeed the sharp-tail as the local resident gamebird. If sharp-tails are highly valued in the agricultural zone, steps should be taken to obtain a voluntary restriction of cultivation. The restriction of cultivation on submarginal land combined with proper management could ensure good future production potentials. Sharp-tails on the forested crown lands (federal) have a good future potential provided proper techniques (limited burning and logging) are used by management to keep this habitat in a condition conducive to sustained, annual production.

The value placed on this gamebird (or any other gamebird or animal) by Manitobans will ultimately determine whether or not they remain as a huntable product of the current multi-use approach to land resources.

2. Ruffed Grouse.

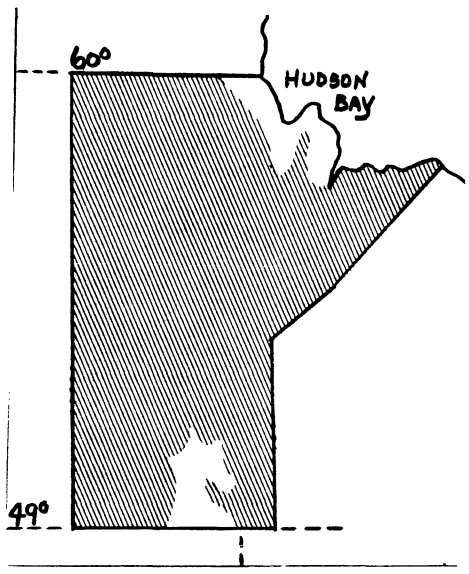


Fig. 5.
Distribution of Ruffed Grouse.

The ruffed grouse is the second most important upland gamebird in Manitoba. Its adaptability to varied habitat enables this grouse to occupy a wide range of forest types. Habitat in Manitoba includes the tree and shrub-bordered watercourses of the now-cultivated tall grass prairie, the dense aspen and willow stands of the parkland, the transition zone and the entire boreal forest zone (8). In these varied habitats, grouse populations range from low to high densities depending on the suitability of the local area. A 10 year population cycle occurs regardless of habitat conditions but habitat strongly influences the density of birds (76, 156e,f,g).

Habitat. Edminster (54) described ideal ruffed grouse habitat as 80 to 85 percent woodland (½ conifer, ½ hardwood), the remaining 15 percent being brushland except for 2-4 percent which would be open areas. Optimum arrangement of these cover types would be openings adjacent to brushland, adjacent to hardwoods-conifer forest land.

The following table 2 lists functional cover types used by ruffed grouse during the four seasons of the year (80, 54).

Table 2. Functional-Seasonal Cover Types Used by Ruffed Grouse

COVER TYPE	SEASON OF USE	FUNCTION SERVED
OPEN LAND: Farm fields, meadows, bareland, marsh edge	Mainly summer; some use in spring and fall.	Enhances value of adjacent cover; dusting and sunning, insect food supply.
BRUSHY AREAS: Overgrown fields, slashings, aspen and willow.	Summer and fall; some use in spring.	Brood cover, fall feeding on buds, fruit, berries, summer feeding, leaves; dusting, spring and some winter feeding.

COVER TYPE	SEASON OF USE	FUNCTION SERVED
HARDWOOD STANDS: Northern and western hardwoods, (Oak, green ash, maple, cottonwoods, basswood, aspen poplar)	Summer and fall; limited spring.	Nesting; fall and winter feeding.
MIXED WOODLANDS: Variety of interspersion; a combination of hardwood and conifer species.	All year.	General feeding; shelter, escape cover (except for summer).
CONIFEROUS WOODLANDS: Variety according to predominant conifers, Spruce-Fir-Pine-Tamarack-Cedar	Winter, some spring and fall.	Winter shelter, escape cover and storm shelter.

The brushy areas, used primarily in summer and fall provide good shelter and are a source of insect food important to chicks. In general, uneven-aged stands and mixed cover types provide optimum grouse habitat. Openings in the forest canopy allow more sunlight to reach the forest floor; this increases shrubby food-plant growth; openings also provide more edge effect and allow interspersion of the existing cover types.

Special Requirements. In winter, snow depths (12" or more) provide an important source of cover. King (80) found that ruffed grouse may spend the greater part of each winter day in forms under the snow; particularly when temperatures are near or below zero. Temperatures in this range are common in Manitoba in the period from November to April. Snow cover, in addition to providing protection from severe weather, also aids in the prevention of predation by such carnivorous birds as

the great horned owl (19, 80).

Grouse require bare soil areas for dusting and dietary sources of sand or gravel for digestive purposes (80, 48, 19). Drumming areas of fallen logs are also desirable additions to grouse habitat and are used as courtship areas in spring (80).

Land Use Practices Encouraging Ruffed Grouse. Fire is common in the forested areas of Manitoba and if limited can be valuable in creating grouse habitat. Fires, both controlled and uncontrolled, burn over 500,000 acres of forest land annually in the aspen-parkland, transition and boreal forest zones of Manitoba (5b). The total area covered by these zones, all of which provide some ruffed grouse habitat, exceeds 141,000 square miles. Succession following forest fires produce profuse growths of fireweed, raspberry, chokecherry, pincherry, blueberry, and saskatoon (19). These shrubs bear fruit and berries important as food to the ruffed grouse.

Clear cutting of pulpwood, common in the boreal forest zone, provides openings which allows the growth of the food and cover shrubs described above.

Edminster (54) regards controlled fire in the forest as a useful tool in grouse habitat management. Woodland protection, improvement by selective cutting and the planting of desirable food types of shrubs are also intensive management practices but are of little use in the necessary "natural" management of habitat areas as large as those found in Manitoba.

In settled areas, light grazing by cattle may improve ruffed grouse habitat; trails made by livestock open the cover providing dusting

grounds and encourage the growth of such food-producing shrubs as the wild raspberry (48).

Land Use Practices Discouraging Ruffed Grouse. Uncontrolled fires and the extensive clearing of forest and brushy edges for agriculture tend to create monocultures which are undesirable and unproductive as ruffed grouse habitat. Overgrazing by livestock which destroys understory and ground cover is also detrimental (48). Brush clearing followed by intensive, widespread cultivation eliminates grouse habitat.

Management and Future. Ruffed grouse are cyclic in Manitoba and subject to rapid and severe population reductions or "crash" declines. For example, 1961 was the only year the ruffed grouse kill exceeded that of the normally higher annual sharp-tailed grouse kill in Manitoba. In 1962, the ruffed grouse kill had dropped by two-thirds and in 1963 and 1964 the hunting of ruffed grouse was prohibited (156e,f,g). King (80) suggests that shooting should be terminated in low population years and this management approach has been practiced in Manitoba for many years. It seems reasonable that a closure of the grouse seasons in heavily hunted areas such as King described would help to insure that sufficient breeding stock survived through the low population years, but Manitoba's grouse, when considered as a total population, are rarely over-hunted and even in habitat located close to high-density human populations (Winnipeg area) they are lightly hunted. In my opinion, the blanket closure of the grouse season is not biologically required as low populations of grouse and a resultant low hunter success reduce hunting pressure automatically.

Closing the ruffed grouse season in remote northern Manitoba is

really insignificant because grouse are rarely, if ever, hunted in the area in any year.

The basis for Manitoba's fall hunting season regulations are formulated from extensive spring appraisals of the grouse population. Drumming counts and habitat population transects are used (156d). If such surveys indicate favorable breeding populations, seasons are held; if unfavorable, seasons are closed.

The ruffed grouse will remain a cyclic but important gamebird in Manitoba. The grouse are relatively unwary and, except under extremely dense habitat conditions, easy to shoot (19). Local over-kills are probably limited to areas of a combination of poor cover and easy accessibility. The vast majority of ruffed grouse range is of the boreal forest type; remote, little affected by intensive land use practices and relatively uninhabited. Until roads are constructed into these areas, the majority of grouse will remain largely unharvested. In many northern areas, the populations may be considered unhunted and in a natural condition.

Land use practices of clean farming and intensive cultivation will adversely affect the scattered low density ruffed grouse populations found in the tall grass prairie and aspen parkland zone.

3. Franklins or Spruce Grouse.

Spruce grouse are common in light population densities throughout the extensive coniferous boreal forest area of Manitoba (8). Scattered colonies of this species also occur in areas where boreal forest and aspen poplar intermingle (transition zone) and in isolated coniferous areas such as the Spruce Woods forest reserve located in central Manitoba (156d).

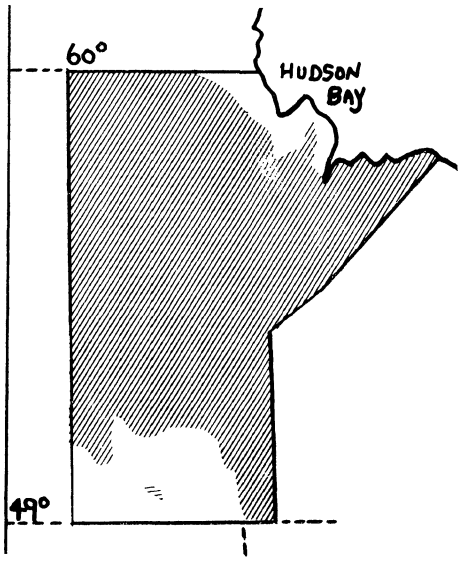


Fig. 6. Distribution of Franklins or Spruce Grouse.

Habitat. Spruce grouse habitat is often regarded as consisting of climax coniferous forest of mixed jackpine, tamarack and white or black spruce associations. The spruce grouse, however, reaches maximum population levels in interspersions of conifers, deciduous trees, berry producing shrubs and open meadows (159). The winter diet of spruce grouse consists primarily of jackpine needles, but summer and fall diets may include tamarack needles, deciduous leaves, berries, seeds and insects (42). In summer, water is considered important but nests are frequently found ½ mile or more from it. The grouse may rely on dew and succulent plants as water sources during the summer period (130).

Land Use Changes Affecting Spruce Grouse. Forest fires and logging operations may be beneficial or detrimental to spruce grouse habitat, depending on their extent. Extensive fires and large scale forest practices promoting monocultures over large areas are detrimental. Small burns (5 to 10 acres) combined with pulpwood clear cutting and other regulated logging are beneficial: The resulting removal of forest

litter and the opening of the canopy allows regeneration of desirable fruiting and shrub species and provides nesting areas (130). Insect populations, important to the chicks as food, may also be increased by the creation of forest openings.

Management. The range of spruce grouse in Manitoba has changed little if any from pre-settlement periods. Populations are cyclic but have probably shown an overall increase with habitat improvements promoted by the land use practices (limited fire, logging) mentioned above. Spruce grouse, due to their remote habitat, light population densities, simple food requirements, low value as a game species and widespread ranges, are in little danger of extinction in Manitoba.

In the future, the hunting of spruce grouse may increase with the increasing human population, but it is unlikely that this will have an overall detrimental effect. At the present time, the lack of roads and impassable terrain conditions typical of boreal forest spruce grouse habitat render this "tame" bird invulnerable to other than local area over-hunting. The total range area is in excess of 112,000 square miles, most of which is currently impassable by conventional transportation (5b).

4. Ptarmigan: Willow and Rock.

Rock and willow ptarmigan occur in northern Manitoba. The rock ptarmigan, a hardier species, if found only in the extreme northern area of the tundra. This bird winters in the vicinity of the tree line and summers entirely on the true tundra along the coast of Hudson Bay.

Food habits of the rock ptarmigan are not well known but Shelford (129) described the diet as consisting of practically any vegetation

the birds can find with preference shown towards willow buds.

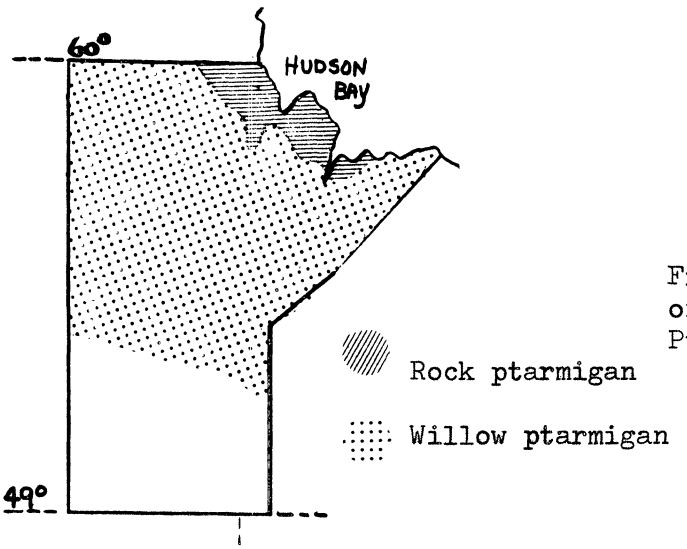


Fig. 7. Distribution of Rock and Willow Ptarmigan.

Habitat. The willow ptarmigan spend their entire life cycle in portions of the boreal forest zone. When their populations are high, there is a tendency to migrate southward; these migrations have been frequently noted as far south as the northern end of Lake Winnipeg and the area of the Saskatchewan River delta located near The Pas (8).

Management. Ptarmigan habitat areas lack roads and so are largely inaccessible by the more common methods of transportation. The birds are rarely hunted by other than the native Indians, Eskimos and white trappers and traders resident to the area. The bag limit has long been 15 birds per day (30 in possession) but is of little significance due to the rarity of recreational hunting (156d,f,g).

The ptarmigan may presently be considered as unmanaged and will remain so until their habitat becomes more accessible and they are subject to hunting pressure. Mining, pulpwood logging, and fishing are industries which may, in future, provide roads into the north and

the ptarmigan range, but to predict at what future date large scale recreational hunting of ptarmigan will occur is impossible.

The range area of ptarmigan is undoubtedly affected to some degree by fires but just what effect fire may have on the habitat potential to produce ptarmigan is unknown.

Introduced or Non-Native Immigrants.

5. Prairie Chicken

Note: Range area in the province is undetermined.

The prairie chicken or pinnated grouse first appeared in Manitoba about 1900 (19). It is believed that this early establishment coincided with the creation of a habitat of tall grass prairie interspersed with grain fields, but the prairie chicken may also have extended its range northward in response to a warming climate. Seton (127) reported that early settlers (1890 to 1910) referred to this bird as the "Minnesota prairie chicken", a non-resident bird that had emigrated into the area from Minnesota and North Dakota.

From 1910 to 1935, the prairie chicken was as common as the native sharp-tailed grouse but large increases in cultivated acreage in the early 1940's with the accompanying reduction of the native tall grass prairie resulted in the reduction of prairie chicken populations. In the mid 1950's, a closed season was declared and at the present time, the prairie chicken is a rare bird in Manitoba and protected from hunting (19).

Land Use Changes Encouraging Prairie Chicken. To improve suitable large tracts of grassland habitat, proper pasture management on native grassland is important. Moderate grazing which maintains the forage

resource is highly beneficial. Controlled burning of grassland areas and the planting and maintenance of field shelterbelts and hedge rows provide good nesting and escape cover (10).

Land Use Changes Discouraging Prairie Chicken. Interspersion of small grainfields with comparatively large tall grass prairie encouraged the prairie chicken. Baird (10) and Yeatter (161) state that prairie chicken are basically intolerant to habitat change, requiring more grassland than the sharp-tail and in larger units. Baird (10) also suggests the grassland must be at least 40 percent of the total habitat and if interspersed with cropland the minimum unit should be 2,000 acres in size.

The prairie chicken requires specialized habitats throughout the season: Spring booming or courtship grounds of open rises and sparse cover; nesting areas of pastures, hayfields and dry marshes and rearing areas of native grassland (10, 19). The prairie chicken seldom renests if the initial nest is destroyed by mowing, burning or predation (10). Losses at nesting time may be high due to fires, floods, or mechanical damage by machinery. Extensive agricultural cultivation (over 70 percent) in an area eliminates productive habitat (10, 19).

Food Habits. The food habits of prairie chicken are similar to those of the sharp-tailed grouse discussed in an earlier section.

Future and Management. Stempel and Rodgers (140), tracing the history of the prairie chicken in Iowa, reported populations had increased as the percentage of cultivated land increased up to 70 percent of the total acreage. Intensified land use (over 70 percent) and the plowing of native grassland reduced the habitat and rapid population

declines or even disappearances followed these practices. The decline of the prairie chicken in Manitoba can be correlated to the post-drought period of intensified agricultural cultivation and subsequent elimination of the original tall grass prairie (19).

Prairie chicken, an important game bird in the early agricultural period (1910 to 1940), will now probably remain rare. Agriculture is important to Manitoba and cultivated crop acreages are increasing each year (95). Severe drought conditions with accompanying idled land and early plant succession would probably allow re-establishment of prairie chicken, but with the return to more normal moisture and intensive agriculture, prairie chicken populations would again decline. The future of the prairie chicken as a potential game bird in Manitoba appears negligible.

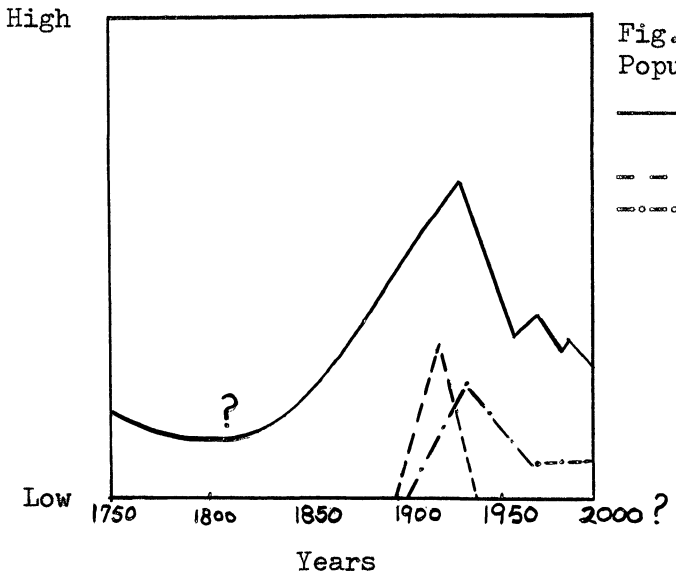


Fig. 8. Trend Chart.
Populations:
——— Sharp-tailed grouse
– – – Pinnated grouse
—·—·— Hungarian partridge (introduced)

6. Hungarian Partridge.

The Hungarian partridge was first introduced into western Canada in 1908-1909 when 207 pairs were released in Alberta. Initial releases

in Manitoba occurred in 1923-24, when 60 pairs were released in the central portion of the province. The drought periods of the 1930's aided the "Hun" in becoming well established in an extensive cereal cropland and grassland habitat. This partridge is considered an extremely successful introduction and peak populations were recorded in 1937-38. Substantial populations remain today in the croplands of central, western and southern Manitoba (19). The "Hun" is cyclic in Manitoba as are all other upland gamebirds (76).

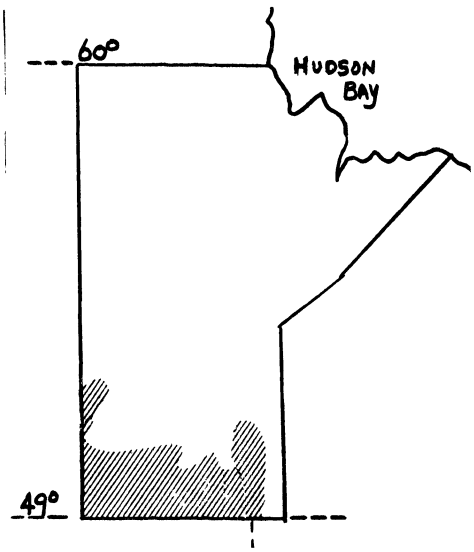


Fig. 9. Distribution of Hungarian partridge.

Habitat Requirements. The Hungarian partridge obtains both food and cover from open, extensive cereal cropland and grassland habitats. Good Hungarian partridge populations occur in large, cool, flat and relatively dry areas of cropland where smaller areas of grassland, weeds or bluffs occur interspersed among the grainfields (2). Leopold (87) suggests that optimum range for this partridge consists of 75 percent cultivated land and 25 percent grass or shrubland.

Nesting cover for "Huns" consists of hayfields, weedy or grassed

fencerows, ditch banks, grainfields and roadsides; the majority of nests are located within 30 feet of some path or roadway (162).

In Manitoba's normal severe winter conditions (snow, wind, cold) the "Huns" use tall grassland, stubble or weed patches more frequently and may even migrate to farmstead or field shelterbelts, willow-bordered potholes, brushy drainage ditches and creek or river bottoms.

Food Habits. Insects constitute a large portion of the chick diet and are also eaten by adult birds. Grasshoppers, ants, crickets, beetles, flies and centipides are frequently found in crop samples (19, 54).

Following the first month of life, this partridge feeds mainly on plant materials (54). Waste cereal grains; wheat, oats, barley, and sunflowers are frequently utilized. Wheat is the most important year-round food in Saskatchewan and is probably equally as important in Manitoba (54). The vegetative parts of cereals and legumes (alfalfa, clover) are often eaten. Weed seeds are important in the diet, particularly those of annual weeds such as pigweed, wild oats and false ragweed (19). Grit is essential (87).

Land Use Practices Discouraging Hungarian Partridges. Clean farming, involving the tillage of grassland, extensive thorough fall cultivation of stubble and the removal of weedy ditches and fence lines are detrimental to Hungarian partridge habitat. These practices eliminate food supplies and nesting and escape cover. Nests of the Hungarian partridge may be destroyed by the early mowing of hayfields, spring tillage of stubble and spring fires on both stubble and grassland. Yocum (162) reported that mowing of hayfields accounted for 72 percent of nest losses and tillage of stubble fields 11 percent.

Weed spraying with herbicides of headlands or roadsides, extensive fall or late spring burning of stubble and grassland, and overgrazing by domestic livestock also reduces cover and discourages Hungarian partridges (19).

Land Use Practices Encouraging Hungarian Partridges. Good soil conservation practices promote good Hungarian partridge habitat. Conservation practices such as the planting of shrubby field shelterbelts (caragana, willow, poplar) and increased forage crop acreages (alfalfa, bromegrass, meadow fescue) are beneficial to Hungarians. Soil erosion control involving the seeding down of gulleys, spoilbanks and steep slopes to perennial grasses also provides important habitat. The current field shelterbelt program of the Manitoba Department of Agriculture and Conservation is extensive in the open cereal grain areas of the province and will be a valuable asset to the Hungarian partridge populations in these areas (95).

Note: Trees and shrubs are supplied free of charge to farmers who pay the shipping costs, plant, and maintain the shelterbelts (95).

The clearing of large areas of aspen parkland bluff is opening parkland area and thus improving and extending Hungarian partridge habitat in this region (19).

Mortality Factors. Land use practices involving spring tillage, burning and mowing destroy nests. The characteristic "Hun" habit of huddling close together on the ground at night facilitates predation (19). Snowy owls which migrate into southern Manitoba during the winter have been observed to be effective predators on Hungarian partridge (19, 67). In late winter, the "Huns" often feed along snow-free

roads and railway tracks picking up spilled grain and gravel; as a result of this habit, large numbers have been noted killed by automobiles and locomotives (19).

Future and Management. The extensive clearing of aspen bluffs and brush from the central parkland can be expected to result in expanded Hungarian partridge range in Manitoba.

An open season of approximately three weeks duration is held on Hungarian partridges each fall and coincides with the regular upland gamebird season (156f,g). Hungarian partridge are difficult to hunt and the fast-flying, scattered coveys are relatively invulnerable to overhunting. The use of dogs in the hunting of upland gamebirds is uncommon in Manitoba and until dogs are used the "Huns" may be resident to other than sporadic local overkill due to hunting. "Huns" may not hold well even to dogs and their habits of running, hiding and preferring open stubble should prevent the heavy killing of birds from any one covey.

If drought conditions comparable to the 1930's recur in Manitoba, the Hungarian partridge populations can be expected to increase.

7. Ring-necked Pheasant.

The pheasant range of Manitoba is currently restricted to a small semi-arid area in the extreme southwest corner of the province adjacent to the North Dakota-Saskatchewan border (8). Pheasant populations in this area are of low density (156d).

Past Pheasant History Correlated to Land Use. The 1930 droughts forced extensive human migration from farmland in southern and western Manitoba. The abandoned farmland reverted to early succession annual

and biennial weeds such as sunflower, sweet clover, false ragweed and pigweed. These provided important sources of food and cover for pheasants (19). During the 1930's, pheasants emigrated into the area from North Dakota and maintained high populations for several years. The mild, snowless winters characteristic of the 1930's aided in their establishment. Idle farmland and harvesting practices such as the stocking and threshing of cereal grains and the waste associated with these practices (providing food and cover) allowed the pheasants to maintain high populations for a few years following the actual drought period. Short hunting seasons were permitted on cock pheasants during this time (19, 156a).

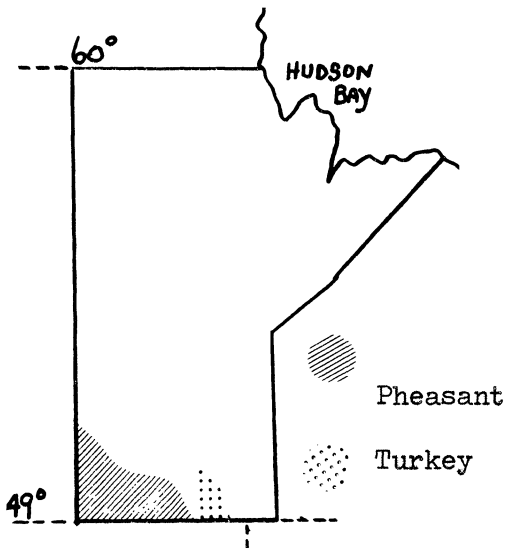


Fig. 10. Distribution of pheasants and wild turkey.

It is significant to note a parallel in North Dakota pheasant populations. Peak populations also occurred in the Dakotas in the early 1940's and declined from 1944 until 1956 (79). Duebbert (49, 51) correlates the increase in pheasants in North Dakota with the occurrence of 25 percent idle cropland following the drought years 1931 to 1936. He suggests that increases in cultivated acreage and intensified

mechanization of agriculture since 1944 have been instrumental in the decline of pheasant populations. Parallels to the above observations can be found in Manitoba's pheasant history; but in addition, Manitoba pheasant range is further north, the winter weather is more severe, and the pheasant population decline has been more marked.

The end of the drought in Manitoba was followed by severe winters, good summer moisture conditions and the resumption of extensive cultivation by a resurgent agriculture. These conditions decreased pheasant habitat and the pheasant population declined (19).

In the periods 1945 to 1948 and 1955 to 1958 an intensive rehabilitation program involving the release of thousands of pen-reared birds was carried out but it did not significantly benefit the status of pheasants in Manitoba (142). The population has remained too low since 1957 for any recreational hunting (156a,c,g).

Limitations to the Growth of Pheasant Populations in Manitoba. The status of the pheasant as an upland gamebird species will remain doubtful in Manitoba. The range is marginal at best for the following reasons: In periods of drought, light snowfall and mild winters, pheasants do well but seemingly cannot adapt to the normal long, cold winter and deep snow with accompanying food and cover shortages. The phenomenon of suffocation due to ground drifting of snow has been frequently noted (19). In addition, the pheasant has not learned to shelter in forms under the snow as do sharp-tailed grouse; or to subsist on the buds and berries of shrubs above the snowline. Pheasants require a seed diet (waste cereals) and prefer to scratch for their food (19). Manitoba winters are normally long (November to April) with

deep snow (2 feet plus) and low temperatures; food such as required by pheasants is often unavailable for long periods of time during the winter.

Present Status. Small, scattered populations of pheasants maintain themselves in Manitoba but no increase has been noted since 1955 (156c). Pheasant populations today are chiefly the result of natural immigration from North Dakota. Hunting seasons on pheasant have been curtailed since the unsuccessful season of 1957 following extensive releases.

It can be concluded that southern Manitoba is at best a marginal pheasant area located on the extreme northern fringe of the central North American pheasant range. Pheasants have not been worthy of mention in Game Branch reports during the last five years and survive in only small numbers (156g). Further releases are probably biologically inadvisable. Periodic drought periods could conceivably result in increased immigrations and subsequent natural increases.

8. Wild Turkeys.

In 1959, five southeastern locals of the Manitoba Federation of Game and Fish Associations formed an organization called "Wild Gobblers Unlimited" which purchased, imported and released 125 wild turkeys in Manitoba. The sportsman groups released the birds at twelve different points in the general vicinity of the "Pembina Trench"; an area that forms the upper watershed drainage area of the Pembina river which flows into North Dakota. The 1965 wild turkey population in this area is estimated at 1,500 to 2,000 birds (142).

The "Pembina Trench" is hilly and extensively wooded, consisting

primarily of a deciduous mixture of scrub oak and aspen poplar with its associated fruit and berry-producing shrub layer mentioned earlier (see Aspen-Parkland).

Wild turkeys require large (10,000 acres) habitat areas of mast bearing trees (147); the wooded area of release, although large enough, has not a great abundance of such trees. Since 1959, it has been shown that the wild turkey can survive and raise its young in Manitoba, but severe winter mortality and the intermingling of wild and domestic birds has been frequently recorded. The winter range is critical and annual winter migrations to the vicinity of farmyards and granaries has been noted (156e).

Manitoba's habitat for wild turkeys is marginal due to the annual relative shortage of winter food (covered by deep snow) combined with normally low and severe winter temperatures (-25° F. is common). The Game Branch (156) considered the introduction biologically unsound, but Stevenson (142) indicates the transplant has been successful in establishing a resident population. The final test will be whether or not the wild turkey can survive an exceptionally rigorous winter (none has occurred since 1955-56) and reproduce well enough to become truly wild without winter feeding, thus providing recreational hunting (156d).

9. Discussion.

Present indications are that Manitoba's upland gamebirds will continue to be important recreational resource assets only if their habitat is maintained. An extensive loss of habitat resulting from current land use practices is presently occurring in the southern half

of the Province.

Intensive agricultural land use practices are rapidly reducing the total area and production potential of upland gamebird habitat. It is unlikely that much can be done to reconcile agriculture and wildlife production in these privately owned areas. Wildlife will be produced mainly as an incidental product of other land use practices unless the production of wildlife becomes economically beneficial to the landowner. In agricultural areas, reduced wildlife populations may be benefited by good soil conservation practices.

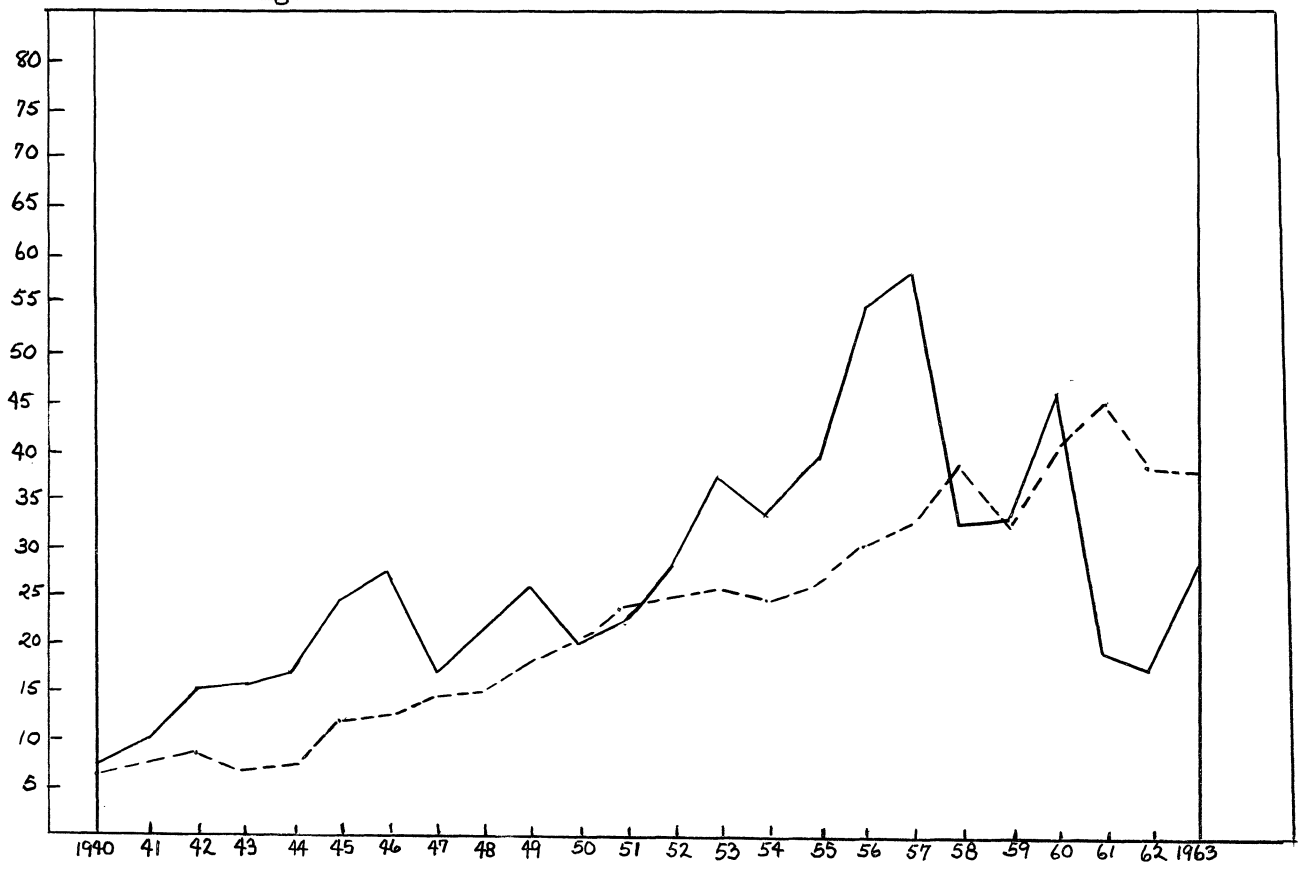
Management of gamebird habitat on crown land is feasible and here lies the future base for upland gamebird production. Land agencies which currently dictate policies regarding land use on crown land will influence the ultimate wildlife productivity of these areas.

It appears that future non-endemic gamebird introductions should be curtailed; the more logical approach to gamebird management is to preserve or create better habitat and relieve land use or environmental pressure and competition from the existing native or successfully-introduced species. This would allow natural population increases. The restocking of native birds to "burned out" areas seems feasible providing the habitat has been restored prior to any re-introduction programs.

In the future, the opening of the Manitoba's vast northern area to conventional travel will allow the harvest of currently isolated gamebird populations; this will be advantageous to recreational hunting and may somewhat relieve increased hunting pressure on the resident southern gamebird populations.

SUB-INDEX #2

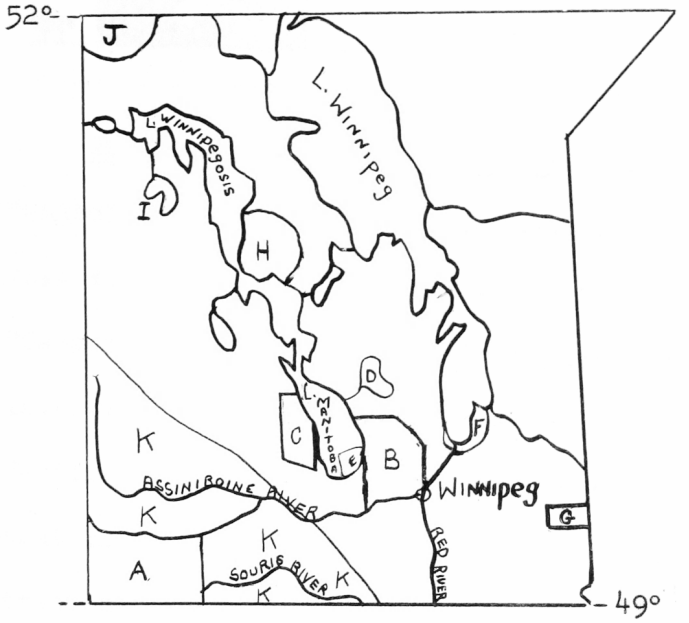
Fig. 11. Waterfowl Kill and Numbers of Hunters 1940-1963.



——— Waterfowl Kill (in tens of thousands)
– – – Numbers of Hunters (thousands)

(156c-g.)

Fig. 12. Gamebird Management Areas in Southern Manitoba.



A. Sharp-tail and pheasant management area.
B. Morning only hunting of Geese in these management areas.
C. Same as above.
D. Dog Lake Goose management area.
E. Delta marshes.
F. Netley and Libau marshes.
G. Whiteshell Game Preserve and A. E. Hole Goose Refuge.
H. Red Deer refuge.
I. Swan Lake refuge.
J. Saskatchewan River Delta.
K. Pothole areas.

POTHOLES, MARSHES AND SOUTHERN LAKES

a. Description and Relation to Duck Ecology and Production.

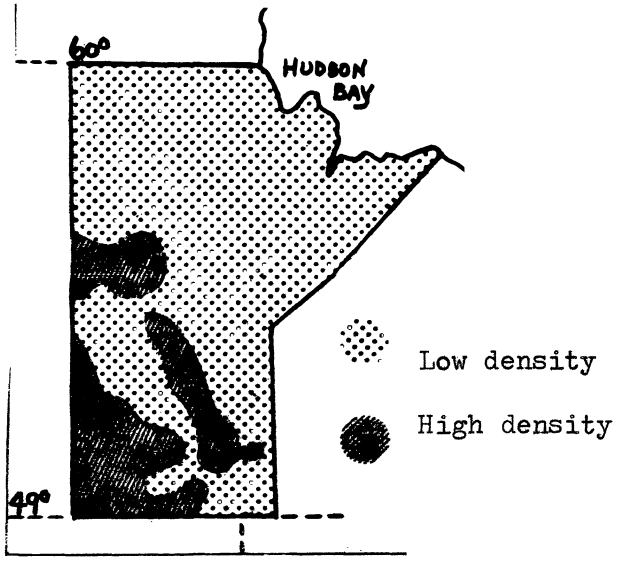


Fig. 13. Breeding season densities of ducks in Manitoba.

The Area and Its Importance to North American Waterfowl Production.

Manitoba lies astride the Mississippi and a portion of the central waterfowl flyways (72). West and south of the geologic formation known as the "Canadian Shield," the underlying shale and sedimentary rocks are overlain with rich silts and glacial drift. Soils in this area are rich and fertile (55). This is the agricultural region of Manitoba and it is here that the most productive marshlands and potholes, and the heaviest concentrations of breeding ducks of the Mississippi flyway are found (72, 19; see Map No. 2). The following table indicates the spring and summer water regime of the 1,006,000 acres of wetland located in this region, one of the most productive duck production areas in North America.

In 1963 this southern wetland of Manitoba supported a spring breeding population of 507,000 ducks; in 1964 the breeding population was 482,000 birds (149). These spring breeding populations make up 8-10 percent of all breeding ducks in North America during those two years.

Table 3. Summer Water Regime of Prairie Potholes, Marshes, and Southern Lakes. Total Water Area 1,006,000 Acres.

(Potholes, Marshes, Shallow Lakes, Farm Ponds)

	Depth	Classification	% of Total Wetland Acreage	Value as Waterfowl Nesting Area
A.	+ 5'	Permanent	3.6	Good
B.	3' to 5'	Semi-permanent	10.4	Most Important
C.	1½' to 3'	Intermittent	15.6	Drought Prone
D.	18" or less	Temporary	43.1	Droughty
E.	+ 15'	Open Lakes	27.3	None--Resting area value only

Note: 61% of the potholes (all but E) are less than one acre in size (91, 19).

Southern Manitoba is semi-arid with a mean annual rainfall of 20.83 inches at Winnipeg and 16.1 inches at Russell. These sites lie at the eastern and western boundaries of the Manitoba pothole area respectively (53). Most of the annual precipitation falls as rain during May and June. Summer drought is common to the region and accounts annually for the major juvenile losses of prairie ducks (90). Snow melt is the primary source of water for the spring filling of the potholes and southern marshes, but run-off from localized heavy showers may occasionally refill wetland areas during the summer period (19).

Pothole Formation and Characteristics. Potholes vary in water depth (18 inches to 5 feet plus); they are generally less than one acre in size (91). These wetland areas are heavily utilized by nesting ducks of both the dabbler (mallard, pintail, teal, gadwall, baldpate) and diver (canvasback, redhead, scaup) groups. Lynch (91) considers the 3-5 foot depth (semi-permanent) and the 5 foot depth (permanent) potholes of pri-

mary importance as breeding areas but the difference between an average crop of ducks and a bumper crop is decided by the annual water condition and subsequent production of the shallower potholes (temporary and intermittent), see table 3. The shallower potholes are most susceptible to destruction by agriculture and are periodically affected by drought (19).

Table 4. Topography of Southern Manitoba Land Area Illustrating Effects of Glaciation and Potential to Drain.

Level to undulating	40.1 %
Moderately undulating	40.7 %
Rolling	11.8 %
Eroded, etc.	7.4 %
(91).	100.0 %

The potholes of the prairie and aspen pakland regions are poorly drained or undrained depressions formed by melting blocks of ice during the retreat of the last glacier. These formations are geologically referred to as "kettles"; however, in local nomenclature such areas are termed "potholes" or "sloughs". The potholes range in size from a few hundred square feet to 20 or 30 acres. The density of potholes in Manitoba varies from 3-4 to more than 120 per square mile (19). They may be divided into two basic types, freshwater and alkaline. Freshwater potholes are normally small and shallow with much emergent vegetation around their margins. Vegetation includes cattails, phragmites, bulrush, grasses and sedges. The open water areas are normally choked with a heavy growth of submerged plants (139, 19). The surrounding edge or nesting cover consist of lowland grasses such as wild barley, wheat grasses and whitetop. Interspersed with these edge grasses are shrubs and trees such as willow and aspen poplar (19, 139). Alkaline potholes (pH. 6.5 to 8.5) are characteristically

larger than the freshwater type and shorelines are often encrusted with white salts (21, 19). The alkaline classification of potholes is probably a misnomer. Peters (109), studying "alkalinity" in soils in Manitoba, found that a more accurate term of classification would be saline; the occurrence of truly alkaline water in the Province is relatively rare, but saline ponds are common.

Edge vegetation of saline potholes is characteristically halophytic (19).

Freshwater potholes appear to be more frequently used by breeding ducks than the saline type and are generally more productive; this usage may be correlated with the more abundant emergent vegetative cover found in freshwater areas (158).

Freshwater and saline potholes are the major source of duck production in Manitoba (139, 91).

Southern Marshes and Lakes. Marshes and lakes compromise 27.3 percent of the total water area of southern Manitoba (see table 1). These wetlands are also the result of recent glaciation. During glacial retreat, large lakes were formed by the melting ice, (Lakes Winnipeg, Manitoba, Winnipegosis, and Dauphin). As the glacial lakes subsided, beaches of sand were thrown up by wave action; these beaches often dammed up marsh areas behind them (Delta, Netley, and Libau marshes). Marshes and deltas were also formed by the deposition of silt eroded by water and carried into the lakes by rivers (Saskatchewan River Delta, part of the Netley Marsh) (19).

Rivers follow eroded valleys and in some instances these waterways have been dammed by alluvial fans deposited by their tributaries; lakes

were thus formed (Pelican, Rock and Oak Lake).

The marshes provide productive breeding habitat for waterfowl; lakes are primarily used in moults and, during migrations, as resting areas (73, 139, 19).

b. Patterns of Settlement and Agriculture.

Manitoba was formally established by the surrender of the Hudson Bay Charter in 1870 (19). The agricultural area of Manitoba located in the southern half of the Province is superimposed on the pothole and southern marsh region. Soil in the "pothole region" is rich, black, and fertile, and the value of agricultural production from the 30,000 farms located in the area totalled 43 million dollars in 1964 (160, 55).

Agriculture (gardening) was first established during the early fur trade period of 1668-1800. With the arrival of the "Selkirk Settlers" in 1812, agriculture increased and the first crops of cereal grains were grown (19).

> Note: These first settlers were brought from Scotland by Lord Selkirk, a shareholder of the Hudson Bay Company. Other groups followed in 1813, 1814, and 1815. In 1816, Northwest Company traders, Indians and metis (half breeds) massacred most of the colonists. The remaining colonists migrated east but returned and were permanently established by 1836.

By 1910, wheat was the main crop in the province and agricultural settlement had expanded throughout the pothole country; during the period 1911-1925, the development of new wheats, new cultural methods and new machinery intensified land use and increased agricultural production. The human population steadily increased. The most significant land-use developments occurred during the second World War years (1939-1945) when the demand for food, abundant rainfall and, most important, the increase

of improved farm power machinery resulted in the drainage and filling of potholes and the breaking for crop production of large acreages of native prairie and forest.

Use of farm machinery continues to increase until the present day, with a resultant extension of agriculture into former prairie and forest areas. During the period 1946-1952, 43,000 to 60,000 acres of new land were broken annually and this trend continues today (19, 20). The total agricultural cropland in the southern pothole regions in 1963 was estimated to be more than nine million acres.

The major crops grown are wheat, oats and barley. Flax, rapeseed, sunflowers, and forage crops (alfalfa, brome, timothy, meadow fescue and sweet clover) are also grown. Corn and peas have recently become important (95).

Waterfowl and agricultural conflicts were reported as early as 1880. Macoun (94) reported of his field trip of 1880, "Geese and ducks are taking to stubble fields in the fall." "Stubble" is interpreted as meaning cereals cut and shocked in stubble fields. Since these earliest crop depredations, waterfowl and crop production relationships have posed one of the major problems to wildlife conservationists in the province. Problems of drainage, filling, cultivation, clearing and grazing are also worthy of discussion. The land use of Manitoba and its effects on the wetland habitat will ultimately decide the fate of the presently abundant annual waterfowl production.

Table 5. Land Use of the Prairie, Aspen Parkland Region of Manitoba: The Area Location of the Potholes and Southern Marshes and Lakes.

Human Use

Moderately farmed	36.8%
Clean farmed	37.9%
Grazing	5.4%
Mixed farm and pasture	17.8%
Provincial parks, Crown land, National parks, etc.	2.1%
	100.0%

Total cultivated acreage = 9,000,000
(91, 19, 95)

c. Problems.

(1). Waterfowl and Crop Depredations. Superimposed on the pothole "duck factory" of Manitoba is the agricultural cropland. The interspersion of the potholes, marshes, lakes and crops usually result in problems of waterfowl depredation. Wheat, oats and barley, the major cereal crops produced, suffer the highest losses (22). Crop depredation problems began with the earliest agriculture. Bossenmaier (22) and Bird (19) cite accounts of crop damage by geese and ducks as early as 1880. Geese were originally the main problem species but today dabbling ducks (mallards and pintails) are considered the worst offenders (22). Crop depredation decreases as the waterfowl population decreases in any given area and vice versa (74).

Depredation by eating, scattering, trampling and soiling of swathed grain can cause severe losses. Wet fall weather conditions can aggravate the problem (19, 22, 74). In 1960, Manitoba's farmers lodged 6,720 complaints of waterfowl damage (141). Western Canadian (Alberta, Saskatchewan and Manitoba) farmers in 1961 (a drought year) suffered damage to over 27,000 farms and lost an estimated 4.3 million dollars to waterfowl;

in 1963, 1 out of 8 prairie farmers lost some crop to ducks with a mean loss calculated at $194 (102). Hochbaum (74) reported that farmers within three to four miles of the lake Manitoba marshes often lost 20 percent of their annual crop.

The dabbling ducks (mallard and pintail) are the main cause of crop losses (22, 19, 74). Mallards which annually constitute 50% of the ducks killed in Manitoba are the greatest problem species; this is because of their feeding habits and abundance (133, 19).

In studies on duck crop depredations, Bossenmaier (22) and Hochbaum (74) found that ducks normally make feeding flights to grain fields from sunrise to 10 a.m. and from 3 p.m. until dark. Cloudy, rainy or snowy weather led to all-day feeding. Bossenmaier (22) found ducks feeding up to 12 miles from water. Hochbaum (74) recorded feeding flights of up to 60 miles but stated that an 8 to 12 mile feeding radius was more common; normally most feeding occurs within 3 to 5 miles of water.

Modern harvest methods of swathing grain in rows 6 to 10 inches above stubble promote better curing and grades but facilitates duck depredation. Depredation damage is the greatest when the date of swathing co-incides with the first fall feeding flights; prolonged wet periods accentuate the problem (74). Bossenmaier (22) noted a preference of fields used as feeding areas by ducks, swathed cereal grain (wheat or barley) was preferred with stubble and burned stubble second or third choice, respectively; wet fields were preferred over dry.

In a study of mallard food requirements it was found that two hundred and sixty-six mallards consumed two bushels of grain per day. Waste grain left in the fields after harvest ranged from 1.5 to 3.6 bushels

per acre for wheat and 4.7 to 7.1 for barley; this wastage was an important feed source to the ducks (22).

Various artificial methods have been tested and proposed to alleviate crop damage. The list of devices and procedures are included in a brochure entitled "Preventing Crop Losses by Waterfowl", available at rural extension offices of the Manitoba Department of Agriculture and Conservation.

However, the problem of preventing crop depredations has not yet been completely solved and a rapid solution is of major concern to wetland preservationists (74, 22, 90). Bird (20) suggests losses could be eased by directing to the farmer the economic benefits generated by waterfowl. Crop insurance for wildlife damage such as offered to Saskatchewan farmers (107) could be incorporated into Manitoba's provincial crop insurance program (90, 95).

Duck hunting on private land can also be a problem as the damage done to private property by waterfowl hunters often exceeds that attributable to the ducks (19).

The key to the solution of the crop depredation may have been suggested by Bossenmaier (22) when he described the wastage of grain and the secondary preference of ducks for stubble fields. Waterfowl seasons usually open when much of the crop remains in the field swathed but unharvested. If, at the opening of the waterfowl season, some early harvested fields were closed to hunting so as to attract ducks and hunters refrained from scaring the ducks onto remaining swathed crops, the problem should be less severe. This is referred to as creating a holding area or "duck pasture" (90). In contrast, hunting in early harvested fields, while swathed grain remains unharvested, promotes further depredation

damage. As yet, however, a waterfowl management practice that incorporates this proposal has not been attempted in Manitoba.

Supplemental feeding of ducks in chronic problem areas has been attempted by Ducks Unlimited since 1957, but is a local and costly cure (84). The occasional early hunting season on cropland 100 yards or more from any water area was effective in controlling crop depredation from 1956 to 1960 but has not been used since due to the difficulty in enforcing its regulations (156e). Hunters were frequently reported shooting immature ducks over water areas during such seasons. Scare-only permits issued to farmers by R.C.M.P. police and conservation officers prove costly to the farmer. These scare-only permits allow landowners to use pre-season shooting to scare ducks from fields but disallow killing the birds. In addition, this regulation is hard to enforce and often results in the slaughter and wastage of immature ducks (74).

The potential of duck damage to the Manitoba farmer continues and may accentuate any disregard they may have regarding the preservation of wetland habitat.

In the pothole country, fear of fall crop damage by ducks has prompted some farmers to deliberately destroy duck nests by late spring burning of grassland and marsh edge, and, in one outstanding instance I know of, to collecting wild duck eggs by hand and feeding them to farm poultry and hogs.

(2). Drainage, Clearing and Filling. Drainage of wetlands in Manitoba is not presently as economically feasible and therefore not as common as in the neighboring states of North Dakota and Minnesota (91, 90). This is because of the currently negative cost-benefit ratio of

such drainage, total cost of which must be born by the individual farmer. However, although actual drainage loss figures for wetlands are unrecorded, trends toward such drainage are evident. Lacey (84:1) states,

> "Drainage is continuing in the parkland pothole area of southwestern Manitoba and has been recently accelerated by the increase in farm power and the recent droughts which provide access to wetland areas".

Closely associated with drainage is brush clearing in which the woody debris is often bulldozed into potholes thus eliminating their value for duck production. Bird (19) states that 40 to 60 thousand acres of parkland are being cleared annually; this amounts to about 2 percent. Clearing of brush and drainage combine to form the chief threat to Manitoba potholes. United States Fish and Wildlife reports of 1961 estimated that at that time 14.3 percent of Manitoba's potholes had been adversely affected to some degree by land use practices such as mentioned above. Manitoba does not directly subsidize pothole drainage but does make available (at a token cost) survey crews for private drainage projects; any farm drainage must be authorized by a Provincial soils specialist or the local district extension agent (95).

Road building, which facilitates drainage, is a major factor in pothole destruction. The accelerated road development program in the southern agricultural pothole area provides accessible ditches which makes drainage of potholes easier.

The trend to increase the average size of farms results in increased cropland; the purchase of larger machinery to work this land necessitates an increase in the size of fields and promotes clean farming with its accompanying elimination of potholes and small bluffs (isolated stands of trees and shrubs). Under the Agricultural Rehabilitation and Develop-

ment Act, groups of farmers may utilize a subsidy of $2 per acre for clearance of 500 or more acres of brushland for the purpose of forage crop production (grasses and legumes) or for increased grazing acreages (112, 7). This promotes the clearing and destruction of extensive wildlife habitat including wetland found in the cleared areas. Large scale marsh drainage and reclamation of wetland has occurred in Manitoba (see Appendix B--Agricultural Rehabilitation and Development Act and Ducks Unlimited, Canada).

(3). Cultivation and Mechanization. As native nesting habitat declines, waterfowl (dabbling ducks) are increasing their use of cropland as nesting sites (19, 139, 100). Milonski (100), studying duck nesting on cultivated land, found stubble, fallow and grassland used extensively; pintail (72 percent) and mallard (6 percent) nests were most common.

Tillage and mowing during the spring nesting period has become a major factor in clutch losses (19). Tillage may directly destroy nests or may predispose the nests to predation (77, 139, 100). Milonski's (100) Manitoba studies revealed that 57 percent of the pintail nests on cultivated land were destroyed by tillage in 1956, and 41 percent in 1957. Weather dictated the extent of destruction, since in wet springs fewer nests were destroyed. He also found that 62 percent of nests worked around were successful but only 27 percent of nests moved out of the path of tillage destruction were reclaimed; desertion was the most important loss factor.

Hay fields or meadows are important duck nesting sites (139, 100). The main problem in mechanized mowing of hayfields is not the actual killing of the duck hen during cuts but the subsequent exposure of the nests to predation by crows and magpies (75). Milonski (100) states that in 110 hayfield duck nests studied, only two hens were killed by mowing but clutch

losses subsequent to mowing were 59 percent. Renestings on mowed hayfields have little chance of success due to recurrent mowing, lateness of the season, exposure to predation, or the lack of a second rapid growth of cover forage.

The use of devices such as the flushing bar are impractical due to the inconvenience without return caused to the farmer. Delayed mowing of hayfields and fall or late spring burning or cultivation of stubble fields appears to be the most logical solution to preventing nest losses (25). Delayed mowing, however, may be impractical to the farmer as overly mature hay is often lower in feed value (protein levels). Farmers must also mow or cultivate when weather conditions permit and delays may result in financial losses.

(4). Fire. Fire results in temporary duck habitat losses each year (84). Burning in Manitoba is particularly damaging during winters of light snow when the complete burning of vegetation edge cover of potholes and marshes occurs; this results in reduced duck nesting cover. Fire in the late spring on stubble, hayland and around water areas destroys clutches of eggs; the land nesting dabbling ducks are most susceptible to this type of loss (84, 78, 73).

To avoid nest losses, Sowls (139) suggests that burning should be confined to grassland intended for haycut, and burning of both grassland and stubble should be limited to the fall period. Timing, location and extent of the burn are the most critical factors regarding duck nest or habitat destruction.

On the other hand, controlled fire in heavy marshland stands of sedgegrass or phragmites may open the cover, thus enhancing such areas

as duck nesting sites (153).

(5). Grazing. Grazing by livestock may be beneficial or detrimental to waterfowl habitat depending on the vegetation of the given area and the intensity of grazing. Sowls (139) found moderate grazing of marsh edge and potholes beneficial in opening the vegetative cover and creating exposed mudbanks used by waterfowl as loafing and resting areas.

In new pasturelands, heavy grazing of the palatable grasses and forbs may render such areas temporarily useless for duck nesting sites, but with extended overgrazing the invasion of unpalatable weeds such as wild barley, Canada thistle, sow thistle and snowberry provide valuable nesting cover to ducks (86, 139). Overgrazing is common in the agricultural areas of Manitoba, and many pastures are characterized by the weeds mentioned. The partial fencing-off of potholes, stock watering ponds, or marsh margins in such pastures is advisable not only for the preservation of nesting cover for ducks but also to prevent the tramping, soil erosion and subsequent filling of the water storage area. Foot rot, common in cattle frequenting wetland areas, may also be avoided by fencing off such areas, thus excluding livestock. The area to be fenced off around the actual water should be the total "wet" or sodden soil area; construction of a lead-in fence would allow livestock to drink if the wetland area is utilized as a stock-watering area.

(6). Predation and Waterfowl. Predation on waterfowl occurs, but to evaluate the overall effect and extent is difficult.

The extent and effect of predation on waterfowl nests, broods, and adults has been widely studied in Manitoba. Each study arrives at differing conclusions both as to the predator species involved and to the over-

all extent and total effect. Kalmbach (75), studying crow-waterfowl relationships, stated that limited early nest predation was probably beneficial to ducks in that it caused renesting and staggered the hatch. This presumably avoids the possibility of severe, widespread losses of ducklings due to adverse weather conditions at the time of hatching. Past studies have cited the following predators as local problems in specific study areas.

Date	Biologist	Area	Predator Listed and/or Studied
1937	Kalmbach	Manitoba	Crow
1963	Munro	Manitoba	Crow, Magpie
1963	Munro	Manitoba	Marsh and Swainson's Hawk
1929	Bird	Manitoba	Great Horned Owl
1941, 1948	Sowls	Delta, Manitoba	Franklin's Ground Squirrel
1955	Sowls	Delta, Manitoba	Striped Skunk
1955	Sowls	Delta, Manitoba	Mink

Predator control, possibly other than by private individuals under a non-bounty system, is not feasible or required. To promote high annual duck production and to insure future good duck potential the only effective approach will be to maintain and preserve the wetland habitat, particularly in the pothole region as this area produces the majority of ducks.

(7). Botulism, Algae Poisoning, Lead Poisoning. Manitoba's shallow lakes and marshes are prone to the development of avian botulism. Bossenmaier (21) studying duck "sickness" at Whitewater Lake found reports of waterfowl die-offs as early as 1912. Cooch (30 and 22) recorded 20,000 dead ducks on Whitewater Lake in the summer of 1945; in 1950 and 1951, 2,000 deaths due to "sickness" were reported each year. The "duck sickness" was diagnosed as a combination of botulism (Clostridium botulinum), the effects of a nemotode (Echurina), and blue-green algal (Schizophyceae) poisoning (22). Botulism usually occurs in late summer in warm, alkaline

shallow, high vegetation lakes, but the toxic effects may carry over. The Wildlife Branch (156) reported several severe outbreaks occuring on small marshes during the early spring of 1963; the birds (lesser scaup, goldeneyes) were affected on their spring return when the wetlands were still largely covered by ice. The laboratory diagnosis confirmed that botulism was the cause of death. The toxicity factors are presumed to be produced by complications produced by the organism C. botulinum and the nematode Echurina in the presence of decaying vegetation, algae growth, alkalinity and warm, low-oxygenated water. The vastness of the area that could be affected annually in Manitoba prohibits intensive precautionary management practices. Future research on economical methods to prevent or alleviate this poisoning may provide a practical solution to the problem (22, 19), but so far no solution has been reached.

Lead poisoning has recently become a problem on heavily gunned marshes. Wildlife Branch reports of 1964 indicate that in 1963 over 1,000 mallards perished on Grant's Lake (a small marsh near Winnipeg); a co-operative study revealed that the cause of death was lead-shot poisoning from shot picked up while feeding and lodged in the gizzard. As hunting pressure increases, this problem could become more common; a substitute for the toxic lead as shot could possibly provide the solution.

d. Fur Management and Duck Production.

Manitoba has a relatively light human population density (3.83 per square mile) and natives in the northern areas of the Province rely heavily on income from wild fur for their livelihood. Because of the recognition of the importance of wild fur value to the natives (Indians and Eskimos), Manitoba has long been a leader in North American wild fur

management and production (35). For example, in 1950-51, the value of wild furs produced in Manitoba averaged $13.50 per square mile, the highest of any Canadian province. In 1954, Manitoba's gross returns from wild furs was estimated at over $1,621,398; and in 1964 in spite of an overall decline in prices, the total value was $1,682,211. (160).

The major emphasis on wild fur management in Manitoba has been centered on increased yields of muskrat and beaver pelts through the preservation or creation of stable wetland areas and control of the total annual harvest (25). Muskrats were originally reduced by settlement and overtrapping, and populations fluctuated with the climatic conditions and water levels. As early as 1936, Manitoba's wildlife workers initiated marsh management programs for muskrat production in the extensive Summerberry marshes in the northwest portion of the Province. Cost of water level control and stabilization involving the construction of control dams was $107,000. In the Summerberry project, 140,000 acres of marshland water was stabilized and muskrat populations increased from an estimated 5,000 in 1936 to in excess of 200,000 in 1939. In the following years, over $1,000,000 worth of pelts has been trapped on a controlled annual spring harvest based on 60 percent of the estimated fall population; by 1955, the provincial government's share from royalties on muskrats alone had exceeded $200,000 (35). An estimated 33,000 ducks are annually produced as a side benefit on this management area (84).

Marsh management promotes waterfowl production as a by-product of fur production. In 1938, the provincial government leased to Ducks Unlimited the then-dry 26,000 acre Big Grass marsh. Two control dams were subsequently constructed at a total cost of $10,000, holding water depths at 3-7

feet over the entire area. Muskrat production since 1942 has averaged 10 to 15 thousand pelts per year and the annual duck production is estimated at 5,000 birds (114, 29).

These are just a few examples of the type of furbearer marsh management carried out in Manitoba; many other marsh areas are managed for the same combination of fur and duck production. Marsh management for aquatic furbearers is economically feasible and has a significant beneficial effect in stabilizing waterfowl habitat and increasing the annual duck production.

Beaver management has also proven profitable, and with beneficial side effects for ducks. The beaver population was practically eliminated by settlement and trapping during the period 1890 to 1940, but under management involving controlled trapping rose from a few scattered colonies in 1942-43 to a level in 1952 that allowed a harvest of 27,000 pelts worth over $1,000,000 (58).

e. General Requirements of Waterfowl Research and Management.

If duck production and recreational duck hunting are to continue at their present level of importance in Manitoba, it will be necessary to determine certain essential requirements. Annual and projected information on the amount, type and location of wetland habitat required for recreational, aesthetic and scientific use of waterfowl is essential. Preservation of habitat should be given ultimate priority and methods should be devised to reduce, eliminate or compensate for current breeding ground crop depredations, particularly in the southern marshes and pothole areas.

For endangered species, such as redhead and canvasback, it will be essential to determine the specific adverse factor or factors limiting

their wild populations. If such species are to be saved, remedial measures should be employed.

It will also be necessary to improve the efficiency of the use of shooting regulations as a management tool. To preclude this, it will be advantageous to increase the accuracy of the breeding ground surveys, determine the contribution of each breeding area to the harvest areas and also to determine the effect of various types of shooting regulations on the kill of each species of duck as well as the total kill.

The development of more effective and economic habitat management techniques is required. The development of habitat techniques must consider their economic and effective application over large areas.

In Canada, a clear-cut division of interest and responsibility for wildlife resources among federal, provincial and municipal governments should be established. To preserve wetlands in agricultural areas, it may be necessary to direct to the farmer a growing proportion of income derived from hunting and associated recreational activities (131, 19).

Aside from land use management, which is the prime factor affecting duck habitat and production, Manitoba has developed programs of hunter and hunting regulations and some waterfowl management areas have been established (156f,g). The major areas of study, production and hunter management are shown on Figure 12. Annual regulations regarding waterfowl hunting, procedures, management areas and bag limits for the various species are available in brochure form from the Wildlife Branch, Department of Mines and Natural Resources, Norquay Building, Winnipeg 1, Manitoba.

Further general concepts that duck management should follow were

suggested as early as 1946 by H. Albert Hochbaum, director of the Delta Waterfowl Research Station, Delta, Manitoba. These suggestions are still valid in Manitoba. Hochbaum, a leading authority on Manitoba waterfowl and habitat conditions, outlined management procedures for dabblers and diving ducks as follows:

Waterfowl managers must forsee plights and predict, manage, and regulate harvests in accordance with prevailing conditions which are, to a large degree, measurable and predictable. The future of waterfowl as gamebirds depends on the proper maintenance and manipulation of habitat preservation and management. Waterfowl management is complex and deals with a wild, international and mobile population involving many different species and environments (73).

Waterfowl management should favor the lesser species; if this is done the other more common species will automatically adjust. Large present numbers do not insure large future populations, but the declines are due to the known effects of drought, land management, and waterfowl harvest management and so to some extent subject to prediction and alleviation.

The more successful duck species (mallard, pintail) have wide tolerances of breeding and feeding sites; however, some diving duck species (redhead, bufflehead) are intolerant to habitat changes and require long seasons to reproduce. Northern Manitoba breeding ranges which are characterized by short seasons are of little or no value to diving duck species such as the redhead (73). The diving ducks are generally less versatile and require more specialized southern breeding habitats than the dabblers.

Diving ducks (like Canada geese) are tradition bound and do not adapt readily to new habitat; thus, diver breeding tradition needs to be re-established in many burnt out marshes in the U. S. (73). Some divers (buffleheads, goldeneyes) require more than one year to mature and so are less capable of rapid population recovery.

Other authors state that in nesting the early, land nesting dabblers are more prone to nest losses by fire, cultivation and predation.

Diving ducks are generally less vulnerable to nest losses (other than by drought) but require a longer nesting season, more specific nesting habitat and frequently specialized habitat such as hollow trees used for nest sites by wood ducks, goldeneyes and buffleheads. Divers such as the redhead and ruddy duck may frequently use dump nests (more than one hen laying in a single nest) which often results in abandonment (139, 73).

Rearing studies show that dabbling ducks fly earlier and mature earlier than diving ducks and are less susceptible to late season drought losses or early season hunting losses. These two types of loss are the principal reasons for the slow recovery exhibited by the diving duck species once their populations are deciminated.

Hunting kill varies according to hunter preferences and the vulnerability of the species (19, 139). Bag checks in Manitoba indicate hunters select mallards but due to their wariness and the large numbers of birds the mallards remain less vulnerable to overkill than other duck species (19, 156b,f,g). The unwary redheads and canvasbacks are particularly vulnerable to overkill (73). Banding studies have revealed more redheads than any other duck species shot per number banded (73).

Hochbaum (73) also suggests that to control the currently excessive, early season kill on almost flightless young diving ducks and mature females, the opening date of the waterfowl season should be no earlier than October 1 (present range September 15 to 30). Upland stubble shooting which would concentrate on grain feeding dabblers could be promoted for early season shooting. Manitoba has had an early stubble season (100 yards from water) but experience has shown that its regulations are difficult to enforce over the large areas involved. However, the early stubble season could provide a partial solution to the duck depredation problem on unharvested crops as well as avoiding hunting pressure on diving ducks.

Manitoba has attempted to alleviate the shooting pressure on the wood ducks, canvasbacks and redheads; in 1961, 1962 and 1963 the redheads and canvasbacks were protected species. In 1964, due to recoveries in the populations, one redhead or canvasback was allowed in the daily bag limit. One wood duck per day has been a common regulation since 1952, (156b,c,d,f,g).

f. Discussion.

The most bountiful waterfowl production originates in the potholes and marshes of southern Manitoba. Conservationists interested in maintaining this production are faced with two major problems; (1) the area is largely privately owned and the landowner currently receives nothing for allowing space for waterfowl and (2) the birds often cause crop damage or a hunting public which damages crops.

To integrate the production of a natural resource such as this with private land use practices necessitates a channeling of the economic benefits generated by the resource to the land owner. Financial easements,

tax concessions and payment for maintenance of wetlands appear to be necessary. The private landowner also has a moral responsibility not to destroy willingly that which cannot be created or returned.

The assumption that the wildlife resource belongs to the public also carries with it a certain responsibility. If the resource is desired, those who utilize it must be willing to pay to perpetuate its abundance. The level of future waterfowl abundance and diversity on private land may hinge on this, especially as it relates to the preservation of wetland habitat and the alleviation of depredation problems. Wildlife cannot much longer be considered to be free for the taking especially when produced on private land.

On crown land, land use and conservation management agencies have the power to conserve and create wetland habitat as part of their overall responsibility. Finances for this program are, however, currently inadequate to maintain waterfowl populations at high levels (112). It is hoped that adequate finances will be available shortly.

NORTHERN WATERSHEDS AND DELTAS

a. Introduction.

North of the agricultural area of Manitoba lies the geologic formation known as the Canadian Shield. The topography of this region is undulating and rocky. The soil is an infertile podzol unsuitable to agriculture. Vegetation consists of the boreal forest in the south and central portions; as one proceeds northward this finally merges into the tundra zone adjacent to Hudson Bay. The area is poorly drained, and lakes, streams, marshes, and deltas cover 2,716,500 acres (91) or about 5.8 percent of the total area (160).

Wetlands of the north are normally only lightly used by breeding ducks, but it is here that the main breeding grounds of the Canada geese are found (90), (see Figure 14). Human habitation of the area is light and the land relatively unaffected by man. Limited mining, pulpwood harvest, trapping and commercial freshwater fishing are the main industries (53).

The northern watersheds are important to moulting ducks (73) particularly the non-breeding and male ducks, the majority of which migrate north from the pothole region to moult (73). These northern watersheds, however, are used as breeding areas only during years of extreme drought when the southern potholes and marshes are dry (58). The area seems undesirable to ducks and seldom, if ever, produces a significant proportion of the total duck production originating in Manitoba. Agricultural reclamation and hydroelectric power developments, such as that at Grand Rapids, have recently eliminated most of the only really productive duck breeding habitat in the region; this area was the marshes of the Saskatchewan River delta located north of the Pas (84) (See Appendix B on Ducks, Unlimited).

b. Geese and Goose Management.

Geese are important game birds in Manitoba with an annual kill in the range of 5,000 to 8,000 birds (156a,b,g). Many species of geese migrate through the Province each spring and fall but only the Canada goose is known to nest within provincial boundaries (156g, 19). Canada geese provide the majority of the fall hunting as the returning migratory flights of other species seldom stopover in accessible hunting areas during their fall migrations (19).

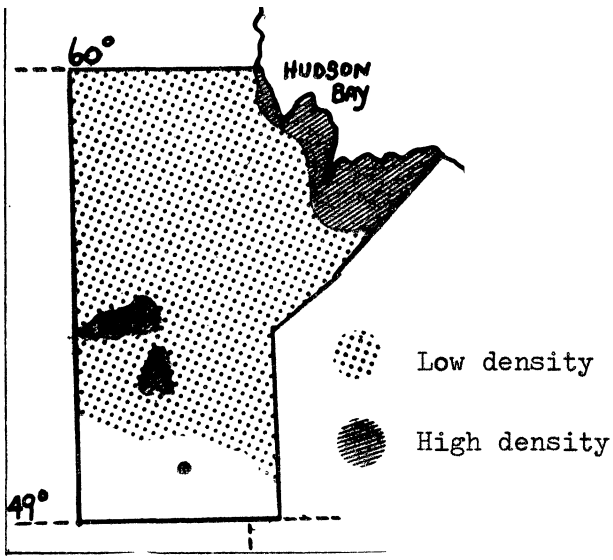


Fig. 14. Canada goose breeding areas.

Geese lend themselves to scientific wildlife management due to their well-defined, narrow migration routes, well-defined wintering areas and high value as a sport species (71). They are also adaptable to changing conditions and, if given reasonable protection (regulated kill) and adequate wintering grounds, can be expected to maintain good populations (82).

Canada goose populations have recently increased in Manitoba. The reasons for the increases appear to hinge on their use of the northern (permanent water) breeding grounds which are currently unaffected by land use practices or prairie droughts (19, 156d,g), but it is undetermined if northern areas were always as heavily utilized by nesting geese. Geese are more wary than ducks and have more diversified food habits and reasonable protection and maintenance of habitat should assure continued good sport hunting. The resistance of the wary geese to overkill and their only moderate potential as crop depredators make them less vulnerable to exploitation by hunters (19).

Habitat Requirements. The Canada goose formerly nested throughout the aspen parkland region of southern Manitoba. Since 1870, increasing human habitation with its accompanying harrasement and extensive agriculture and wetland destruction have eliminated the greater part of this area as a goose breeding ground. A few protected refuges (Delta, A. E. Hole Refuge) still maintain limited local breeding flocks (19). Canada geese are also found in light to moderate breeding densities on water areas in the boreal forest and tundra regions of Manitoba (81, 19, 156g, 8).

Geese require undisturbed, broken marsh, lakes or large pothole areas for nesting (81). Nests are frequently located on islands but shore nesting adjacent to suitable wetland areas is common (81, 19). Geese in the northern breeding grounds seldom renest (81). Klopman (81), studying the nesting of Canada geese at Dog Lake, Manitoba, during 1954 and 1955, found nesting success averaged 48 percent with an average brood size of 5.2 goslings per successful nest. Nest losses were mainly due to high winds and subsequent flooding (50 percent).

Geese are more versatile feeders than ducks and utilize greens (grasses, shoots, sprouts) to a greater extent. Crop damage by geese has not recently been regarded as a serious problem in Manitoba (156f).

Season and Bag Limits. Manitoba's annual goose season runs concurrently with other waterfowl seasons. In a restricted area (within 15 miles of the Hudson Bay coastline) the limit is 5 geese per day, 15 for the season, except for actual residents of the area. Throughout the rest of the Province, the daily limit is 5 geese (10 in possession) with no season limit. White-fronted geese, not common in fall migrations, have a special limit of 3 per day (6 in possession). The total daily bag limit

of geese (10 in possession) includes all species (156g). The use of boats in waterfowl hunting is prohibited on Whitewater and Dog Lakes, known areas of fall goose concentrations.

Hunting pressure on geese can be locally severe. The development of firing lines and the following of feeding flocks by car hunters was noted by Bird (19). To remedy such situations, to hold geese in the area longer and to provide a regulated kill, the Wildlife Branch recently adopted a policy of "morning hunting only" in areas adjacent to Lakes Winnipeg and Manitoba (156d,f,g). This regulation is designed to prevent continuous harassement and permit geese to feed undisturbed during the afternoons. Continuous, day-long harassement has been observed to drive the geese from the area (156f).

Local Flock Establishment. The establishment of local breeding flocks of Canada geese is a proven management practice (90). This has been accomplished in several areas in southern Manitoba (19). However, there are many lakes and reservoirs remaining in southern Manitoba to which this practice could be expanded. If local flock establishment is attempted, provisions for protection from local harassement and poaching is necessary.

Wetland acquisitions for the establishment of waterfowl management areas has been carried out through the provincial Wildlife Branch, the Canadian Wildlife Service, and Ducks Unlimited (Canada). Such areas as Whitewater Lake, Oak Lake, the Souris River Valley, Big Grass, Delta, Summerberry, Netley and the Libau marshes may provide the wetland habitat base for future local breeding flocks of geese (90, 156g, 84). There are many other parkland area lakes suitable for acquisition and the establish-

ment of Canada goose flocks whenever economics permit.

COOTS, RAILS, AND WILSON'S SNIPE

These aquatic birds are regularly listed as game birds in Manitoba under a general hunting season daily limit of five per day of each species (ten in possession) and no season limit (156c-g). Coots, rails and snipe are locally a low-value game species and are seldom (if ever) specifically hunted. Ward (154) stated that regular hunter bag checks over eight consecutive years in the Delta marsh region revealed 18,338 ducks killed but no coots, snipe or rails in the bag even though coots were nearly as numerous as ducks in the check area. He considered coots were merely used for target practice or for a "warm-up" to the duck shooting. Coots, however, are important game birds in some parts of the United States. Wisconsin and Illinois record good bags each year (154).

The coot withstands hunting pressure well, probably due to their high nesting success (97 percent on a 5-year study). This success could be accounted for by the fact that they are not prone to predation (nest over water) and do not nest on temporary potholes (77, 154).

The coots, rails and snipe will probably not become important local gamebirds unless the normally heavy local duck populations become severely reduced.

Coots are territorially aggressive in the spring and may limit duck nesting on small permanent potholes (personal observation). Ryder (122) found coots attacking 11 species of ducks and interspecific territorial aggressiveness was common. Coots may, however, be beneficial to ducks; Sowls (139) considered young coots as important buffers to ducklings in that the coots absorbed the bulk of mink predation.

SANDHILL CRANES

The sandhill crane originally was abundant in the aspen parkland zone; nesting habitat was found along rivers and in dry lowland areas adjacent to large potholes. Criddle (38) reported sandhill cranes as eliminated from these areas by 1880. Loss of nesting habitat to cultivation appears to have been the major decimating factor.

Sandhill cranes are still abundant in the westlake area of central Lake Manitoba. Their foods consist of cereal grains, grasshoppers and aquatic invertebrates. Crop depredations prompted a fall season in 1964, the first held for over 20 years. A second fall season was held in 1965. Bag limits were two birds per day under a special license, but hunters found the birds wary and erratic in their feeding habits; a low crane kill resulted but large areas of crop were successfully protected (156h).

DISCUSSION

Southern Manitoba is one of the major duck breeding areas in North America. The potholes and southern lakes and marshes (most of which are located on private land) are being directly reduced in numbers, and the suitability of remaining wetlands as duck nesting habitat is being impaired.

If ducks are to be maintained at high population levels, a reconciliation between conservationists and agricultural interests is essential. The task of preserving wetlands on private land without economic detriment to the farmer-owners is complicated, but a rapid solution is necessary if ducks are to remain an important renewable resource.

The northern wetlands have been relatively unaffected by land use and are important to goose production but are of little use to ducks.

SUB-INDEX #3

FURBEARERS

1. Introduction.

Furbearing animals and profits to be gained from trading in their pelts with the native Indians provided the incentive for initial exploration and development of the area that is now Manitoba. Fur trading and development can be broadly divided into four distinct periods; 1668 to 1840 (the period of fur trade and initial settlement); 1840 to 1870 (the transition period); 1870 to 1900 (the period of settlement) and 1900 to the present (the period of intensified agriculture) (101).

2. Periods of Development.

Fur Trade and Initial Settlement: 1668 to 1840. The fur trade began when the Hudson Bay Company ship the "NONSUCH" reached Hudson Bay in 1668 and the first fur trading posts were established along the arctic coastline. Competition from rival fur companies such as the North-West Company and from private fur traders prompted Hudson Bay Company traders to move inland. In 1691, Henry Kelsey first explored the aspen parkland and tall grass prairie regions of Manitoba and reported beaver and otter as abundant along the streams, muskrats and mink in the marshes, and fox, ermine, fisher and marten in the uplands. Kelsey also recorded that vast herds of buffalo roamed the area. The Indians were friendly and with the encouragement of rum and a few trade goods were willing to catch the furbearers (33, 94).

La Verendrye, a French furtrader in the employ of the North-West Company, explored southern Manitoba and built many forts, among them Fort Maurapas (near the present site of Winnipeg) in 1738, Fort La Reine near Portage La Prairie (1738) and Fort Dauphin on the Mossy River in 1741.

Alexander Henry built fur trading forts along the Red and Assiniboine Rivers in the period 1800 to 1808 (33).

From 1668 to 1800, white men were attracted to Manitoba by the abundance of furbearers and sale of their pelts to the European market. These fur traders established peaceful relations with the Indians and except for the encouragement of trapping near the posts and the introduction of a limited supply of firearms, they had little detrimental effect on the furbearer, big game or Indian populations.

In about 1800, rivalry between fur companies for the lucrative trade led to the widespread introduction of large numbers of firearms, steel traps and rum. Increased importations of these products may have been prompted by European inventions and subsequent less costly production of such items. The Indians became degraded, debauched and diseased, and furbearers and big game were shot, trapped, and generally overexploited with no thought given to conservation (19). Prairie fires were often started by the whites and Indians to drive the herds of game animals and raged unchecked; these fires may have contributed to the decline of such furbearers as the beaver and the timber wolf through contributing to loss of food and woody habitat (19).

The Transition Period: 1840 to 1870. During this period the fur trade reached its peak. Rival traders vied for furs of the Indians, and keen competition induced the Indians to over-trap. By 1870, furbearers and game populations were greatly reduced by overtrapping and possibly also by frequent prairie fires, and the fur trade had declined. This destruction was particularly severe in the southern prairie and parkland regions (19). At the time of the formation of the Province of Manitoba,

in 1870, most furbearers and game in these southern regions had been reduced to levels of near extinction.

The Period of Settlement: 1870 to 1900. On November 19, 1869, the Hudson Bay Company surrendered to Great Britain its rights over Ruperts Land. On July 15, 1870, Ruperts Land was transferred to the Dominion of Canada and the Province of Manitoba was formed. This political event formally closed the now defunct fur trade and opened the area to settlement and agricultural development (19).

During this earliest period of agricultural development, prairie fires were controlled and the aspen, willow and associated shrubs of the parkland spread southward. Livestock were introduced to replace the buffalo and elk and the unregulated killing of other big game (mule deer and moose) and furbearers continued. In 1876, the first game act was passed; under the Act most furbearers were protected from May 1 to November 1 and the use of poison, which had been extensively employed in the taking of fur animals, was prohibited (19). However, there were few game wardens, the public was generally unconcerned and consequently game laws went largely unheeded.

The Period of Intensified Agriculture: 1900 to the Present. Fur prices remained high and furbearer and game populations persisted at low levels until the 1930's; but during this period the public had gradually become more conservation minded and game laws were generally obeyed. However, a few citizens still considered it their priviledge to take game and furbearers at will and this situation persists today.

Since 1930, furbearers and most game populations have increased; these increases appear to have been influenced by the following: Game and fur

regulations laws have become stricter and better enforced. Game preserves and sanctuaries were established and protected. Hunting and trapping seasons were now based on surveys of populations, and food and habitat conditions, as determined by Provincial game department personnel trained in the technical aspects of wildlife management.

Muskrats and other aquatic furbearers have benefited from the absence of prolonged drought. In large marshlands, methods of muskrat farming have been developed through the use of water level controls. This was accomplished by the construction of dams and dikes which facilitated the periodic drainage and reflooding useful in maintaining optimum marsh habitat and high muskrat populations. Indians were employed in marsh management, and fur harvest was adjusted in accordance with annual populations (35, 58).

In the northern areas of the transition and boreal forest zones, registered traplines were established to eliminate excessive competition and stabilize furbearer populations (19). In this system, a single individual is given sole rights to a trapping area and is encouraged to practice conservation and management and to leave sufficient breeding stock (156d,e).

Under programs involving closures of seasons, strict quotas on catches, short seasons and live trapping and reintroduction, beaver populations have spread into long-vacant habitats. Beaver are so numerous over much of Manitoba that in many areas they are threatening their food supply or creating pest problems (156d,f,g; 58). To reduce populations, trapping seasons have been extended and in some areas quotas removed. Bird (19) states that in a large section of the agricultural prairie and aspen

parkland regions beaver populations are currently believed to approach densities found in pre-settlement areas (1668-1800).

In the tall grass prairie and aspen parkland zones, muskrat, weasel, mink, fox and badger have also again become abundant. The domestic fur ranching of mink has become big business (19).

An important reason for recent increases in fur populations in both the southern agricultural areas and the northern unsettled regions has been the decline in fur prices since about 1930. This decline coupled with increasing wages and prosperity in both agriculture and business has resulted in a significant decrease in fur trapping (19). In southern Manitoba, trappers are few and trap as a hobby or on a part-time basis. However, because of furbearer abundance, their contribution to the total value of wild fur equals that of the northern area trappers (8). It is only in the north that fur trapping today is of major importance as a chief source of income to area residents. The fashion market fluctuates greatly in its demand for furs, and unless it stabilizes, fur production by trapping will not again become a basic economy of a large segment of the populations of southern Manitoba. Synthetics have tended to replace fur.

3. The Present Importance of the Wild Fur Industry in Manitoba.

The Province of Manitoba has one of the highest annual wild fur takes in Canada (see section of Fur Management and Duck Production).

In the southern agricultural areas where there are fewer valuable furbearer species, there is an abundance of badger, weasel, red fox, coyote, raccoon, skunk, and jackrabbit in the uplands and muskrat, mink and beaver in aquatic habitats (8). These species produce a high revenue per square mile to the part-time trapper, and what fur production in these areas lacks

in quality is compensated for by the quantity of furs produced (53). In the agricultural area, muskrat, beaver and mink constitute 70 to 80 percent of all part-time trapper income (156f,g). Furbearers other than the mink, beaver and muskrat are no longer deliberately trapped in the southern portion of Manitoba.

In the northern transition zone, boreal forest and tundra areas, resident native Indians, Eskimos and white trappers and traders still rely almost solely on fur trapping as a primary source of income (156f). The diversity of furbearers in this area is great but abundance is low and trappers must cover large areas to secure a livelihood (53). Most of Manitoba's fur management in the form of marsh management, trapper education and registered trapline is centered in this area (35). Like the southern part-time trapper, the northern fur trapper of the transition and boreal forest zone relies on the muskrat, mink, and beaver to supply the main source of income but in tundra areas a trapper's sole income may be dependent on one or two rare species such as the arctic fox, marten and wolverine (53). The trapping of wild fur, which is currently declining in southern Manitoba, will probably remain an important source of income to many remote northern area residents.

Table 6. Fur Production From the Wild Showing Average Value, Production and Total Annual Values 1924-25 to 1960-61.

Species	Average Production	Average Value per Pelt	Total Value
Muskrat	589,805	$ 1.38	$ 813,930.90
Mink	20,664	19.26	397,988.64
Beaver	14,344	18.47	264,933.68
Weasel or Ermine	93,792	1.39	130,621.08
Red Squirrel	257,275	.47	120,919.25
Badger	259	5.86	1,517.74

Species	Average Production	Average Value per Pelt	Total Value
Bear (Black)	131	$ 3.05	$ 399.55
Coyote	2,778	7.57	21,029.46
Fisher	347	35.17	12,203.99
Fox (Blue)	7	16.39	114.73
Fox (Cross)	1,847	14.10	26,042.70
Fox (Silver)	297	18.53	5,503,41
Fox (Arctic)	726	19.75	14,338.50
Fox (Red)	7,184	6.20	44,540.80
Lynx	1,199	22.88	27,433.12
Marten	241	21.29	5,130.89
Otter	1,684	21.45	36,121.80
Jackrabbit	8,220	.48	3,945.60
Raccoon	186	1.96	364.56
Striped Skunk	9,589	1.35	12,945.15
Timberwolf	255	6.33	1,614.15
Wolverine	26	11.88	308.88
	Average total value		$1,941,948.58

Note: Quantities of coyote, jackrabbit, raccoon, striped skunk, badger, timberwolf and other sometime "pest species" in Manitoba are probably grossly underestimated due to localized year-round control, particularly during spring, summer and early fall when the pelts are valueless. (156e).

4. Current Status of Fur Species with Emphasis on Relationships to Land Use and Management.

a. Muskrat.

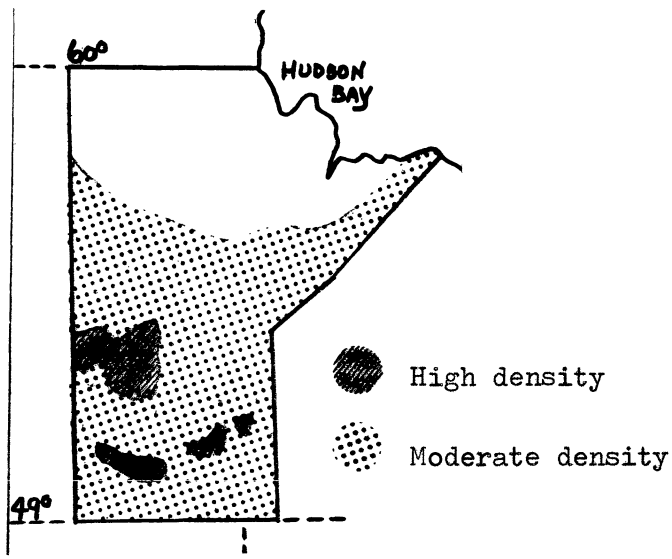


Fig. 15. Distribution of Muskrat.

The muskrat is the most important fur bearer in Manitoba. Although the price of an individual muskrat pelt is not high ($.50 to $3.00) the annual quantity taken for the past forty years has averaged over one half million animals (156d). The fashion market has remained relatively stable in its demand for muskrat fur.

The present range of this aquatic rodent has not changed from pre-settlement periods, and muskrats are found from the 49th parallel to the northern tree line. Heaviest concentrations occur in the potholes and southern marshes and lakes of the aspen parkland and transition zone (53). The habitat requirements of muskrats are similar to those of ducks, so water conditions promoting good duck populations are equally beneficial to muskrats (84).

Factors Affecting Distribution and Abundance. The most important single factor affecting muskrat populations is drought (19). Drought is common in the prairie and aspen parkland zones, and in drought periods muskrat populations decline. Even in dry years when potholes and marshes do not dry up completely, muskrats may suffer heavy winter mortality caused by the freezing to the bottom of aquatic wintering areas (19).

In 1961, a year of extreme drought, southern muskrat populations declined to the degree that in 1962 the fur trade imported 30,000 pelts from the United States to supply demands (156e).

Agricultural land use practices such as draining or filling of potholes or marsh drainage are detrimental to southern muskrat populations and these practices are increasing (84).

The muskrat populations of the northern transition and boreal forest zones are relatively unaffected by any land use but populations are of

low density and optimum suitable habitat is scarce (156d).

Management. In the transition and boreal forest zones, the provincial government has established "fur blocks" for muskrat management. These controlled areas are created by marsh management through the stabilization of water levels and are designed to promote stable and annual high muskrat populations. In such marsh areas as the Summerberry and Pasquia marshes located at The Pas, and the Big Grass Marsh situated in central Manitoba, water levels have been controlled by the construction of dams and dikes in key areas. Muskrat populations have increased (see section on Fur Management and Duck Production). Ducks Unlimited projects which stabilize aquatic duck habitat also aid muskrat populations, and resultant provincial revenue through royalties has often exceeded the cost of the projects (35, 84).

In areas of marsh management and on some registered traplines, fall censuses by house count are used to determine spring season trapping quotas (156e). Throughout the remainder of the Province, trapping of muskrats is restricted to a spring season and the total catch is limited by manipulating the length of the season (114, 29, 35). In drought years, when the populations are vulnerable to winter kill, a fall "salvage" season is often held.

The muskrat has been intensively studied in Manitoba and under management thrives well in close proximity to human populations (98). The high reproductive potential and annual fall migrations of the animals insure full occupation of available habitat (19).

Future. Under controlled seasonal trapping muskrats should remain a valuable fur resource in the southern agricultural areas. High density

muskrat populations are, however, dependent on the maintenance of suitable aquatic habitat, and drainage, filling and erosion of potholes and marshes are reducing this habitat in southern Manitoba (84). The muskrat will continue to persist in low densities along rivers and streams in this area.

In northern habitats of the transition and boreal forest zones, the muskrat populations will presumably remain at a stable but medium density.

b. Beaver.

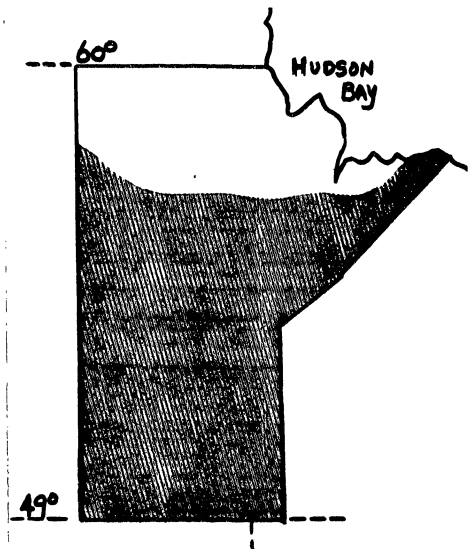


Fig. 16. Distribution of beaver.

Beaver were originally distributed throughout Manitoba wherever the association of water and deciduous tree growth provided essential habitat requirements. Prior to settlement, beaver were probably important agents in controlling water levels and runoff (19). The beaver was the main furbearer responsible for the exploration of the Province, and organizations such as the Hudson Bay Company and the North-West Company were founded to obtain and export beaver and other furbearers to the European market. Beaver populations, during the competitive fur trade period of 1670 to 1840 suffered from over-trapping and loss of habitat through prairie fires

to the extent that by the 1900's they were rare. Seton (126) reported beaver as formerly abundant in southern Manitoba, but by 1910 the populations had declined and by 1940 they were gone from the south and limited to a few scattered colonies in the northern boreal forest zone (19, 62, 58).

Since 1940, under the protection of closed seasons and with a little live trapping and transplanting, beaver populations increased to reoccupy almost all available habitat (19). By the early 1950's, the beaver populations were again being trapped and since 1958, 30,000 pelts have been taken annually, the highest province-wide catches ever recorded (58, 19).

To maintain good populations, the beaver requires an aquatic habitat of rivers, streams, deep potholes or lakes bordered by early succession deciduous trees. Nash (105) found that chief food trees were aspen, willow and green ash.

The beaver today is again well established from the 49th parallel north to the tree line. The key to continued high populations appears to be regulated trapping. To regulate the beaver populations, a regular fall and spring trapping season is held each year (24). In the south, the harvest is regulated by the length of the season. In northern areas and on registered traplines, ground surveys and aerial lodge counts are carried out by both trappers and game branch personnel; the harvest is based on local populations and habitat conditions (156e,f,g).

In total value, the catch of beaver now approaches and occasionally exceeds that of muskrat or mink, but it is only under regulated trapping that beaver will continue to be of great importance (19, 156f).

In southern areas, beaver occasionally become a pest through the plugging of drains and culverts and the damming of small streams; this

has resulted in the flooding of agricultural land. In instances of such damage, beaver populations are greatly reduced in that local area by trapping, or the beaver dams dynamited (156f). Simple overpopulations of beaver are also becoming an occasional problem in that the beaver is capable of destroying its own habitat through the over-use of food species of trees. Such habitat destruction can be avoided by an increased harvesting of the population (19).

c. Mink.

The mink ranges throughout Manitoba. Like the muskrat, beaver and otter, the mink is associated with an aquatic habitat. The total yearly catch of mink, while not as high as many other furbearers, is second in value only to the muskrat. The mink has a high average value per pelt ($8.00 to $55.00), and in some years the total value of mink pelts has exceeded that of the normally more valuable muskrat catch (53, 156e). Mink fur is currently in high demand and the wild catch averages 20,000 each year (137).

Mink populations do not appear to be adversely affected by land use, as the highest density mink populations occur in the southern agricultural regions (19). Local mink populations at Shoal Lake were noted to fluctuate with the muskrat populations which in turn fluctuated with local water conditions. Muskrats in this area are believed to constitute a chief source of prey for the mink. Mink may occasionally become pests due to their depredations on unprotected poultry flocks (137).

Mink have been domesticated and are the main furbearer raised on fur ranches in Manitoba. The furs from mink ranching supplement the wild catch, and revenue from this source currently exceeds 3.5 million dollars annually (156f).

It should be clarified here that mink, unlike muskrat or beaver trapping management, need not be as closely controlled or as carefully applied for each habitat area. The mink and muskrat populations appear to thrive under the current methods of controlling the catch roughly through season length and controlled quotas, other than on fur blocks, are not employed. The mink is relatively wary and hard to catch and should continue to be abundant in Manitoba.

d. Weasel.

Three species of weasel occur in moderate densities throughout Manitoba; these are the long-tailed weasel, the short-tailed weasel and the least weasel (137). Weasel species are combined in fur catch reports and are often referred to as ermine. Bird (19) suggests that southern weasel populations have declined with increasing cultivation. However, early declines may have been associated with good fur prices and the extensive trapping of early settlement periods. Since 1930, weasel populations have remained moderately high throughout most of the province with the highest densities in the aspen parkland zone. Weasel pelts are worth about 1 or 2 dollars and the total catch averages 90,000 annually (156d). Demand for the white winter fur is moderately good.

The long-tailed weasel may occasionally become a predator of immature domestic poultry and game bird populations. The economic relationships of weasels to small game and rodent populations have not been investigated.

e. Bobcat.

The bobcat is a rare species in Manitoba and only three authenticated records exist (137). These occurrences are in the south-east portion of the Province adjacent to the Minnesota border and in the Winnipeg area.

The bobcat may in future enter the Province from the south and become established if current factors influencing the northward range expansions of the white-tailed deer and raccoon apply to the bobcat. It is presumed that a gradual warming trend in the climate coupled with the expansion of agricultural land use northward has prompted northward range expansions, but in the case of furbearers this is not substantiated.

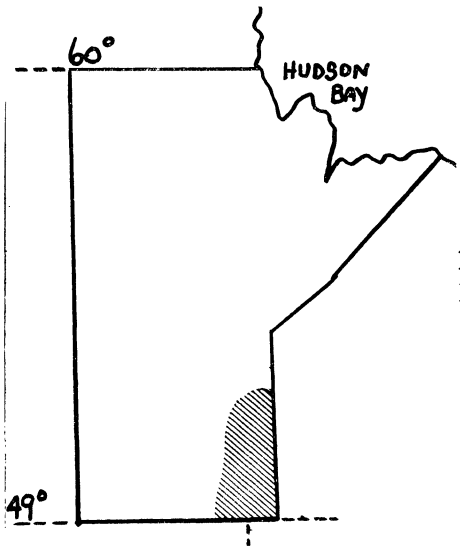


Fig. 17.
Distribution of bobcat.

f. Lynx.

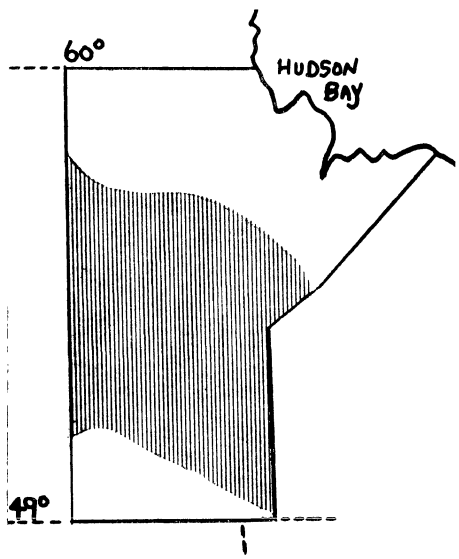


Fig. 18.
Distribution of lynx.

The Canada lynx originally ranged from the tree-lined watercourses of the tall grass prairie region north to the northern edge of the boreal forest zone (106, 19). Lynx abundance and distribution are closely associated with snowshoe hare populations, since hares constitute their main supply of lynx food (106). A ten-year cycle of snowshoe hare and lynx abundance is one of the most regular and widely studied predator-prey relationships in nature (76).

The lynx is a relatively unwary and moderately valuable furbearer. During early settlement periods and until the early 1950's, the prairie and aspen parkland zone lynx populations were eliminated by overtrapping. The extensive clearing and plowing of shrubland which reduced snowshoe rabbit habitat may also have contributed to the lynx decline. However, during this settlement period, the northern transition and boreal forest zones continued to support cyclic but relatively high lynx populations (137). In the past several years, the decline in fur prices has led to a decline in trapping in the southern zones and this factor accompanied by a good snowshoe rabbit population in the remaining shrubland has resulted in a southward range expansion of the lynx. This expansion has extended south into the adjacent states of North Dakota and Minnesota (19, 156f). The first southern appearances of lynx in the early 1960's were accompanied by much newspaper publicity but of late the reports of lynx are so common that little mention is made of these animals. Several specimens I examined while at Shoal Lake were large and in excellent condition.

It was initially believed that the southern appearance of lynx was due to a snowshoe hare shortage in the north, but this has not been confirmed and must be questioned as southern snowshoe hare populations were

good at the time. Elton (56) and Keith (76) report that in Manitoba the snowshoe hare populations throughout the Province cycle together. There is no reported widespread discrepancy as to area.

In the northern transition and boreal forest areas the lynx is expected to remain a common furbearer. Recent extensive fires in these zones have created large areas of early succession vegetation consisting of willow, aspen and associated shrubs; this has produced optimum habitat and snowshoe rabbits have increased. Lynx populations have increased accordingly in these areas (19).

The annual catch of lynx during the period 1933 to 1961 averaged 1,200 animals (156d). At present, lynx fur is in demand for trim on coats and jackets. A new market is arising for "trophy" rugs made of whole lynx skins. In response to this demand, increased trapping pressure may again reduce populations.

Lynx have, on occasion, become predators of unprotected domestic poultry in agricultural areas.

g. Squirrel.

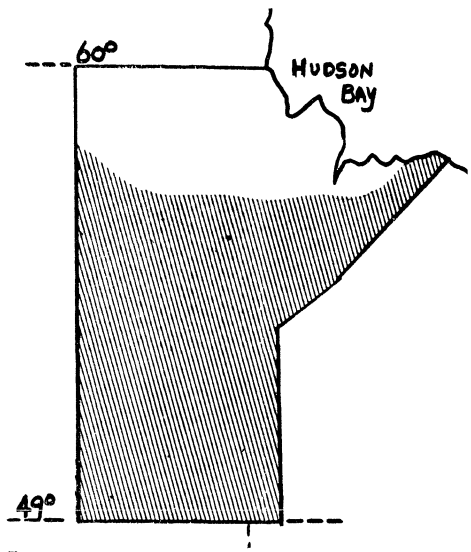


Fig. 19. Distribution of red squirrel.

Three species of squirrel occur in Manitoba. In the extreme southern portion adjacent to the United States border the eastern grey squirrel maintains low populations over a limited area. This squirrel appears to be expanding its range northward and eastward in Manitoba (137). In the Red River valley area of Manitoba, it occasionally creates problems by chewing holes in wooden granaries used for the storage of agricultural crops. The grey squirrel is sometimes hunted for its flesh; the pelt is valueless.

Flying squirrels occur throughout the former tall grass prairie, aspen parkland and transition zone (137). They are valueless as furbearers and are not known as a problem species.

Red squirrels are common throughout the forested areas of the Province (137). Highest densities occur in the transition and boreal forest zones. The red squirrel pelts provide a small but steady income to local trappers and rural boys. The annual take is about 250,000 (156d).

In the south, the red squirrel is mainly confined to riverbottoms and this habitat will probably persist largely unchanged.

In future, logging and clear cutting of pulpwood may reduce local habitats in the transition and boreal forest zones but extensive habitat losses are not forseen.

h. Badger.

Badger range in Manitoba extends over the prairie, aspen parkland and transition zones. Populations are highest in the southern and western prairies and parkland and decrease as one proceeds northward (137). The badger appears well adapted to cultivation and its present populations are associated with agricultural land. Badger populations were low during the early 1900's (126). Soper (137) reports that the lowest population occurred

in 1925, when badger fur reached its highest value. Since 1930, increasing badger populations have resulted from increased agricultural brush clearing combined with low fur values and reduced trapping.

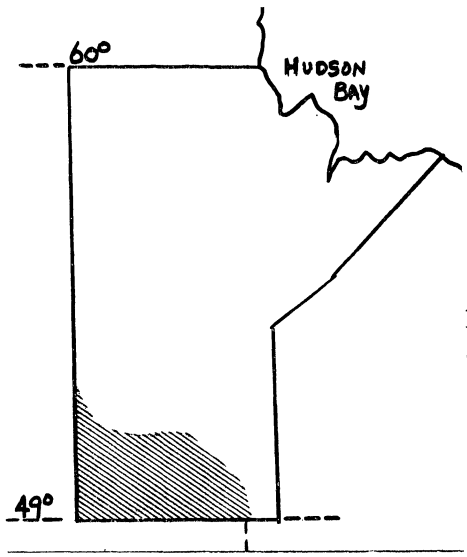


Fig. 20. Distribution of badger.

The badger is often a pest species both as a predator of domestic poultry and in its habits of opening large burrows which create livestock hazards in pastureland and cultivation problems in croplands. On the other hand, the badger may be beneficial in controlling ground squirrels and other rodents (19). However, the economic position of the badger in these agricultural regions has not been established.

i. Raccoon.

The raccoon was a common animal in southern Manitoba prior to 1900 (128). From 1900 to 1922, raccoons were rare. Since 1922, the raccoon populations have increased. Bird (19) states that raccoons have adapted well to the expanding agricultural habitat and find food in abundance (raccoons are omnivorous). The continued northward expansion of the raccoon will possibly be limited by a lack of preferred hollow tree denning

sites (19). In northern areas, the predominant conifers (white and black spruce) and aspen poplar provide few den sites.

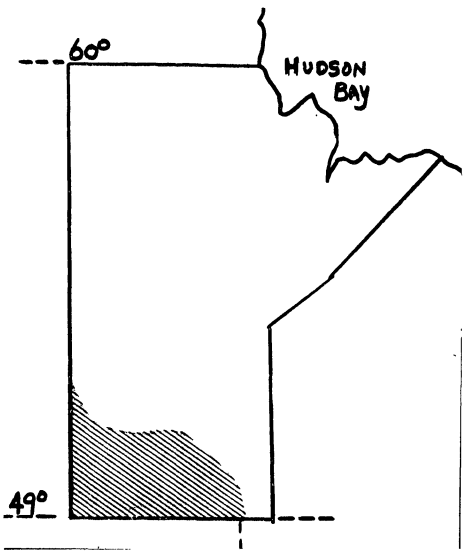


Fig. 21. Distribution of raccoon.

Raccoons are currently of little value as sporting or furbearing animals and in agricultural areas create problems by depredation on poultry, garden and fruit crops. Sweet corn is a favorite food and raccoons may frequently strip a garden of domestic corn in a single night. "Coon" hunting is, as yet, not a popular sport in Manitoba and unless the pelt returns to favor in the fashion market, hunting and trapping may not suffice to limit populations.

In southern agricultural areas, raccoon habitat appears to be optimum along the margins of streams, rivers and lakes. In these areas, large trees provide cover and the wild fruits, berries and aquatic invertebrates such as freshwater clams and crayfish provide food. The raccoon dozes in dens during the cold winter months, becoming active in mild periods.

j. Striped Skunk.

The striped skunk is the commonest mustelid in Manitoba (137). High-

est density skunk populations are currently found in agricultural areas of the Province where the omnivorous burrow-digging skunk finds food and cover in abundance (137). In the northern areas of the transition and boreal forest zones, low density skunk populations occur (19, 137).

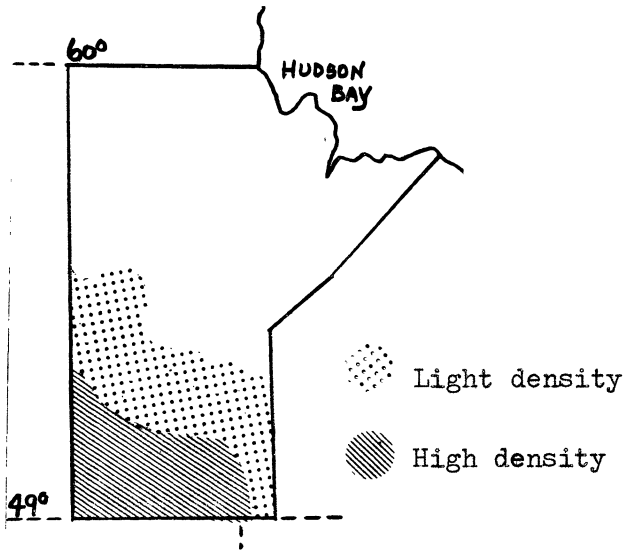


Fig. 22. Distribution of striped skunk.

Prior to 1930, skunk fur was in demand and populations were kept relatively low by trapping. Since then, little trapping pressure has been exerted on these animals and southern area skunk populations have mushroomed. Skunks are currently a serious pest species due to depredations on poultry and waterfowl and particularly due to the high incidence of rabies in the population. Skunks infected with rabies have been collected throughout the agricultural areas and dogs, cats, horses, cattle and hogs have been infected by them (69a, 95). Fear of rabies has prompted localized municipal control through public education programs and assistance in skunk eradication. During 1963 and 1964, some municipalities employed professional trappers for skunk control programs (personal observation). In skunk control programs, municipalities have avoided the bounty system

in favor of rural self-help programs through public education (newspaper, radio, television). These education and control programs have been directed and facilitated by personnel of the Wildlife Branch and the Extension Service of the Department of Agriculture and Conservation.

However, attempts at skunk eradication have generally failed, and at present the skunks remain in high density over most of southern Manitoba. The incidence of rabies has decreased, but the disease is still present (69b). Skunk fur value is low and aside from disease the great horned owl and coyote appear to be the only suppressors of skunk populations (19).

k. Wolverine.

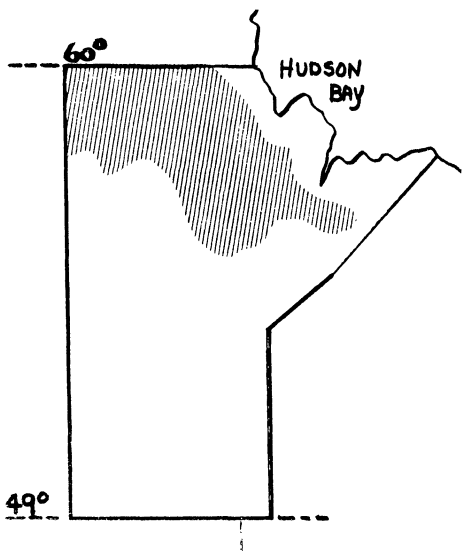


Fig. 23. Distribution of wolverine.

The wolverine was never abundant in Manitoba and its current status is that of a rare animal of the extreme northern boreal forest and tundra areas (137). Soper (137) records that the wolverine requires extensive wilderness areas and does not thrive in close proximity to man. Seton (128) regarded the wolverine as an important predator on beaver and stated

that wolverines were most commonly found where beavers were abundant. However, recent increases in beaver populations have not resulted in increased wolverine populations (19, 58). The annual yearly catch of wolverine totals only 30 to 50 animals (137).

Currently the wolverine is in demand as a trophy animal and complete skin rugs are purchased for decoration by private individuals and businesses.

Wolverines are currently increasing in Montana (147). This may well be due to decreased trapping pressure. It remains to be established whether or not wolverines are achieving a similar increase in Manitoba.

1. Fisher.

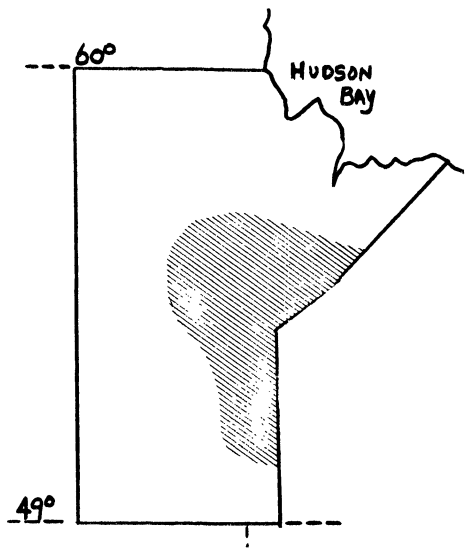


Fig. 24. Distribution of fisher.

Alexander Henry recorded the fisher as originally ranging throughout Manitoba and recorded many pelts in the fur lists of areas in close proximity to the present cities of Winnipeg and Brandon (33). With overtrapping, followed by settlement and agricultural cultivation, fisher populations were eliminated from the prairie and aspen parkland. Present day popula-

tions are restricted to the central and northeast sections of the boreal forest zone (8, 137). Soper (137) states that Manitoba's annual catch is 300 to 500 animals all of which originate in the central and eastern portions of the Province. Fisher fur is still in good demand and local populations are not expected to increase nor the boreal forest range to expand unless the fisher is afforded more protection. However, the fisher may be invulnerable to other than extremely intensive overtrapping as the animals are difficult to catch (156f).

m. Marten.

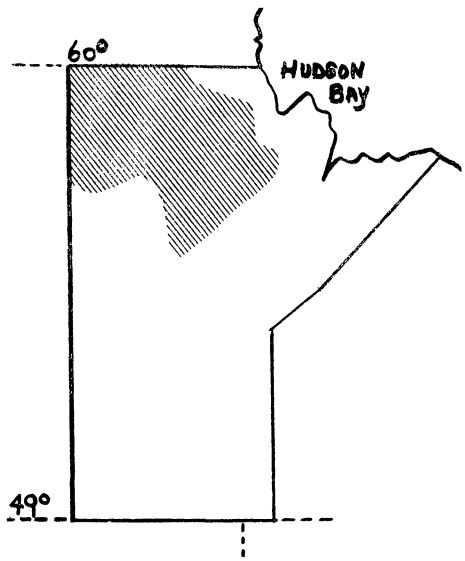


Fig. 25. Distribution of marten.

Manitoba marten range is currently confined to the extreme northern areas of the boreal forest zone but during the early fur trade period (1670-1840) marten were common in the southern aspen parkland and transition zones. Henry recorded a take of 1,207 animals at the Red River post (Winnipeg) in the winter of 1806-07 (33). Seton (126) reported the marten as eliminated from its southern range by 1850. Soper (137) suggests that overtrapping has been the major cause in the decline of marten populations. At present, 100 to 200 pelts are taken annually in a localized

northwest section of the boreal forest zone. Marten fur is still in good demand and the population appears stabilized (137). Recent live trapping and transplanting of marten has been carried out by the Wildlife Branch in an attempt to re-establish the animal in a greater area of its former northern ranges (156f).

n. Otter.

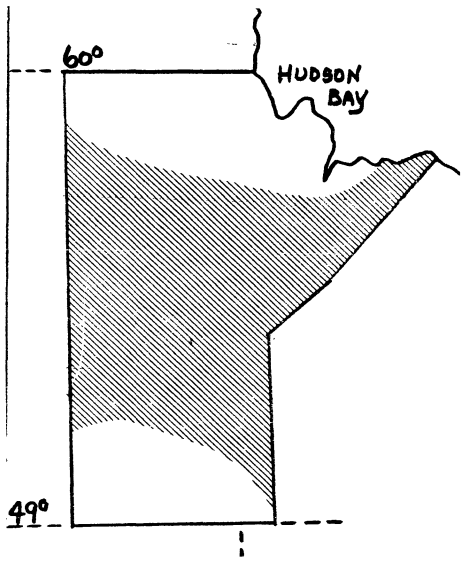


Fig. 26. Distribution of otter.

Otter were formerly common throughout Manitoba from the 49th parallel north to the tree line (19). By 1900, southern occurences of otter were rare (128). The disappearance of the otter from its southern ranges was associated with overtrapping, and current populations are restricted to the transition and boreal forest zones. Otter pelts are still in good demand with an average catch of 1,600 animals. Trapping pressure keeps populations stable (156d,f).

o. Arctic Fox.

The arctic fox inhabits the remote tundra area of Manitoba along the coast of Hudson Bay (137). Its range has been unchanged since early fur

trade periods and is only sparsely occupied by a few native Indians and Eskimos. These foxes migrate southward in winter and have been taken 300 miles inland from the coast during severe winters (137). The arctic fox provides a chief source of income for tundra trappers and the total average annual catch is near 700 animals (156d). The arctic fox populations are expected to remain at their current level. Extensive human habitation is improbable due to the severe climate and current lack of economic incentives to enter the area.

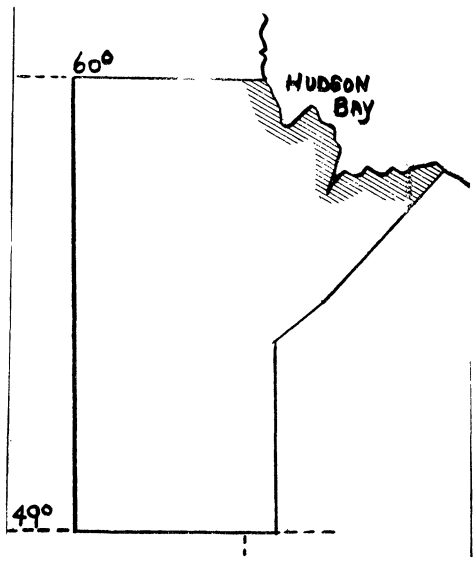


Fig. 27. Distribution of arctic fox.

p. Timber Wolf.

The timber wolf in pristine eras ranged over all of Manitoba. Wolf populations in the prairie and aspen parkland zones were evidently greatly reduced prior to settlement and initial agriculture during the earliest agriculture period 1870 to 1900 (19). This early reduction was primarily due to trapping and hunting but also of significance was the elimination of the buffalo and the extensive reduction of other big game animals upon which the southern wolf population depended for food (19). With agricul-

tural settlement during the period 1870 to 1930, the elimination of the timber wolf from the prairie and parkland was completed. The timber wolf is an effective predator on domestic livestock; agricultural livestock production and wolf populations are incompatible.

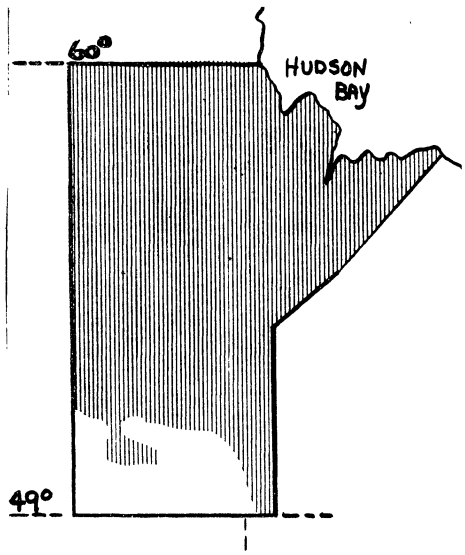


Fig. 28. Distribution of timber wolf.

From the early 1900's until 1955, the timber wolf was subjected to a bounty system of control in both agricultural areas and northern regions. In addition to the bounty, poison, professional trappers and game branch personnel were often utilized to effect wolf reduction programs (156a,b, f,g). Since 1955, Manitoba has revoked timber wolf bounties and has adapted the policy of government control of wolves in specific problem areas (156f,g).

Manitoba has three major wolf control policies related to distinct areas of the Province. These are: Control of wolves in areas adjacent to settlement as a means of protecting livestock; control of wolves in remote areas of central Manitoba; and control of wolves on the barren-ground caribou ranges (111).

Control of wolves in areas adjacent to settlement is economically important as Manitoba's northern fringe of settlement is chiefly a livestock producing area and the efficiency of the timber wolf as an effective predator of domestic livestock has been demonstrated many times (156a,b,e). The purpose of this specific area control is to create a wolf-free buffer zone between the cattle range and the wolf populations of the central transition and boreal forest zones. deVos (45) considered this form of control necessary in similar situations in Ontario.

The necessity of wolf control in the lightly inhabited and remote central boreal forest areas has been questioned by Pimlott (111). This area lies between the northern fringe of settlement and the barren-ground caribou range and is relatively inaccessible and unsettled. The area also supports a growing but unharvested moose population (156f). Cowan (34), studying wolf-game relationships in remote areas of Alberta, stated that unharvested game herds were not significantly reduced or adversely affected by wolf depredations. However, the remote central area of Manitoba also supports a protected but declining woodland caribou population, and concern for caribou welfare has popularized wolf control in the region (156c).

The control of timber wolves on the barren-ground caribou ranges has been prompted by a recent, rapid decline in caribou numbers (16). Control in this area will undoubtedly continue not because wolves have been established as the main cause of the current decline (16), but because wolf depredations on caribou are a much-publicized decimating factor, the control of which has gained popular public support.

Timber wolves may contribute to the caribou decline (111) but are

far less effective as a reduction factor than the loss of caribou range due to tundra fires or the indiscriminate and often wasteful killing of the animals by natives of the area (15). Native human usage of barren-ground caribou in Manitoba may annually exceed the natality increment of the herds and in this situation declines are inevitable (16, 111).

Currently, the timber wolf occurs in medium density populations throughout the northern transition zone, the boreal forest zone and the tundra areas (137). Southern expansion of the wolf range occurs periodically. One of the more recent re-establishments has occured in the area of the Duck and Porcupine mountains and in the Riding Mountain National Park (136, 19). The roughly wooded terrain characteristic of these areas forms a land peninsula of heavy cover which penetrates deeply into the northwest agricultural areas of the province. Timber wolves dispersing from this peninsula onto cultivated land constitute a potential for livestock depredations (156f).

Strong (143) considers that limited numbers of wolves in the park are desirable for the control of protected ungulates but because of the heavy cover and large size of the area, accurate censuses of wolf populations are difficult. Wolves range widely and since their re-establishment, livestock losses on cultivated land have been reported. Some wolf control appears to be necessary.

Wolf pelts reached their highest value in the season of 1928-29 when prices averaged $20.00. Lowest average value was during the winter of 1947-48 when the price was $4.00 per pelt. The current value of a timber wolf hide is $12.00 (63).

The future value of the timber wolf may be as a trophy or game animal.

The wolf is large, elusive and like all large carnivores is sought by hunters. The State of Alaska in 1963 recognized the potential value of the wolf by placing it on the big game listing.

q. Coyote.

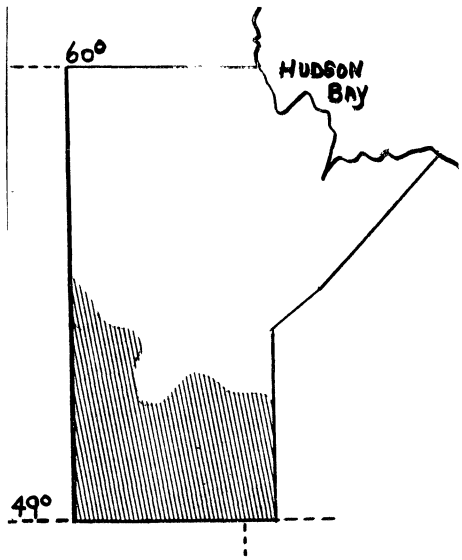


Fig. 29. Distribution of coyote.

Coyotes are native to the tall grass prairie, aspen parkland and transition zones of southern and central Manitoba. During the period of over-exploitation by the fur trade (1900 to 1840) the coyote population declined (19), but by 1900 Seton (126) reported them as again abundant. This increase may have been facilitated by the elimination of the timber wolf in these zones. Bird (19) and Soper (137) currently regard coyote populations as again declining and correlate their decline with extensive human habitation and cultivation of their former optimum ranges. Bounties which were in effect until late 1965 may have contributed to the current population decline, but the widespread use of the poison "1080" is probably far more significant (see Appendix C).

Coyotes are normally found only in the southern prairie, parkland and

transition zones, but some northward expansion into the boreal forest zone has occurred. This is in the area of the agricultural Pasquia reclamation project of the Saskatchewan River delta (137). The coyotes are conceivably limited in expansion of their range northward by the northern resident timber wolf population.

Coyotes have created pest problems in the agricultural areas by depredations on poultry and sheep flocks. At present, the low coyote populations combined with reduced sheep populations and protected (confined) rearing of poultry have reduced this conflict (95). Sheep production is not popular or localized in any particular area of southern Manitoba. The rearing of sheep is confined to scattered, small farm flocks and the number raised, or density in any specific region is not high.

Coyote control was, until 1965, attempted by means of a bounty system, and by "1080" poison control program both administered by municipal areas. The "1080" poison control appeared most effective, and by late 1965, the government-subsidized bounty system was revoked (156h) (see Appendix C). At present, each municipality decides individually what its predator control program will be; if bounties are imposed the local municipal taxpayer must bear the full cost (95, 156h).

It is probable that the "1080" program of coyote control will continue to be used in specific problem areas, but current low sheep populations suggest that its use will not be widespread. The current policy regarding all predator control, including that of coyote and wolf, is to remove all blanket control methods and resort to intensive control by trapping, poisoning and hunting in areas where such animals constitute a real problem.

Coyote fur prices are variable but since 1930 have been generally low. In the years 1919-1920 and 1927-1928, coyote pelts reached their highest average values of $17.58 and $20.00 respectively. Lowest average values were received in 1953-54, when the price averaged $1.83. In 1964, the average value of each coyote pelt was $6.08 (63).

Coyotes may be beneficial in rodent control and may also, in the future, have a positive value as a sport species. The current use of over-snow vehicles and "varmint" hunting techniques for coyotes is increasing during the winter months (156h).

A re-evaluation both as to the influence of coyotes on pest rodent species and of their economic relationships to agriculture is required. Under present "1080" control, coyote populations are expected to remain stable and of moderate density.

r. Red Fox.

The current range of the red fox is the total area of Manitoba from the 49th parallel to the coast of Hudson Bay. As a result of genetic strains, the red fox occurs in four distinct color phases in the Province; red, blue, cross and silver; the blue is the rarest phase (137, 156d). Fox populations are densest in the southern agricultural prairies and aspen parkland. Current fox populations in these areas are the highest ever recorded (156g).

The red fox has followed the same general pattern as many other fur-bearers. During the period 1840 to 1930, the fox pelt was a valuable fur item and foxes were kept at a low level by intensive trapping. Since 1930, the market value of the long-furred pelts fell and caused a decline in fox trapping; consequently, the red fox has become common throughout the

Province and abundant in southern regions where agriculture may have improved fox habitat (19). The extensive cultivation has resulted in an increased interspersion of fields, brushland, and grassland, and the rodents and insects (especially grasshoppers) preyed on by the red fox have remained abundant (19). It is also possible that the fox is dominated by the wolf and coyote, so that the early elimination of the timber wolf and the current reduction in coyote populations permit fox increases (137, 19).

The red fox fur value has been variable. The highest average value of $31.00 per pelt was received in 1928; the lowest average value occurred in 1957-58 when the price fell to 82 cents. The average value in 1964 was $4.75 per pelt (63).

Foxes have created pest problems by depredations on poultry. These depredations resulted in a bounty being placed on the fox in municipal areas in 1943. The bounty continued until 1965 when government support, which had amounted to 50 percent of the total bounty paid out by each municipality, was dropped.

The occurrence of rabies in the red fox population is always a potential problem (26, 125). In southern Manitoba, incidences of rabies in the fox have recently been confirmed (69b). The fox population has not been as severely infected in the recent outbreaks as that of the striped skunk. However, the possibility that the fox is a carrier of rabies is now present. If rabies in the fox becomes common, fox control on an intensive local area basis by government personnel and local area residents is anticipated. This type of problem area control has been practiced on skunk populations in municipal areas exhibiting a high incidence of the disease (95).

The red fox is gaining in popularity as a sporting species for the "varmint" hunter and as an off-season game animal for both rural and urban residents. Murie (103) suggested that adequate fox control can be accomplished by local hunters and regarded trapping and seasonal hunting as effective population regulators.

In Manitoba's farm areas, fox hunting is most productive during the off-season winter months when snow cover makes the fox more readily visible. In addition to conventional hunting methods, hunters in Manitoba frequently employ aircraft, over-snow vehicles and automobiles in pursuit of this sport.

5. Policies and Trends in Fur Management.

Manitoba may be divided regionally into two broad areas in terms of the importance of wild fur production and management; privately owned land and crown land.

In the southern agricultural municipal areas (privately owned) which include the prairie, aspen parkland and the southern portion of the transition zone, trapping provides only a seasonal income to rural resident part-time trappers and farmers. The potential for habitat improvement is limited. The landowner dictates land use policies in the area.

In this area, which currently produces abundant fur yields of muskrat, mink and beaver, the catch for each species is regulated by the length and timing of the trapping season. Generally, there is a late fall-early winter season for mink, weasel, squirrel, lynx and other non-aquatic furbearers. On muskrat and beaver, the regular season is normally held in the spring, but in years of drought a fall "salvage" season may be held (156a,f,g). Each trapper is required to purchase a trapping license. In

the municipal areas, no registered trap lines are established (156c,d,e,f,g).

In the northern boreal forest and tundra regions (crown land), fur management is important and is based on the production of stable, harvestable furbearer populations. To accomplish this goal, emphasis has been placed on the production of beaver, muskrat and mink which, as in the south, annually provide 70 to 80 percent of all trapper income. Techniques employed have been mainly marsh management, the creation of registered traplines and trapper education which emphasizes the proper trapping and preparing of quality pelts. This is accomplished through extension work of personnel of the Wildlife Branch and by the publication and distribution of brochures and booklets on the subjects of quality wild fur production (63).

With regard to registered traplines, in addition to assigning registered blocks of land to individuals for their sole trapping areas the Wildlife Branch places emphasis on sustained yields from each area. Annual quotas for each fur species are established through ground and aerial census surveys, conducted by both trappers and Wildlife Branch personnel. Each registered trapper must report annual catches as to species and estimate habitat conditions and furbearer populations in the area registered as his trapline (156e,f,g).

The Wildlife Branch engages in the promotion of fur sales by wild fur displays and marketing brochures (156g).

Trapping seasons and trapper licensing are employed as management tools in the same manner as in southern areas.

In the marketing of furs, trappers may either sell their catch directly to a licensed fur dealer or trader or may sell the furs by public auctions which are held several times yearly. The auction of furs is

supervised by government personnel (156g).

Taxes on wild furs are levied in the form of a government royalty which varies in amount as a percentage of the value of each fur. Revenue from this royalty is used to finance fur management and trapper education programs (156f).

6. Factors Influencing Future Furbearer Populations.

a. Fashions and Economics. The future of furbearers and the welfare of furtrappers is dependent on the economic demand of the fashion trade, clothing and decorative industries. Furbearer populations have, in the past, been largely controlled by market demand which dictates prices and, indirectly, the intensity of trapping (19). During the fur trade and early settlement periods (1670 to 1930) the demand for fur was good and furbearer populations were kept at low levels by trapping (19). Since 1930, fur prices have declined and fur trapping, other than as a part-time venture has correspondingly declined over most of the Province. This factor coupled with increased wages and general business prosperity has removed the pressure on furbearer populations; today it is only in the northern, relatively unsettled and undeveloped areas that fur remains a chief source of income for resident natives and professional trappers (53). Furbearers, particularly the low-valued, long-furred species have increased (19).

The current trend toward the increased raising of ranch-reared furs or the utilization of synthetic fur substitutes may further reduce the demand for wild fur (156f,g).

b. Land Use Practices. Land use practices related to furbearer abundance are of major importance only in the farming areas of Manitoba.

In this area, land use practices such as the drainage and filling of wetland habitat has reduced the potential of the southern agricultural areas to produce muskrat and other aquatic habitat furbearers, but to date the extent and significance of this type of damage has not been accurately assessed (84).

Agricultural cultivation and land clearing in the prairie, aspen parkland and transition zones involves the clearing and cultivation of large areas of aspen and willow shrubland. This eliminates the habitat of many upland furbearers, and the resultant wind and water erosion of soil may have a significant detrimental effect in filling potholes and marshes, both important habitats for aquatic furbearers. The magnitude of this as a factor in reducing furbearer populations has also not been determined. Agricultural land clearing and cultivation have seemingly improved the habitat for such species as the striped skunk, badger and red fox (53, 19).

Fire control in agricultural areas may have enhanced the area for certain fur species by allowing the growth of early succession trees and shrubs along watercourses and on non-cultivated land. Recent southern area increases in beaver, lynx and fox populations may be due in part to increased food and cover found in this type of habitat.

Fires in the northern areas of the transition zone and in the boreal forest areas are common and may be influential in creating early succession shrub growth which improves the habitat for snowshoe rabbits, beaver and small rodents; this may consequently have allowed increased carnivore populations such as lynx and timber wolf.

Prairie droughts, which are, in part, associated with agricultural

land use practices such as brush clearing and drainage, are most influential in reducing aquatic furbearer populations through periodic loss of habitat (156e).

c. Public Health. Rabies is a potential disease problem in furbearer populations. In the southern farming areas, recent incidences of rabies in the striped skunk and red fox present a health hazard to humans and domestic livestock. This disease necessitates periodic local but intensive control of infected furbearer populations (69b). To supplement control, voluntary innoculation of domestic pets against rabies has been a widespread practice among rural and urban residents. Rabies in the northern areas has been frequently reported (69b), but the extent of the infection and the problems created in this area are unknown.

d. Predation and Pests. Current farm trends toward the large and totally protected rearing of domestic poultry will reduce the opportunity for predation (95). The small unprotected poultry flocks may continue to exist on marginal farms but the need for other than local control of individual predators diminishes. The major predation problems in future will probably be restricted to those related to the timber wolf, coyote and black bear depredations on sheep and cattle raised in the northern and eastern fringes of settlement.

In anticipation of these potential problems, Wildlife Branch intentions are to resort to local intensive individual species control by local residents, professional trappers and government personnel. The bounty system in effect until late 1965 has been terminated after having been found costly and ineffective (156h).

e. Recreation and Trophy. Furbearers such as the wolf, black bear,

coyote, red fox, wolverine, lynx and even badger and raccoon may in future be utilized as sport species for hunter recreation or may be taken for their decorative or trophy values. In a recent visit to sporting goods and department stores in Winnipeg, I noted prepared rugs of black bear, polar bear, timber wolf, coyote and wolverine for sale, in addition to manufacturer novelty items such as slippers, jackets, and parkas made from raccoon, lynx and badger pelts. The desire of tourists and urban dwellers for such items may in future form the major market outlet for many such wild furs.

Recreational hunting of the larger furbearers has gained impetus as an off-season sport during winter months. Species such as the red fox and coyote are taken by conventional hunting, over-snow vehicles and "varmint" rifles (19). With the removal of government support for bounties in 1965, the supply of such animals available for this type of recreation may increase (156h).

The "varmint" hunting of striped skunks, badgers and raccoons may also increase.

SUB-INDEX #4

BIG GAME

1. Introduction.

Big game animals in Manitoba fall into two groups; those that have been drastically reduced and whose populations are currently limited by land use practices, and those that have benefited to some degree or have been relatively unaffected by land use other than fire. All species are periodically influenced and most are regulated by man's annual harvests.

In the first category, there are many species that have, for all practical purposes, been reduced to levels of near extinction; these are the bison, antelope and grizzly bear. Mule deer, once abundant, survive only in remote hill areas. Elk, black bear and timber wolves have been eliminated from the tall grass prairie and most of the parkland, and while the black bear and timber wolves have adapted well to the northern areas, the elk persist only on limited ranges in the Riding and Duck Mountain areas.

Direct reduction by overkilling initiated the declines of bison, wolf, black bear, antelope, mule deer and elk populations in southern Manitoba, but increasing agricultural cultivation has been important in stabilizing habitat and big game populations at low levels.

Fire is important. In the south, fire reduces brushy cover but in the northern forests fire creates brush cover. In addition, extensive repeated fires have resulted in lichen and moss damage in the tundra and boreal forest zone, and caribou, both woodland and barrenground, are declining.

Environmental resistance is important as a controller of certain wildlife populations in Manitoba. These winter-seasonal factors comprised

of combinations of cold, wind, snow, disease and parasites combines with limited predation by timber wolves in northern areas to keep big game populations below maximum density in relation to the food supply. Food supplies are normally adequate but may be buried by snow. Snow also restricts movements of animals.

In the second category are two adaptable species, the white-tailed deer and the moose.

White-tailed deer emigrated into the Province as a result of early, limited cultivation complemented by the removal of most predatory and competitive species. White-tails reached peak abundances in the early 1950's but are now declining in the agricultural areas due to overgrazing and increasing and intensive mechanized cultivation which removes the brushy habitat. White-tail range is expanding northward but is limited by factors which will be discussed later.

Moose were killed out in the parkland but have been aided in northern range expansions and population increases by repeated fires in the forest zones which created vegetation utilized as both food and cover. Gains in moose populations have been offset by caribou population declines in these same areas.

Only the polar bear and muskox appear to be unaffected by land use practices since little, if any, habitat change has taken place on their ranges. These animals have been severely reduced, or in the case of the muskox, eliminated by direct killing by man.

2. White-tailed Deer.

Introduction. White-tailed deer are the most abundant and important big game animals in Manitoba. This may seem rather surprising in view

of the fact that they are not native to the area and were unknown in Manitoba prior to 1881 (137, 127, 128). However, when one considers the land use changes wrought by settlement and agriculture since 1870, the northward spread of the white-tailed deer becomes a logical and natural occurrence.

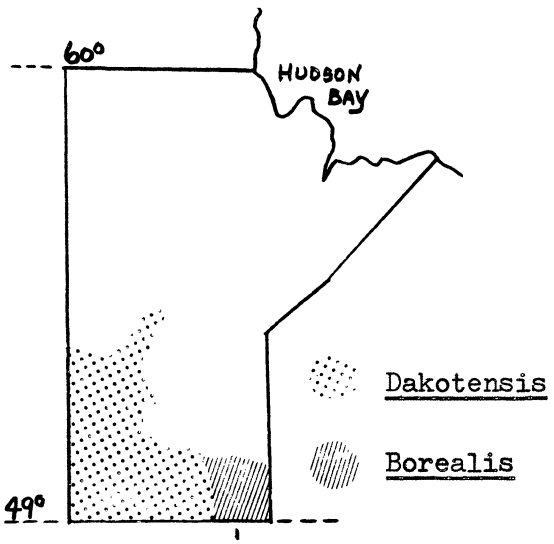


Fig. 30. Distribution of white-tailed deer.

Early agricultural settlement which suppressed prairie fires and created an intense interspersion of cropland and early succession growths of aspen, willow and many associated browse shrubs, provided near optimum white-tailed deer habitat (19). The white-tailed deer expanded their ranges northward.

White-tails first appeared in the Red River Valley in 1881 and by 1884 they were common in the Pembina Hills but were unknown at Seton's Carberry home (127). Since 1884, the white-tailed deer has been the predominant deer species of southern Manitoba. The highest white-tail populations occur in the privately-owned agricultural areas (137), and white-tail range appears to be steadily expanding northward with agriculture.

The deer have recently (1959) been reported as far north as Pucktawaugon on the Churchill river (137). In addition, a gradual warming trend in the climate has helped this northward spread. Deer are, however, limited in extreme northern areas by the prevalence of conifers and by deep snow which buries their food supply and renders them easy prey to wolves and Indians (47).

W. P. Taylor (148) and Soper (137) describe Manitoba white-tails as two subspecies, the northern white-tail (O. v. borealis) and the Dakota white-tail (O. v. dakotensis). These subspecies are characteristically larger than many of their southern relatives.

The northern white-tail is found throughout southern and eastern Manitoba east of the Red River and ranges northward into the Whiteshell forest preserve (137). The Dakota white-tail is more common and abundant west of the Red River, occurring over most of the agricultural south, central and western portions of Manitoba.

White-tail numbers increased steadily during the period 1880 to 1950. During white-tail establishment periods, Manitoba was under the "Buck Law" and held a short annual season each fall during which only one buck was allowed per hunter (19). From a total reported kill of 840 in 1933, the take increased to an estimated 30,950 taken by 45,986 hunters in 1951 (19, 156b). It then became necessary to stabilize or reduce populations to alleviate crop damage and prevent excessive winter losses due to starvation. This was done by means of either-sex hunting. Since 1950, the regulations regarding either-sex hunting have varied but white-tail populations have stabilized (19).

Weather is important to deer welfare. deVos (47) suggests that

accumulations of 18 inches or more snow over a period of several weeks may cause severe die-offs. Deep snow restricts winter movements and makes normally adequate browse plants unavailable. Several spectacular winter die-offs have occurred in Manitoba; the winters of 1948-49 and 1955-56 were exceptionally severe (19). Such mortality is followed by a rapid recovery of the population. Ransom (116) states that this is because the die-offs are not the result of the over-use of forage.

Food supplies appear entirely adequate over most of the Manitoba white-tail range (156g), so factors other than food are the major limitations to white-tail abundance. Ransom (116), in a study of Manitoba deer populations and range conditions, clarified some extremely important factors relating to deer management in Manitoba. These are as follows: Winter range areas are large and yarding is uncommon. The winter environmental resistance (low temperatures) can cause serious loss of condition despite the availability of food and is sufficient to prevent overpopulations and to hold maximum deer densities far below that reached in the lake states. Deaths during Ransom's study were not primarily due to deep snow or lack of food but rather to "environmental resistance" comprised of combinations of such factors as cold, parasites, decreased food quality and snow. In addition, Ransom (166) suggests that winter weather keeps maximum deer densities far below that of range capacity. Net productivity was also below that realized by deer in the lake states. It is significant to northern area deer management to weigh carefully Ransom's conclusion: "The extreme importance of weather in the environmental resistance acting against deer in Manitoba is sufficient to invalidate the application of some deer management principles derived in areas where total food supply

is a chief limiting factor."

As stated, white-tails have adapted well to the mixed aspen-grassland-farmland habitat and thrive in close proximity to man in southern Manitoba. The removal of mule deer may have contributed to the first rapid white-tail increase. Soper (137) suggested that the white-tail has usurped the former mule deer ranges and that mule deer have been practically eliminated. Since mule deer are normally considered a hardier, more dominant species, this conclusion of Soper's is probably misleading. The mule deer is less wary and easily eliminated by overhunting in prairie country.

Manitoba Deer Habitat Changes. Agriculture has provided an optimum habitat for white-tailed deer. Cereal grain farming on a limited scale (leaving adequate cover) aids white-tails which feed on fall rye in the spring and the ripened heads of cereal grains and flax in the fall. These deer are particularly fond of sweet clover (an introduced species) which has spread in a wild state over much of southern Manitoba (19). White-tailed deer have also been known to invade marsh edge areas of sedges, bulrush and heavy stands of phragmites. This grass provides shelter and the deer become semi-aquatic, wading and swimming readily (19). Examples of this type of habitat are found at the southern end of Lake Manitoba and the Big Grass Marsh.

The privately-owned southern deer range has produced the vast majority of white-tailed deer. From 1900 to 1950 the area of this habitat increased. Since 1950, both the habitat and deer populations have been rapidly depleted. This is the result of intense, mechanized cultivation, the use of the bulldozer in land clearing and the intensification of beef cattle production. Such practices reduce deer populations by reducing both the

total area and the quality of brushy habitat. Deer can only be maintained by maintaining their range, preventing overpopulations and guarding against winter starvation and excessive browse plant removal or depletion. Indications are that in future the agricultural range may be restricted to non-arable river bottoms.

White-tails may continue to expand northward but northern transition and boreal forest zones have low carrying capacities and populations cannot be relied upon to be abundant (116). Ransom (116) found populations in the totally protected Whiteshell Game Preserve (transition zone) at stable low levels even under good food and cover conditions.

As stated, the chief threat to the white-tails continuing importance as a game animal west of the Red River is the trend throughout the aspen parkland towards clean farming. This trend is indicated by the steadily increased bulldozing of the aspen bluffs and the plowing and cultivation of the remaining grass and shrubland (19). In this privately-owned habitat, increasing farm costs, mounting land taxes and the currently favorable prices of cereals and beef add to the incentive to clean farm and produce as much cash crop as possible. Conservation-minded farmers often have no choice but to move towards intensive farming due to the cost-price squeeze characteristic of modern agriculture.

The northern white-tail populations found in eastern Manitoba are less affected by increasing cultivation or clean farming. The area is relatively sandy, infertile and only marginal to farming. Some farms are abandoned periodically. Recent extensive fires in this aspen-spruce habitat have retarded climax succession. Much of this area is productive deer habitat but due to the extensive, flat, relatively unbroken forest, deer

are harder to hunt here than in western regions and most hunters currently avoid this area. This is a problem of hunter preference. Forest regeneration damage by deer has occurred in this area and efforts to channel hunters into the region to harvest the abundant white-tail populations should be made (5b,c).

Increasing beef cattle populations are common over much of Manitoba. The Department of Agriculture's efforts to double Manitoba's beef cattle population in the next ten years indicates increased grazing and adds to the problem of salvaging white-tail habitat (95). Most of southern Manitoba is privately owned, and the landowner who lacks any monetary incentive to produce or salvage game ranges will naturally attempt to provide himself the with maximum income from farming. One way farmers accomplish this is in the form of increased acreages (through land clearing) for the production of cattle and crops. Game, at present, often has negative values to the land owner, expressed in crop damage or in the attraction of callous sportsmen who may damage property (19). In much of the agricultural white-tail habitat, posting of land against hunting is increasing. This is the result of relatively poor farmer-hunter relationships which evolved because of the lack of consideration given to the landowner by the hunters.

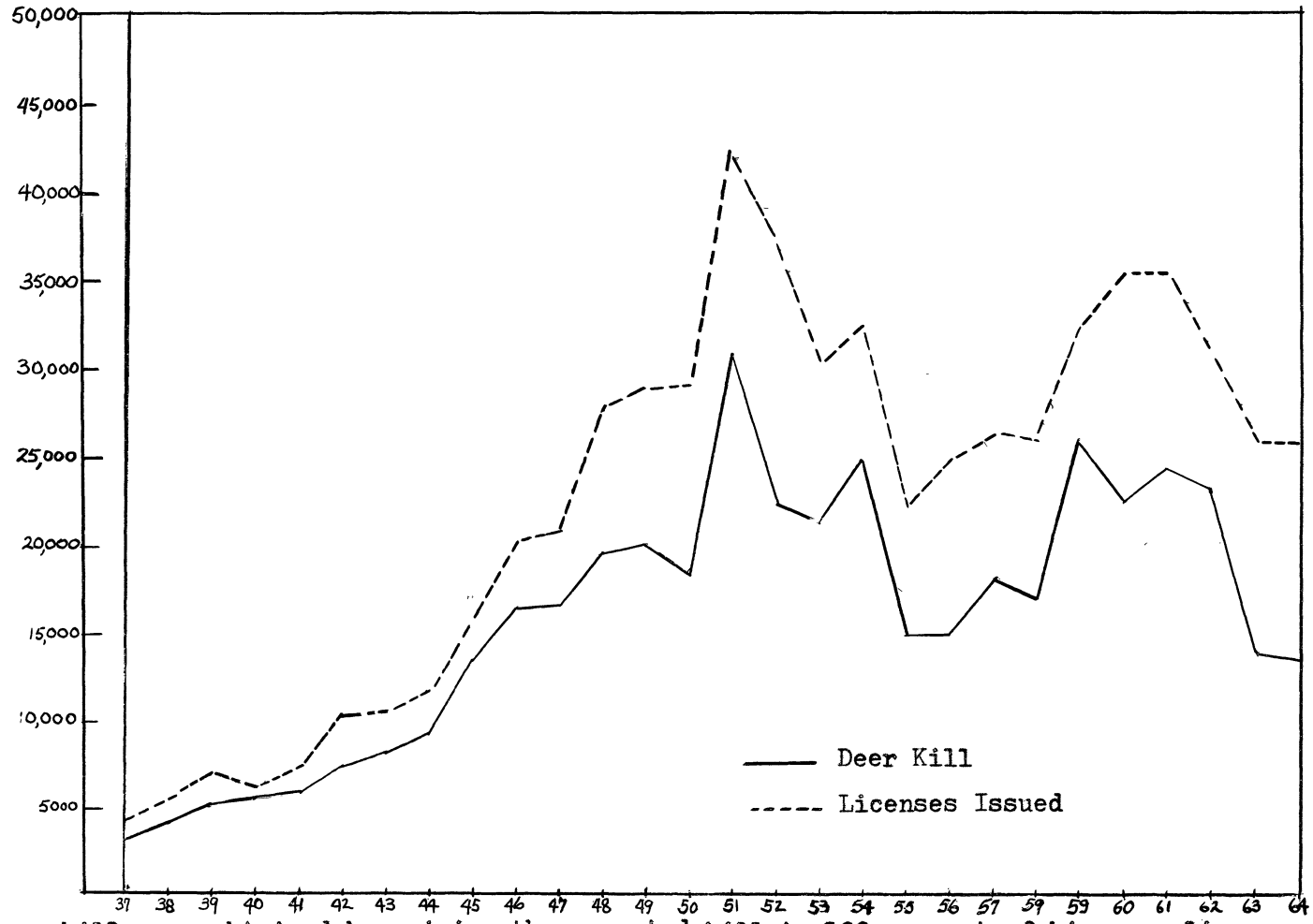
As a result of land clearing and overgrazing, winter deer range is becoming critical in most of Manitoba. The woody cover utilized as such must be extensive enough to prevent snow drift-ins from the border areas and should be located adjacent to the many small bluffland summer habitats of the white-tail. Winter range must also be safeguarded against summer overgrazing by cattle and possible overkilling by poachers and hunters.

The provision or retention of such wintering areas is in my opinion one of the most important management tools to insure future adequate white-tailed deer production. There are, at present, "school sections" of government-owned land scattered throughout southern Manitoba white-tail range. These "school sections" are currently leased to private individuals and since they are not privately owned, are subjected to overgrazing by livestock owned by the leasee. Such areas could in future provide the initial base for white-tail winter ranges. The Wildlife Branch has completed habitat evaluation studies on these areas, but to date the only acquisition of lands for game range have been attained through the Agricultural Rehabilitation and Development Act's federal-provincial land use agreement. This acquisition was in the Souris River valley and Lauder sandhills areas (112).

Management and Future. The graph (on the next page) indicates the white-tailed deer kill and number of hunters during the period 1937-1964. From it we can see that the deer populations have stabilized or may be decreasing.

Deer management and law enforcement are the responsibility of the Wildlife Branch. Co-operation in law enforcement is given by the Royal Canadian Mounted Police. The Province is currently organized into large flexible deer management areas but no direct control over the number of hunters in each area is exercised (156f). However, there have been numerous attempts by management indirectly to control hunter numbers in areas subject to overkill. It is presumed that hunters will more readily hunt areas designated for any deer seasons and relatively inaccessible and remote areas (such as in eastern Manitoba) have been regularly opened for

Fig. 31. Graph Showing Comparison Between Deer Kill and Licenses Issued 1937-1964.



Figures on deer kill were obtained by raising the reported kill to 100 percent of big game licenses sold by direct proportion. Figures are inexact but indicate the approximate yearly take of deer (156c-g, 117).

this type of deer management. Note: For information as to annual locations of the management areas and regulations pertaining thereto, contact the Wildlife Branch, Manitoba Department of Mines and Natural Resources, Winnipeg 1, Manitoba.

In 1952, deer were reportedly inflicting heavy damage to farm crops in southern Manitoba, and the first either-sex season was held (19). Restrictions on legal sex have varied since then with fluctuating deer populations and according to the needs of each management area. In 1963, "morning hunting only" was first attempted to control over-harvest in the Pembina Valley. In 1964, the total area west of the Red River and south of the trans-Canada highway was again restricted to a buck deer season. In 1965, Manitoba plans a province-wide any deer season (118).

The deer season usually opens in late November and is of two weeks duration. Sunday hunting is prohibited for all game species. The opening of the season is calculated to coincide with the first snow-fall, as snow conditions improve hunting and reduce crippling losses. All hunters must wear a complete outer suit of white or a blaze orange cap and white suit as a safety precaution. Party licenses--where three to five hunters sign an agreement to hunt together and all may continue to hunt until the license is filled--have been offered since 1962 (156f). Harvest records are obtained by hunter return of licenses on a mandatory but unenforced basis. The license contains room for such data as the number of days and area hunted as well as the sex of the kill. Two or more deer licenses (or deer per license) per hunter have never been offered and extensions or re-opening of the deer season are rare. Check stations (which record hunter success) are concentrated on areas each year to obtail kill data

and are normally confined to one or two pertinent areas. It is mandatory for all vehicles to stop at such check stations (156g). Manitoba's Interlake deer area was studied by these methods during the 1964 season (156g).

The annual yearly kill of white-tailed deer is probably grossly underestimated due to some elusive but significant factors. License returns are vastly incomplete (118). Poaching is common and occurs on all deer ranges at most times of the year (19), but particularly during the early fall seasons held on upland gamebirds and waterfowl. Hunters may make multiple unreported kills, and the relative scarcity of conservation officers, the general unconcern of the public and the large areas of deer range facilitate this practice. Wounding losses may be especially severe in snowless seasons. In addition, the frequent buck season probably results in many illegal kills of does and fawns which are left in the bush as total wastage. Local deer area residents probably illegally utilize far more deer than suspected by game managers.

3. Moose.

Introduction. Moose are forest animals and prefer low swampy areas or early vegetative successional growths where there is an abundance of vegetation such as willow, saskatoon, aspen and red osier dogwood upon which they browse. In midsummer they spend the majority of their time in swamps and lakes to escape flies; at this period they feed on aquatic vegetation such as lily roots. In winter, the moose range widely, browsing on deciduous trees or shrubs (19).

Seton (127) described Manitoba's moose populations and moose range as follows:

> "Abundant in all the forested areas of Manitoba; apparently in no danger of extinction since reasonable game laws have come into force.

> Several thousand are killed each year....The estimated total head of moose within our limits in between 20 and 30 thousand head."

Moose ranges and distribution have changed from the time of Seton's study. In southern Manitoba, the establishment of an extensive agricultural economy reduced the distribution; moose, which had formerly ranged throughout the parkland where there was an abundance of willow and swamp growth, are now confined to the national parks, forest reserves and relatively inaccessible areas on the northern and eastern fringes of settlement (19). Today, the fire-influenced transition and boreal forest zones form the habitat base for currently abundant moose populations.

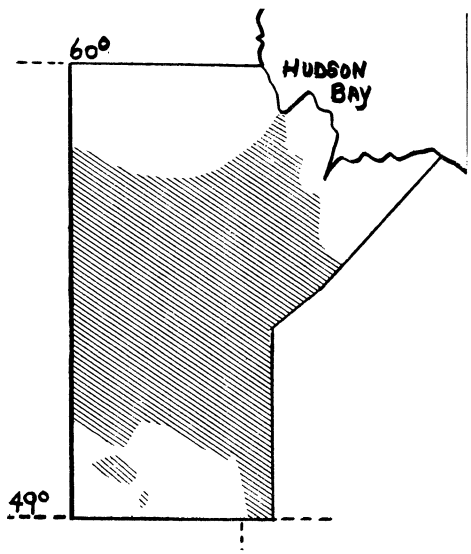


Fig. 32. Distribution of moose.

From 1890 to 1940, moose steadily declined in Manitoba. This decline was due to the effects of settlement and relatively unregulated hunting and poaching (68). Since 1940, as a result of stricter game laws, law enforcement and the increased brushy food and cover created by extensive fires in northern forested areas of the province, moose have increased (110). For example, the Interlake area of Manitoba reached maximum density moose population levels in the period 1957 to 1960 (156c, 110).

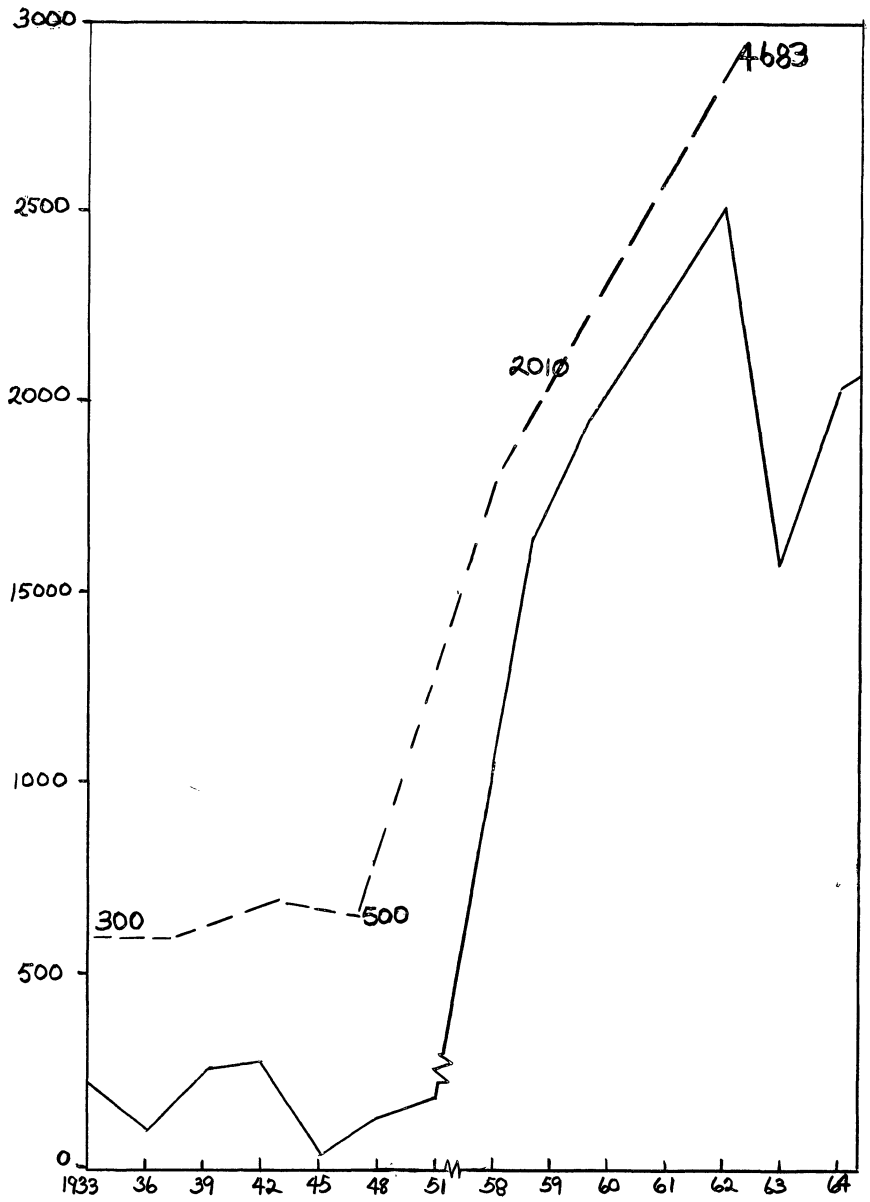


Fig. 33. Graph of Moose Kill and Trend Chart of Hunters 1933-1963, Illustrating Recent Increases in Hunters and Harvest. Estimates of kill are based on license return data. (156c-g, 117)

Management and Future. In Manitoba, moose remain second in importance only to the white-tailed deer as a big game animal. In southern and central Manitoba, they are found in the Spruce Woods forest reserve, the Riding Mountain National Park and the Duck and Porcupine Mountains (137). Medium density populations also occur in eastern and southeastern portions of the Province in such areas as the Sandilands and Whiteshell forest preserves. In northern Manitoba, large forested areas (in excess of 112,000 square miles) support moderate to abundant moose populations (156f,g; 137). As stated, northern moose range is optimum in areas of the transition and boreal forest zones where annual extensive fires have created brushy browse. In these areas, over 500,000 acres are burned annually (8, 5).

The chief limiting factors to Manitoba's moose populations (other than human) appear to occur during the winter. Deep snow with resultant food shortages interacts with winter tick infestations and timber wolves to exert some natural control. Disease may also be a factor, but this is unverified. Moose research data in Manitoba are scarce and unpublished, but findings by Maliepaard (1962*) in Saskatchewan and by Pimlott (110) and deVos (47) working under northern Ontario conditions, appear applicable because of the similar, if not identical, climatic and habitat conditions found in Manitoba.

There are data to substantiate the hypothesis that Ontario moose are largely underhunted and can withstand heavy hunting pressure under suitable conditions (47). deVos (47) states that the most pressing moose management problem in Ontario is inadequacy of harvest. This is the result of four factors; the lack of detailed information on the status

* see footnote under "Literature Cited"

and ecology of moose, inaccessibility of large areas of moose range, public pressure against liberalized hunting seasons or sex restrictions and failure of most hunters to penetrate into the hunting areas. Moose were (and still are in most northern areas) underhunted in large areas of Manitoba. The remoteness and inaccessibility of most moose range, the lack of guides and facilities and the usual strenuous hunt under the rigorous and often dangerous weather conditions of late seasons place the moose out of the desired reach of most Manitoba sportsmen.

Moose kill figures in the period 1933 to 1952 (156a,b) indicated little variation in the number bagged each year. Total reported kill for the above period was 1,750. The bag limit was one adult bull, and the areas opened to hunting varied but influenced kill figures to only a minor degree. In 1953, the first either-sex season was held, in which female moose over the age of one year were declared legal game in specified areas. Since 1953, Manitoba has sectioned the moose range into management areas with limits on sex based on limited population and habitat surveys. No regulation of the number of hunters in each area is attempted. An early September bull or trophy season is held annually followed by an any-age or sex general season; this late season is normally held from late November to mid-December (110). Annual management areas, season lengths and restrictions are available from the Wildlife Branch, Norquay Building, Winnipeg 1, Manitoba.

Moose hunting has increased tremendously in recent years. For example, in 1959, 2,010 licenses were issued. By 1963, 4,683 licenses were sold, an increase of over 100 percent. The kill has increased accordingly, but Soper (137) and the Wildlife Branch (156g) report no significant decreases

in moose populations. The Wildlife Branch report of 1964 (156g) states, "There is no evidence of over harvesting, in spite of the considerable increase in hunting pressure."

Moose, because of their high trophy value, large size and the difficulties associated with their hunting are a highly valued game animal, and recent law enforcement problems have occurred related to their hunting. These include the illegal use of aircraft in the actual hunting of the animals. Violations have included direct shooting from the aircraft, driving moose to waiting hunters and spotting the animals for ground parties (156f,g).

Poaching is a common but difficult law enforcement problem in areas of moose habitat adjacent to settlement. The lack of sufficient concern by the public, supplemented to too few conservation officers to enforce the adequate game laws, is a problem common to most game species in Manitoba.

Manitoba urgently requires factual information on its moose ranges and populations. Wildlife Branch annual reports of 1952, 1963, and 1964 stress this need. The 1952 report (p. 51) stated the problem as follows:

> "Moose populations are spotty due to uneven hunting pressure, habitat preferences, etc. More information is needed on sex ratios, age ratios and actual numbers in various areas. Trapper reports and limited aerial surveys are being used to estimate populations."

This situation still exists. Population estimates remain as guesses supplemented by limited aerial and ground surveys (156g).

Manitoba's annual moose harvest is mainly influenced by hunter accessibility to the moose range. The opening of the northern areas to conventional travel would greatly facilitate moose hunting by allowing

access to the unharvested moose populations resident to remote areas. Moose over much of the Province are totally unharvested. The large moose resource will become valuable to the Province only if roads are constructed to allow accessibility. In the future, logging, mining and commercial fishing may provide such access roads, but until then, the moose populations may remain a potentially valuable but largely unavailable resource. Recreational demands by an ever-increasing public may be the major factor in the development of the north.

Fire and lack of its control in forested areas have created the currently favorable abundant moose habitat and the resultant population increases. If moose are to maintain annually high populations, the use of repeated fire as a management tool to create and maintain early succession moose range will be necessary.

4. Elk.

Introduction, Range and Problems. Murie (104) described the Manitoba subspecies of elk (C. c. manitobensis) as a smaller, darker form than either C. c. roosevelti or C. c. nelsoni. The Manitoba subspecies is characterized by sandy-brown upper parts and small antlers.

In Manitoba's precolonial days, elk were second in abundance only to the bison (19). The elk ranged widely over the southern half of the Province, and former range areas included the tall grass prairie, aspen parkland and transition zones. H. U. Green (61) stated that the Cree Indians believed the elk more numerous than the bison in the areas adjacent to the Riding and Duck Mountains and heavily utilized the herds during their winter migrations to the Dauphin valley. The native Cree, using trade firearms, had evidently decimated the herds prior to white settle-

ment. Elk hides were the principal item of barter used by these Indians.

Seton (127) estimated Manitoba's elk population at 5,000 animals confined to the hilly, heavily wooded areas of the Riding and Duck Mountains (maximum elevation 2,710 feet). Colonel H. I. Stevenson, forest inspector for Manitoba, gave an earlier estimate of 2,500 head in 1904 (19).

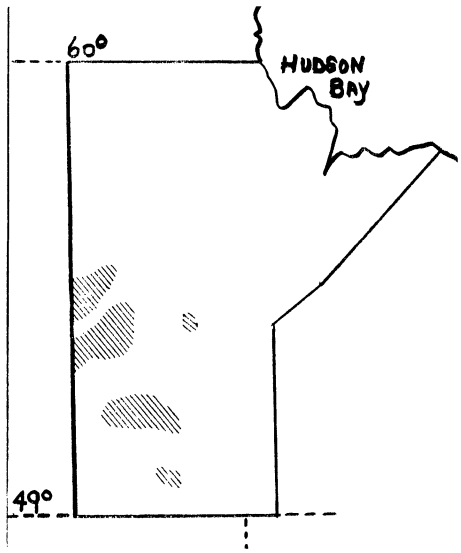


Fig. 34. Distribution of elk.

Present day Manitoba elk populations in Manitoba occur in the Riding Mountain National Park, the Porcupine and Duck Mountains, the Spruce Woods forest preserve and in areas near Mantagao and Katimik lakes in the Interlake region (43).

Elk are versatile foragers and tolerate varied terrain. Banfield (13) lists favorite browse plants in Manitoba as including willow, saskatoon, chokecherry, hazelnut, aspen, oak and dwarf birch. Calving begins in Manitoba about May 21 and is completed by June 14; the mean date is June 3 (61).

The following table illustrates elk population trends, seasons and bags. Past population estimates and harvest data are provided by Davies

(43), Colls (31), Rasmussen (119) and Banfield (13).

Table 7. Elk Populations and Hunter Harvest 1914-1964.

Date	Estimated Population Riding Mtn. Nat. Park	Licenses issued	Hunter kill	Area Location of the season
1914	500	--	--	No Season
1941	5,000	--	--	" "
1944	7,900	--	368	Riding Mtn. Adj.
1947	15,000	1,217	544	" " "
1948	6,000	1,400	914	" " "
1950	6,000	--	938	" " "
1951	5,200	--	1,766	" " "
1952	5,848	--	935	" " "
1955	--	1,300	568	" " "
1956	--	580	142	Duck Mtn.
1957	--	937	153	" "
1958	--	767	194	" "
1959	--	4,385	2,511	Duck & Riding Mtn.
1960	--	2,511	209	Duck Mtns.
1961-64	5,000*	**		

* (43) Complete harvest data is unavailable.
** Season closed.

The bag limit during various seasons has varied from one adult male to one elk. In 1965, elk hunting was again resumed in the Duck mountains on a permit basis only. Those wishing to hunt elk submitted their names and license fees and 175 permits were drawn with a limit set at one adult bull per hunter. This area is presently considered as an elk management area (116).

The elk of Riding Mountain National Park constitute Manitoba's major herd; this herd is located on a 2,000 foot plateau surrounded by agricultural cropland. Total area of the park is 1,148 square miles (13).

Elk range far out of the National Park in years of severe winter snow conditions and heavy winter concentrations have been reported in the Laurier area east of park boundaries (31). When these natural migrations

occur, the elk may inflict severe damage to forage and cereal crops and haystacks in the surrounding agricultural areas. Colls (31) reported heavy damage in localized areas during the period 1949 to 1952.

The Riding Mountain herd is subject to overpopulation problems. The increase from low numbers to an overpopulation under protection from hunting and the concurrent reduction of natural predators is typical of large herbivore populations in many parts of North America (108). Banfield (13) described Riding Mountain overpopulations during the winter of 1946-47. The overabundant elk had destroyed their browse, and a winter kill of over 20 percent of the population occurred. Banfield (13:129-134) reported:

> "The population dropped from an estimated 77.1 to 58.7 per square mile of concentrated winter range. The rising yearling class had the heaviest loss of 64 percent. The senile age classes also suffered heavy losses....This high population caused extensive damage to aspen stands. As high as 76 percent of all aspen under 10 feet in height were killed in certain areas, while 69 percent of the aspen more than 10 feet in height had the bark peeled by elk. Elk also killed out saskatoon and chokecherry. Willows were so closely browsed that they were reduced to clumps of dead sticks with a few green shoots in the center. Hazel brush and dwarf birch were browsed to the snowline but remained healthy and recovered. Grasses and herbage were severely eaten down."

Elk within the National Park are the responsibility of two federal government agencies. These agencies are the Canadian Wildlife Service and the National Parks Service. Provincial Wildlife Branch officials are only concerned with seasons, bag limits, hunter regulation and agricultural damage outside the National Park area. Seasons are set when actual agricultural damage occurs or when heavy winter snows indicate potential damage may occur. Elk tend to migrate to surrounding agricultural areas, and early, heavy winter snows usually lead to damage.

Elk and other wildlife within the National Park are reduced when necessary by direct, non-selective harvest by government personnel (57). Due to the present low populations, park officials do not expect to resort to this measure in the forseeable future (155). The recent addition by natural immigration of a resident timber wolf population of about 25 animals exerts some natural control of park ungulates (143). Live trapping and shipping for restocking is seldom carried out and trapping and subsequent slaughter never. Leopold (88) states that direct reduction has been Canada's National Park policy since 1943.

There is interspecies competition with the National Park. Colls (31) estimated 2,000 mule and white-tailed deer and 1,500 moose, in addition to the 6,000 elk, in the park area during aerial surveys in 1951 and 1952. Farming interests also compete, particularly in drought years when much hay is cut within the Park area. In 1950, for example, 1,500 tons of hay were removed. Several hundred cattle and horses may summer graze regularly within park boundaries and drought years accentuate this normally heavy drain on park forage resources (31, 43, 155).

Poaching of elk both within the National Park and in areas adjacent is a constant problem. Colls (31) suggested that poaching may have been the main reason that the Riding Mountain area herds failed to show significant increases in the period 1949 to 1952; many illegal kills were recorded during his aerial transects. Green (61) blamed poaching on lack of enforcement personnel and anti-trespass laws. Poachers were usually farmers or market hunters. The local public attitude towards poaching is one of indifference. I lived in an area adjacent to the park for three years and can verify the existence of a type of market hunter in the district.

Future. As with all Manitoba's big game, the major natural control of elk populations, other than by human killing and loss of suitable habitat to cultivation, is environmental resistance. This resistance is largely climatic and consists of extreme cold, deep snow and resultant food shortages and related complications.

In all elk range, timber wolves exert a minor degree of natural control. As mentioned, timber wolves have recently become re-established in the Riding and Duck Mountains and adjacent areas (19, 137). Colls (31) reported a relatively stable population of about 25 timber wolves in the Riding Mountain area and six wolves were collected within park boundaries during his studies in 1950-51. Two of the wolves studied each measured seven feet in length and weighed 80 to 100 pounds respectively. The stomachs of both contained elk remains. Area resident black bears and coyotes may take a few elk calves (61, 19).

The elk and wolf populations in the Riding Mountains, Duck Mountains and related areas are hard to census due to heavily wooded cover and Strong (143) states that although wolves are still present in appreciable numbers, the actual number may remain unknown.

Elk will probably never again be hunted on an annual regular season basis. Permit hunting only in years of favorable populations in the Duck Mountains and in years of agricultural damage in the vicinity of the Riding Mountain National Park is planned elk management (118). Elk ranges are now limited by agricultural land use; former suitable habitat is mostly under cultivation.

5. Caribou.

Introduction. Caribou in Manitoba are of two native subspecies, the barrenground and woodland (137); these animals are resident in the boreal

forest and tundra zones of the Province. The caribou requires both climax boreal forest and tundra vegetation as its habitat, and proper maintenance and range management of these areas are extremely important to their welfare. Manitoba supports a resident woodland caribou population but is of major importance as a wintering area for barrenground caribou native to the Northwest Territories immediately north of Provincial boundaries.

Barrenground Caribou.

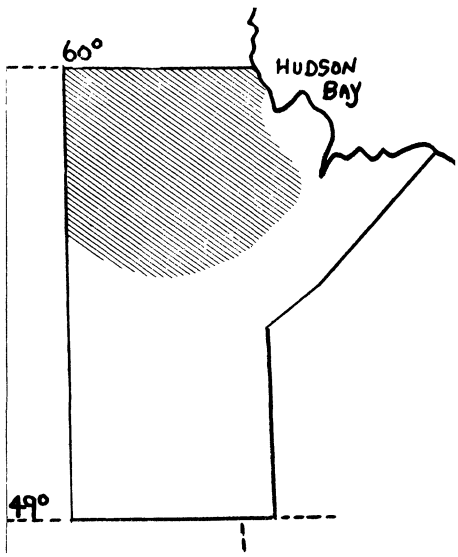


Fig. 35. Distribution of barrenground caribou.

Barrenground caribou populations are steadily declining, and Soper (137) suggests the species may be vanishing. For example, in 1955 barrenground caribou wintering in Manitoba were estimated at only 25,000 head. Winter populations prior to 1955 had been censused as high as 90,000 (16).

The wintering area frequented by barrenground caribou is of the northern boreal forest type; the area is of low relief, lakes are numerous and sand and gravel ridges frequent. The soil is podzolic, shallow and infertile. Numerous bogs occur due to bedrock and permafrost. Winters in the area are long and rigorous with an average January temperature of

-20 degrees Fahrenheit (15, 12, 14, 53).

The decline of barrenground caribou populations is due to a combination of misuse of the animals by resident natives and the widespread destruction of their food supply and habitat by extensive fires. Wasteful killing and the use of the inadequate .22 rifle for caribou hunting appear to be prime factors in the wastage. Banfield (16) reports that the annual kill of caribou often exceeds the natality increment of the herds. In addition, tundra and boreal forest fires destroy valuable food sources of mosses and lichens which under the short growing season require a recovery period of 25 to 50 years. If the underlying humus layer is burnt the moss and lichens may never recover (16). In situations such as this, further population declines are inevitable.

Barrenground Caribou Management. Barrenground caribou preservation is a matter of conservative use of the animals themselves and maintenance of their habitat in a natural condition (14, 16). Manitoba's caribou herds are known to winter in the northern boreal forest and summer on the tundra. The prevention of fires in these areas seems of utmost importance, but no fire control is reported.

In 1956, the Manitoba government closed the season for recreational hunting of all caribou (156c,d); the season has remained closed since then. Caribou hunting is restricted to native Indians and Eskimos and white trappers and traders resident to the caribou ranges.

Barrenground caribou tagging studies have been conducted by Wildlife Branch personnel in an attempt to determine range, migration patterns and the magnitude of the decline. In the five years prior to 1964, 1,346 caribou were marked. Range exclosures are being constructed to determine

forage utilization and moss and lichen recovery after fire (156f,g).

Woodland Caribou.

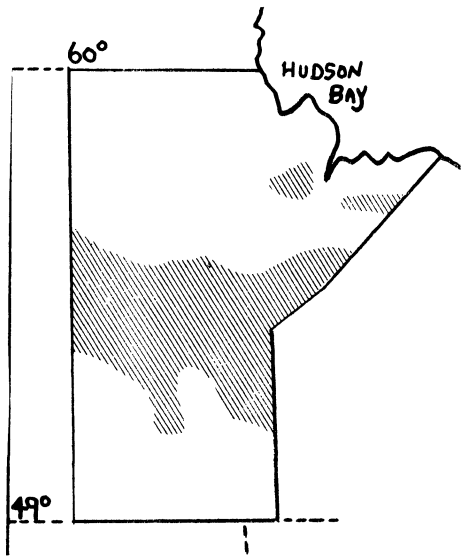


Fig. 36. Distribution of woodland caribou.

The woodland caribou was once common over most of the forested areas of Manitoba (137). Today, scattered small bands may remain in southeastern Manitoba in areas such as the Sandilands and Whiteshell forest preserves, but Manitoba's largest herd is located in the Hudwin Lake area northeast of Berens River in northern Manitoba. In this area, a base herd of 4,000 to 5,000 animals is resident (137). Scattered bands of woodland caribou range over most of the remaining west and central boreal forest zone. Woodland caribou habitat consists of climax boreal forest; mosses and lichens form the chief sources of food. In addition, caribou eat deciduous shrubs in limited amounts (44).

Woodland caribou populations in Manitoba appear to be declining (156f). deVos (44) states that a similar decline began in northwestern Ontario about 1900. He considers that hunting or poaching were not of major significance in the decline; most important was the destruction of the

climax boreal forest habitat by logging, human habitation and fires. However, the possibility of decimation by disease introduced by the continuing northward expansion of ranges of the white-tailed deer and moose is also considered important.

deVos (44) states that habitat management based on ecological studies of the long-term effects of fire and logging on the boreal forest should form the basis of woodland caribou studies and preservation. Lichens are the primary caribou food item and in many areas of Ontario are only beginning to recover from the land use effects of fire and logging. Recovery may take 40 to 60 years. Lichen management is woodland caribou management (44).

The control of other ungulates (moose and deer) inhabiting woodland caribou areas may be necessary. These competitors are increasing and their browse habits are essentially the same as those of caribou (44, 47).

The management of woodland caribou in Manitoba (as in Ontario) has consisted primarily of closing the recreational hunting season over the past decade (156e). This form of management has not arrested the decline or resulted in any significant increases in the population.

6. Mule Deer.

Mule deer were once common and abundant in the tall grass prairie and aspen parkland zones of Manitoba. Seton (126) reported the deer as common in the Carberry Hills, Eastern Sandhills and Mitchell's Plain, where they were locally referred to as "jumping deer." Soper (134), reviewing range and abundance changes in Manitoba mammals, described mule deer as common in the Province prior to 1929, after which they became rare. A similar disappearance of mule deer from parkland areas was re-

ported by Baines (9) in the Yorkton, Saskatchewan area. Mule deer were fairly common in 1883, were scarce by 1911 and disappeared about 1928. White-tailed deer appeared from about 1910 and by 1920 had become abundant.

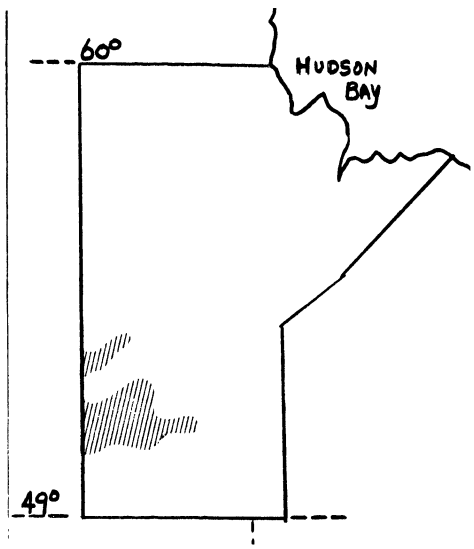


Fig. 37. Distribution of mule deer.

The decline of mule deer populations in Manitoba was conceivably initiated by extensive habitation and agricultural cultivation of their former optimum ranges, but a more significant factor was probably unregulated overkilling during the drought-depression years 1929 to 1938.

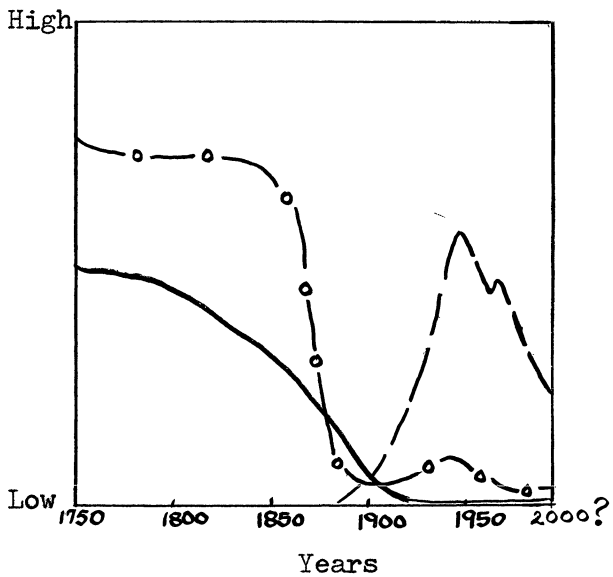


Fig. 38. Trend Chart: Manitoba Populations of

—·—·—·— Elk

——— Mule deer

- - - - White-tailed deer

Mule deer are a hardy species but are relatively easily taken due to their habits of frequenting sparse cover and frequently stopping after being flushed. The deer may again become an important game animal in uncultivated sections of their former range as game law enforcement and conservation practices become more effective and private landowners more concerned for their welfare. Montana has experienced increased mule deer populations under effective law enforcement (147).

Mule deer still occur in Manitoba in scattered, low density populations in the Brandon Hills, Carberry Hills, Spruce Woods Forest Preserve, Turtle Mountains, Duck Mountains and Riding Mountain National Park (53). The deer may also occur in light densities in the transition zone of northern Manitoba. Rand (115), reviewing W. H. Bryenton's notes on Herb Lake mammals, found evidence of mule deer in the Flin Flon area. Strong (143) states that Manitoba currently represents the eastern limit of mule deer range but verifies that the land use practices of agricultural cultivation have reduced suitable habitat in the Province.

The last authenticated mule deer kill in Manitoba occurred in 1961 (19). Wildlife Branch annual reports of recent years do not indicate the existence of the deer in huntable populations (156a,b,c-g). A search of hilly areas in former ranges would probably be necessary to determine the number and distribution of mule deer in the Province. Conceivably, these deer under protection and management could once again become a common game animal. However, Manitoba residents, many of whom have never seen a mule deer, currently regard the white-tail as the deer of Manitoba.

7. Grizzly Bear, Polar Bear and Black Bear.

Prior to settlement, three native species of bear occurred in the Province; these were the grizzly bear, polar bear and black bear. In 1965, only the black bear and polar bear remain. Grizzly bear formerly ranged over the tall grass prairie and aspen parkland regions of the Province. These bears are presumed to have been dependent on the bison as a source of food and became extinct shortly before the bison were nearly exterminated (19). Skull records of Manitoba's grizzly bears are located in the Manitoba Museum at Winnipeg (134, 137).

Polar Bears.

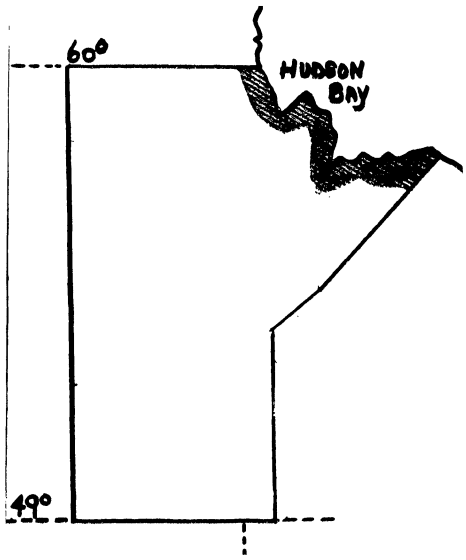


Fig. 39. Distribution of polar bear.

Polar bears frequent the offshore pack-ice of Hudson Bay on the Arctic ocean where their chief food is seals (order Pinnepedia). The northern mainland of Manitoba is primarily used by the bears as a denning area (156f).

The polar bear has long been totally protected from recreational hunting in Manitoba and are legal game only to native Eskimos and Indians.

These bears are currently declining due to the extensive native use of firearms in hunting. It appears that the key to polar bear survival is to allow the natives to find means other than hunting or making a living (59). Polar bears, however, may be in danger of extinction from hunting, but due to their vast range areas and the relatively few natives living within that range, this is not considered an immediate problem (137, 59).

Polar bears have sporadically become a problem species in northern settlements (137). Wildlife Branch reports of 1964 indicate that during the winter of 1963, six polar bear had to be removed from the town limits in the seaport of Churchill.

Limited recreational hunting by permit may, in future, be used to manage polar bears. If polar bears are holarctic or circumpolar in their arctic range, the current closure of recreational hunting in Manitoba may be ineffective in maintaining moderate density local bear populations. Alaska regularly harvests 200 to 300 polar bears annually (132).

Black Bear.

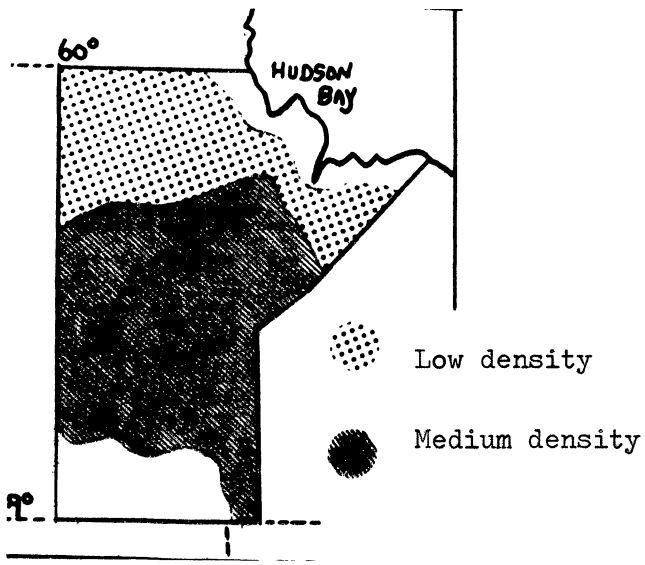


Fig. 40. Distribution of black bear.

Black bears originally ranged over most of Manitoba from shrub-bordered watercourses of the tall grass prairies to the treeline of the northern boreal forest. Pre-settlement populations in the southern prairies and parklands were high. Alexander Henry (33) referred to the black bear abundance along the Red River and in the Pembina Hills and Turtle Mountains,

> "Their dung lies about in the woods as plentiful as that of the buffalo in the meadow....They are valueless and easy to hunt... one of my hunters killed 36 prime bear in the course of a season."

With settlement, the black bear was eliminated from the prairie and parkland regions, and since 1870 has been only a rare visitor in these areas (134, 137). Good populations of black bear presently occur in the areas immediately north of the agricultural areas and in the southeastern sections of the Province (19). The black bear may be expanding its range northward.

Black bears, while not nearly as efficient or effective predators as the timber wolf, have in the past become frequent pests of farm livestock. This problem has been most severe in those areas of settlement adjacent to forest areas. Bear depredations have been recorded on cattle, sheep, hogs and the young of wild cervids (156c,e,f). Bird (19) described their feeding habits as omnivorous, and diets included wild fruits, berries, acorns, birds, ants, and small and large animals.

Past management policies and status of black bear have varied. No records can be found prior to 1933, but since the bears were not specifically or formally classed as big game animals they were probably subjected to a year-round open season. During the period 1942 to 1949, the bears were designated as a game animal on crown lands and 403 were legally taken (156b). Paradoxically, the black bear in the past has often been con-

currently a game animal in season (on crown land) and a year-round bountied predator on municipal land. In 1947, 270 adult black bear and cubs were bountied for $1,362 (156a); the bounty continued until 1964 when 75 bears were killed at a cost of $448 (95).

In 1963, the Wildlife Branch declared the black bear a protected species on crown land to be managed by a special spring season held each year on adult black bears without cubs, but the bears remained on the municipal predator list in many areas. The year 1964 proved to be one of wild berry crop failures, and resultant cattle depredations on farms adjacent to forested areas necessitated a special fall season in which 142 bears were killed (156g). In years of unusual food shortages (berry crop failures) black bear depredations on livestock increase (19). Berry crop failures are frequent in Manitoba and may result in some natural control of black bears due to starvation, but this has not been proven.

In 1965, a regular spring bear season was held (156h). The past management of the bear as both a bountied predator and a game animal has proven unpopular and often unnecessary and wastful; in the summer of 1965 all government support for predator bounties was removed. The black bear is now classed only as a game animal (156h).

Livestock depredations by black bears may, in future, create further agricultural problems. In such cases, plans are for local and intensive individual or problem area bear control by trained personnel; this, combined with regular bear seasons, should minimize predation problems. Black bears are currently considered a big game animal and bear hunting is increasing in popularity. While black bears are incompatible with southern area agricultural production, good populations may be expected

to persist in wooded areas of the transition zone and the boreal forest area. However, in these northern areas, the lack of roads makes much of the bear range inaccessible to hunting. In future, the opening of the north by mining, recreation, commercial fishing and logging industries may facilitate hunter access to bear populations. The use of dogs would improve bear hunting in such heavily wooded areas of Manitoba. Presently the use of hounds for hunting any big game animal is illegal in Manitoba; legalizing their use in bear hunting could be a valuable asset to the sport.

8. Cougar or Mountain Lion.

The mountain lion is a rare species in Manitoba. Seton (126) provides past evidence of mountain lion occurrences at Plum Coulee, Swan Lake, Brandon and Oak Lake. Soper (134) cites the occasion of an old starving male lion killing a small boy at Birtle, Manitoba in 1922; this lion was shot. G. W. Malaher, Director of Game for Manitoba, provides record of a mountain lion being positively identified at Gem Lake in 1955 and another recent authenticated sighting was recorded at Marquette in 1956 (G. W. Malaher, letter to R. D. Bird, 1956).

Bird (19) and Soper (137) state that the mountain lion may have originally inhabited the aspen parkland regions of Manitoba, but in only light densities. The major limiting factor to mountain lion establishment in the Province is the intensive cultivation of the aspen parkland region combined with northern environmental resistance in the form of extremely low winter temperatures. The lions are not well adapted to such prolonged cold, and the prospects of the occurrence other than of the occasional transient appear negligible.

9. Pronghorn Antelope.

The pronghorn antelope no longer exists in a wild state within the boundaries of Manitoba. Prior to settlement and subsequent extensive cultivation, antelope occurred in the tall grass prairie regions of southern and southwestern Manitoba. Seton (126) lists regular reports of antelope prior to 1858. Alexander Henry reported antelope in the Pembina Hills and Souris River area (33). Coues, in 1874, recorded scattered bands along the Souris River. The last reported kill was at Whitewater lake in 1881 (19). Seton (126), exploring former range areas in 1882, could find no remaining antelope or record any reports of them. Soper (137) states that the antelope has completely disappeared from Manitoba.

Antelope range was originally the tall grass prairie area located adjacent to the southern boundary of Manitoba. With settlement, prairie fires were checked and the former tall grass prairie was either extensively cultivated or underwent plant succession changes which brought in trees and shrubs characteristic of the aspen parkland. The total area is now intensively cultivated for cereal grain production and the small portion not cultivated supports dense stands of woody growth. Land use practices and natural plant succession have reduced the capability of these areas to support antelope. Reintroduction is not feasible in view of these currently undesirable features of former optimum antelope habitat (19).

10. Buffalo or Bison.

Bison prior to settlement were the most numerous large herbivore of southern Manitoba. Mac Neish (93), tracing Indian cultures in Manitoba from before 3,000 B. C. to about 1,750 A. D. found that in the oldest culture examined, bone fragments indicated that the bison was the predominant food species.

Pristine Manitoba bison herds were so numerous that they frequently overgrazed small sections of the prairie and along with prairie fires were instrumental in holding much of the prairie in a short grass subclimax. This enhanced the habitat to such associated species as the pronghorn antelope and Richardson ground squirrel (137). Alexander Henry (33) wrote of the Red River area of southern Manitoba: "The grass would be long were it not for the buffalo....By rubbing and trampling they destroyed small groves of trees."

The initial decline of the bison herds occurred during the period 1800 to 1840 when rival fur companies imported large amounts of firearms and prairie fires set by whites and Indians raged unchecked (33). The last wild bison were seen near Winnipeg in 1817; the last large herd was found along the Souris River in 1867, and the last wild individual was killed in 1883. The buffalo seemed destined for extinction; former ranges were the tall grass prairie and aspen parkland, the most fertile agricultural regions of the Province. The abundance of the herds, large size of the animals and their wide ranging habitats rendered them incompatible with civilized agriculture. Soper (137) suggests that during winter, Manitoba herds may have migrated southward, but some buffalo undoubtedly wintered in river bottoms and hilly areas of the Province.

With the elimination of the bison, dependent species such as the timber wolf and grizzly bear disappeared from southern Manitoba (19). Associated species such as the antelope also declined.

Bison today are found in two fenced locations; the Assiniboine Park Zoo located at Winnipeg and in the Riding Mountain National Park. The herd located in the Riding Mountain National Park is stabilized annually

by direct reduction executed by park personnel (155). The large range areas necessary for the reintroduction of bison are non-existent and the demand for bison for re-stocking is low.

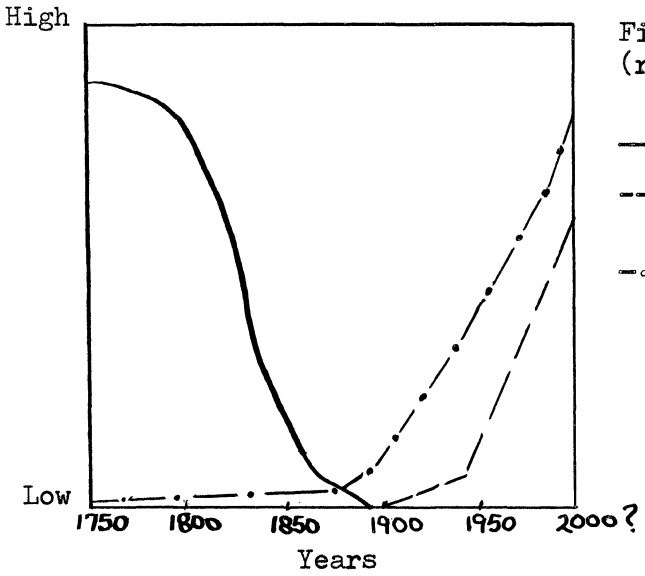


Fig. 2. Trend Chart (repeat).

——— Buffalo

------- Mechanization and Cultivation

—·—·—·— Human Populations

11. Muskox.

The muskox formerly inhabited the restricted, open, arctic tundra area along the Hudson Bay coast in the northernmost extremities of Manitoba (137). Preble (113) recorded the last two individuals during the summer of 1897 midway between York Factory and the mouth of the Churchill River. Manitoba muskox populations are now extinct. Soper (137) reports the nearest muskox as several hundred miles distant to the northwest. The extinction is believed to have been caused by unregulated killing between 1800 and 1900. This was partially due to the introduction of firearms among the Eskimos and Indians.

SUB-INDEX #5

IV. E. NON-GAME SPECIES OF ECONOMIC SIGNIFICANCE

NON-GAME SPECIES

Introduction

The term "problem species" is difficult to define as most animals or plants can potentially create problems. The degree of economic importance is related to the time, place, conditions, density of the population and the opportunity to create problems; the economic production of food and clothing and factors of human and livestock health are also often involved. Pests are a value judgment.

The following section deals only with wildlife species which have created annual and persistent economic problems in Manitoba. Most of the problem species are associated with agricultural production but a few such as the starling, house sparrow, Norway rat and house mouse are also important pests in towns and cities.

Problem species control in Manitoba is mainly the responsibility of the landowner, but in some instances, such as in rabies or predator control, specified municipal assistance and governmental aid is available. Bounties are not presently subsidized by federal or provincial government agencies, and if levied, costs are the sole responsibility of the municipality. This is a recent development. Until late 1965, a government subsidized (50 percent) bounty of furbearers such as the fox, coyote and, in some cases, black bear was in effect over most of the Province (156h).

The problems of economic pest species and their relationships to predatory species and land use practices have not been widely studied in Manitoba, and the verified facts relating to them are few.

1. Birds.

a. Hawks and Eagles. Manitoba has many summer resident hawk species, but only the goshawk, bald eagle, and golden eagle are known winter resi-

dents. Eagle populations are mainly confined to the transition and boreal forest zones and are not considered of economic significance.

Most hawks and eagles are currently given legal though often unenforced protection. Exceptions are the accipiters; the sharp-shinned, Coopers hawk and goshawks which have created pest problems in depredations on domestic poultry and small game birds and animals (19). The Coopers hawk may be a recent addition to the fauna of Manitoba. Seton (126) did not record the presence of Coopers hawks in the Province, but at present they are common in the southern prairie and parkland areas (19).

The large buteos; Red-tailed, Swainsons and ferruginous rough-legged hawk are common breeding birds, but populations are probably now reduced in numbers. Bird (19) cites land use changes created by agricultural land clearing as detrimental in that tree nest sites have been removed. These large hawks are vulnerable to exploitation by shooting due to their habits of sitting on exposed power lines, telephone poles and dead snags (19). In one of the few food habits studies of hawks, Bird (19) found Swainsons hawks feeding on grasshoppers, mice and ground squirrels.

Marsh hawks are common and reach their highest population densities in North America in the potholes and marshes of southern Manitoba (36; Hochbaum, 1956 from Bird, 22). Because of their habits and preference for nesting in snowberry, tall grass and on the ground they have been little affected by land use. Sowls (139) and Hecht (70), studying marsh hawk food habits, found that mice, insects and lizards formed their main diet, with occasional runs on young coots, muskrats and ducklings. Bird (19) states that during waterfowl seasons, wounded ducks form a major portion of the marsh hawk diet.

The winter resident goshawk has been cited as an effective predator on sharp-tailed grouse, ruffed grouse, the snowshoe hare and the western white-tailed jackrabbit (19). Bird considers that goshawk populations are declining in southern Manitoba because of removal of their woodland habitat through agricultural land clearing.

Hawk populations appeared to be correlated and to fluctuate with rodent populations (19, 152). The current status of hawks as regulators of small rodent populations is, however, not known.

b. Owls. Owls can be divided into two groups in Manitoba; those that are year-round residents of the Province and those that are summer residents only. Year-round resident species include the great horned owl and the arctic or snowy owl.

The great horned owl occurs from the 49th parallel north to the tree line of the boreal forest zone. Populations of this unprotected bird have been recorded as little affected by agricultural land use in the prairie, parkland or transition zones, although extensive brush clearing may remove nesting habitat (19). In the northern zones the great horned owl habitat remains in the primitive state.

Great horned owls are found wherever woody cover provides nesting habitat. Bird (17, 19), studying the nesting and food habits of these owls, found that abandoned crow nests were selected as nesting sites. Their food included muskrats, snowshoe hares, skunks, voles, mice, rats, ducks, coots, and pocketgophers; in other words, anything the horned owl is able to catch and subdue. The great horned owl has, on occasion, become a pest as a predator of domestic poultry and, at present, is a much-persecuted bird in settled areas. The owls, however, survive well in

close proximity to man (17, 19).

The snowy owl is a resident nester of the far northern tundra areas where populations of the owls fluctuate with the lemming cycles. Frequently, this owl migrates southward in winter and becomes a winter resident of southern Manitoba. Since 1961, the snowy owl has been common in southern Manitoba each winter (personal observation). Snowy owls are a legally protected species but during southern migrations many are taken as trophies and it is doubtful if a significant proportion of those that migrate south ever return to their nesting areas (152). In winter, the snowy owl has been noted to be an effective predator on southern populations of hungarian partridge and the western white-tailed jackrabbit.

Other species of owls that are as yet unclassified as to seasonal residency or economic importance but which are afforded legal protection are the screech owl, burrowing owl, long-eared owl and short-eared owl. No verified information is available as to range or distribution. The long and short eared owls are believed to be summer residents only (19).

c. Crows.

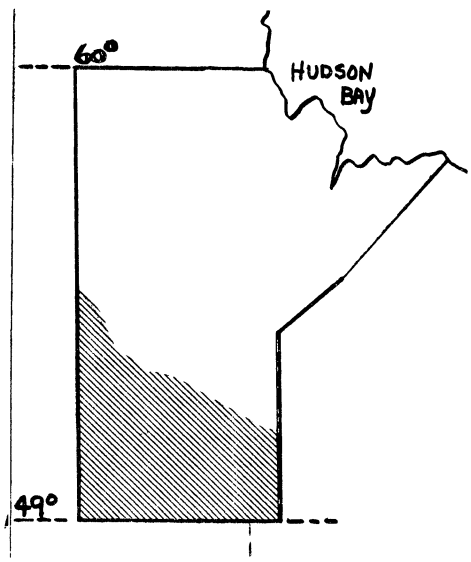


Fig. 42. Distribution of crows.

The crow is presently common in the southern prairies, aspen parkland and transition zones of the Province at all seasons with the exception of winter. Coues (32) recorded few crows and hypothesized that the recent extensive prairie fires which had suppressed woody growth prevented crow populations of that early period from becoming abundant. During initial settlement in the period 1870 to 1900, prairie fires were suppressed and woody growth and crows became abundant. Criddle (38) reported that peak crow populations occurred in the period 1900 to 1920 and linked their abundance with limited agricultural cultivation, an abundant agricultural food supply and extensive early succession growths of aspen and willow. Criddle (37, 38) considered crows beneficial and stated that these birds were mainly insectivorous, but Kalmbach (75) and Munro (102) studying crow-waterfowl relationships in Manitoba, regarded the crow as an effective predator of duck eggs and downy young.

Crows are currently declining in southern Manitoba (19). The decline appears to be correlated with extensive brush clearing and increased cultivation of optimum habitats in the aspen parkland and southern transition zone. Of importance in the decline are local crow reduction programs of Ducks Unlimited, the Manitoba Federation of Game and Fish Associations and most rural area residents. The past widespread crow control programs on the crows' mid-western and southern United States wintering grounds are also believed to be contributing to the decline of Manitoba's crow populations (19).

Crows are vulnerable to shooting in Manitoba, particularly in the spring when the birds arrive and snow still covers the ground. Concentrations of these birds then feed on garbage dumps and congregate in spring

night roosts. Crows congregate on roosts again in the late summer and fall and again become vulnerable to shooting (personal observation).

The use of calls and decoys in the shooting of crows is gaining popularity, as is recreational "plinking" of crows by both urban and rural residents.

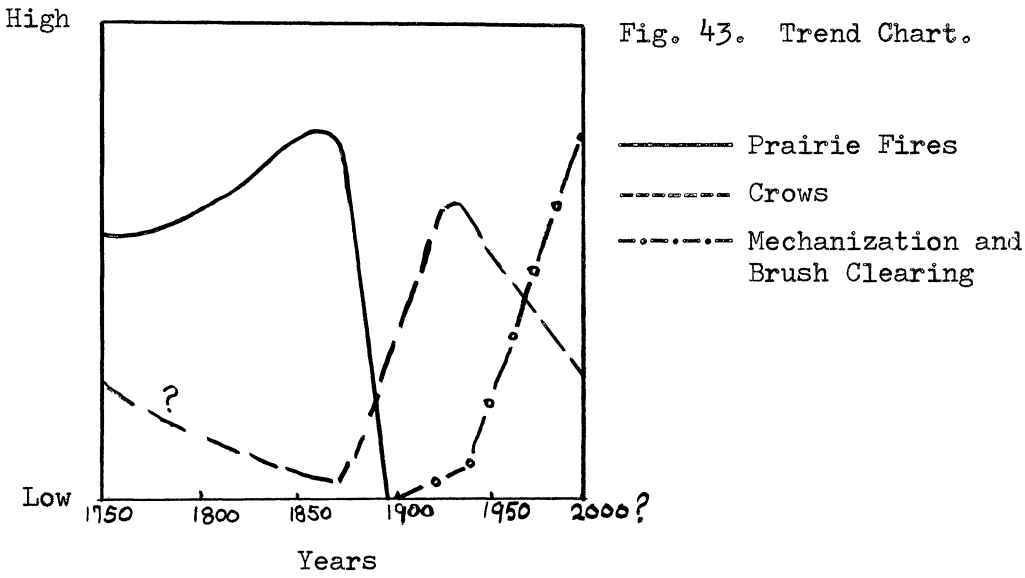


Fig. 43. Trend Chart.

The economic relationships of hawks, owls and crows to pest rodent and insect populations is undetermined in Manitoba. Such studies would be useful.

d. Magpies. Magpies were rare summer visitors to the Province prior to 1910. In the year 1910, an increase was noted in magpie populations and the first nests in the Province were recorded (64). Currently, the magpie is a common year-round resident in the prairie and aspen parkland zones and appears to be expanding its range northward. Bird (19) states that recent range expansions have occurred into the southern boreal forest regions near The Pas and Moose Lake. The early establishment and recent increases of the magpies may be partially due to agricultural land

use practices, but this correlation has not been established. Their presence in winter, however, appears to depend on the availability of food supplied by man's activities. Food gleaned from garbage dumps, road kills and carcasses of wild animals and domestic livestock provide the chief source of winter sustenance to the birds.

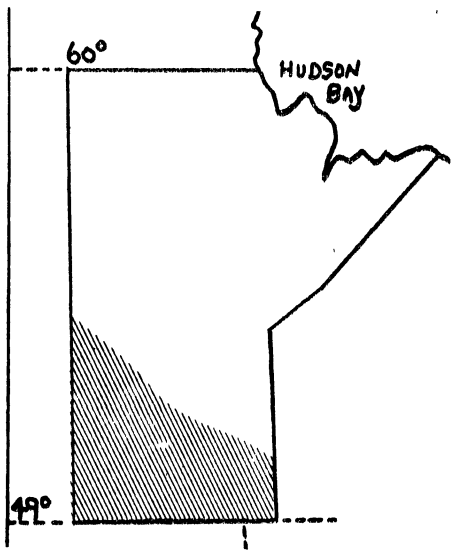


Fig. 44. Distribution of magpies.

The magpie has become a pest due to its depredations on birds' nests, small game populations and cattle. Cattle are damaged when abcesses in their backs caused by the warble fly grubs are pecked at by the birds. Most damage occurs during food scarcities in late winter when deep wounds in the flesh are inflicted by the pecking of the birds. Frost entering the wound may result in the animal's death (Criddle, 1949, in letter to R. D. Bird in 19). The pelts of dead furbearers caught in traps may also be damaged by magpie feeding during winter months.

Magpies are not popular with farmers and sportsmen, and local magpie control is frequently attempted through the use of municipal bounties. These bounties are enacted by the local municipalities and, under the

Predator Control Act are paid out without government support. The bounties have been unsuccessful in controlling magpie populations (19).

Magpie reduction is best accomplished by utilizing knowledge of the birds' habits to effect control. Wire and steel traps baited with bloody meat are recommended methods and have been used to reduce magpie populations on many occasions (156d). Faster, more effective control can be carried out during the late fall when magpies congregate on a common night roost. At Shoal Lake, fall magpie roosts were found in second growth aspen and low willows. Birds moved at least four miles from the roost by day. The roosts can be located by following groups of birds during the late evening. Magpies are vulnerable to killing in the roost areas and, in my experience, the majority of birds can be taken in a single evening.

e. Blackbirds

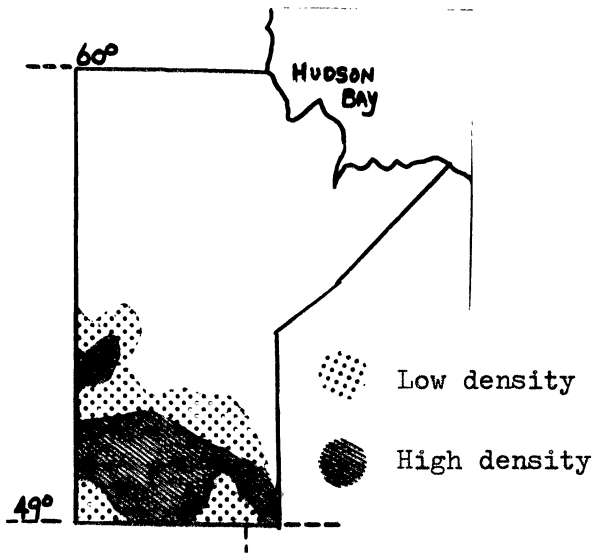


Fig. 45. Distribution of blackbirds.

Blackbirds are currently the most abundant bird species of the agricultural prairie and parkland regions (19). Blackbirds are of economic importance due to their extensive depredations on cereal crops of oats,

corn and oil crops of sunflowers. Earliest damage was recorded in 1884, when the Manitoba Department of Agriculture reported local area crop losses ranging from 5 to 25 percent damage due to blackbirds. At present, the blackbird probably creates far more serious pest problems on agricultural crops than the much-publicized waterfowl damage (20).

The redwing blackbird is the most common species, but associated with the large fall flocks of redwings are the rusty, Brewers and yellowheaded blackbirds and the common grackle (19). Crop damage is most severe in cropland areas adjacent to wetland habitats used by the large flocks as night roosts. Damage to cereals consists of the picking off of seeds or kernels from the ripened heads or the crushing of kernels in the immature milk or soft dough stage of growth.

Sunflower heads are stripped of seeds and sunflower seeds are the preferred food of the birds. On the other hand, the blackbird may be beneficial to a degree in that it consumes great quantities of a variety of insect species (19).

Recent increases in blackbird populations appear to be related to the increase in shallow semi-permanent aquatic habitats with their associated emergent growths of bulrush and willows. Roadside ditches that have vegetation of this type are common nesting areas. The blackbird also nests in western snowberry and wild rose, which are increasing in pasturelands and along headlands. Crows are effective predators on blackbird eggs and young; crow population declines may be a factor in the recent increase of blackbirds (20).

Scarecrows, acetylene exploders and shooting have been employed to alleviate crop damage but these methods have achieved only moderate success.

The problem of reducing economic losses due to blackbird depredations of agricultural crops remains unsolved.

At times, other than during the late growing season and harvest periods, the blackbird may be beneficial. Bird (20) found that food choices during the spring and summer periods consisted mainly of insects and weedseeds. This beneficial habit in blackbirds as well as other seasonal problem species may be more valuable than the damage done in season. Marsh (96) stated:

> "Very many of those (birds) generally supposed to consume large quantities of the seeds of cultivated plants really feed almost exclusively on insects....It appears highly probable that even the species (blackbird) which consume more or less grain, generally make amends by destroying insects whose ravages would have been still more injurious."

This observation was made a long time ago; more studies of these relationships are required in Manitoba.

f. Starlings. Starlings were first recorded in Manitoba in June of 1925 (19). Small flocks are now common in the prairie and parkland zones. Starlings are associated with farmsteads, towns and cities. Problems created are due to their noisy behavior and defecations on buildings and livestock feed supplies. The starling has not become abundant, and little, if any, control is practiced. The effects of belligerent starling populations in reducing native songbirds is not known.

g. House Sparrow. Seton (126) first recorded the house sparrow (a true weaver bird) at Carberry in 1892. This bird reached peak populations during the era of horse agriculture when seeds passed in horse droppings provided a widespread and abundant food supply (19). But since 1940, the horse and house sparrow populations have declined. This sparrow

is still common, however, as a semi-domestic bird of rural farmsteads, towns and cities of southern Manitoba.

h. Other Birds. In addition to most birds mentioned in the preceeding pages, the bronzed grackle is the only other bird not protected by law (19). Studies of the economic and ecological relationships of birds to insects, rodents, pesticides and the economy of the Province are required to evaluate scientifically the many species occuring in Manitoba. In addition to any economic benefits they may provide, birds have an aesthetic value, and bird watching and membership in ornithological clubs is increasing in the Province.

2. Animals.

a. Ground Squirrels.

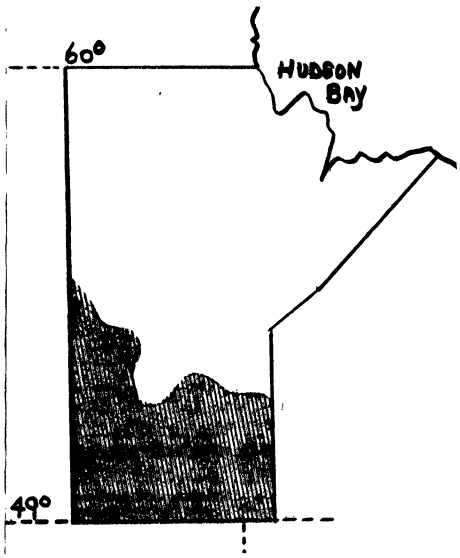


Fig. 46. Distribution of ground squirrels (all species).

Three species of ground squirrels are native to Manitoba; these are the Richardson, Franklin and striped, or thirteen-lined ground squirrel (137).

The Richardson ground squirrel was originally found in scattered colonies in the tall grass prairie and aspen parkland zones. The early

colonies were closely associated with the recurrent fires which assisted these colonial ground squirrels in keeping the tall grass prairie free of trees and shrubs and in a short grass subclimax (137, 19). Today, the Richardson ground squirrel is a problem species only in areas where there is heavy grazing in close proximity to the production of cereals, grass and legume crops. Agricultural crop damage to both cereal and forage crops and the maintenance of large colonies of these animals on overgrazed pastures has occurred (19).

Control of Richardson ground squirrels is achieved naturally by badgers and hawks and artificially by local municipalities who distribute "gopher" poison at cost to farmers who have gopher problems.

Remedial measures to prevent problems from these animals hinge on the prevention of overgrazing by domestic livestock and the cessation of the removal of the ground squirrels' natural enemies the badger, red fox, coyote, hawks and owls (19). The Richardson ground squirrel is the chief recreational target species of rural and urban residents.

The striped or thirteen-lined ground squirrel is non-colonial in Manitoba (40), and its economic effect on cultivated crops is undetermined. I attribute some edge clipping of cereal crops along roadsides to these animals. Soper (137), Bird (19) and Criddle (40) state that the populations of this "gopher" have been reduced from pre-settlement periods by intensive cultivation of its natural habitat, the tall grass prairie. However, good populations remain today, and the thirteen-lined ground squirrel has expanded its range northward in the parkland in association with road building and agricultural cultivation. The major habitat currently consists of grassy roadsides and forage crop fields of alfalfa and

grasses. New pastures have replaced the old prairie habitat. Populations of the thirteen-lined ground squirrel have at no time reached pest proportions (19).

The Franklin ground squirrel reaches its highest populations in the parkland and southern transition zone (137). This ground squirrel is associated with shrubland, heavy grass stands and marsh edge. Franklin ground squirrels are non-colonial and their economic relationship or importance to agriculture is unrecorded. Sowls (138) studied the life history of the Franklin ground squirrel and stated that it was a predatory species on nests and young birds of ground nesting songbirds and waterfowl.

b. Western White-tailed Jackrabbit.

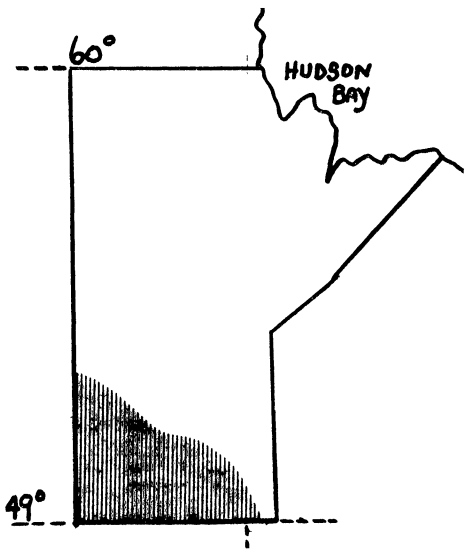


Fig. 47. Distribution of white-tailed jackrabbit.

The white-tailed jackrabbit is not native to Manitoba but presently occurs throughout cultivated areas of the former tall grass prairie, aspen parkland and transition zones. Seton (128) reported the first appearance of these jackrabbits (a true hare) during the period 1881 to 1885. By 1887, the jackrabbit was extremely abundant on cultivated areas.

Populations since 1887 have varied in density with local habitat conditions, but the jackrabbit continues to expand its range northward in association with agriculture's creation of a farmland habitat (19).

Jackrabbit habitat is seemingly enhanced by agricultural land use consisting of the clearing of brushland, cultivation of fields and the growing of cereal and forage crops. Breeding, feeding and rearing of young is completed on cultivated land or in tall grassland or low sparse shrubland in close proximity to cultivated land (19, 137).

During snowless seasons, the jackrabbits are scattered widely but in winter snow conditions the rabbits migrate to patches of aspen, willow or tall grass which they utilize as both food and cover. The jackrabbit moults from brown in summer to white in winter and is relatively well-camouflaged. In winter, jackrabbits frequently burrow in the snow during the day and are active mainly at night; they are seemingly unaffected by severe cold (19).

Fluctuations in jackrabbit populations are not cyclic, as in the snowshoe hare, but are influenced to some degree by the abundance of predators (red fox, coyote and great horned owl) and especially by the availability of food and cover in winter. There may be a climatic influence in spring and summer moisture conditions which relates to the survival of young jackrabbits, but this has not been verified.

The highest jackrabbit populations were recorded in Manitoba during the drought years of the 1930's when abandoned farmland and early succession growths of weeds and shrubs provided optimum habitat conditions (19).

The jackrabbit is currently unclassified as to game status, and no

regular seasons, limits or licenses are required for its taking. The fur and meat are, however, moderately valuable (50 to 75 cents), and large numbers are taken each year by rural residents. Meat of the jackrabbit is highly palatable but the majority of rabbits are sold as whole carcasses to mink ranchers who utilize the meat as mink food and occasionally resell the hides. The average fur sales of jackrabbit during the period 1924-25 to 1960-61 amounted to 8,220 pelts annually, but the total number taken each year was undoubtedly much higher (156d).

Jackrabbits create problems for farmers by stripping the bark from field and farmstead shelterbelts and fruit trees. Damage occurs during the winter when deep snow cover enables the rabbits to reach high on the trees. Jackrabbits are also hosts to the bladder tapeworm of dogs, foxes and coyotes and to the human flea (19).

Since jackrabbits are afforded no legal protection, various unconventional methods are employed in their capture. These practices include the use of traps, baits and shooting. The practice of shooting jackrabbits during the winter with the aid of lights is illegal but common and difficult to control. There is currently an air of pest elimination associated with jackrabbit hunting.

As the clearing of shrubland continues in the parkland and transition zone, jackrabbits can be expected to expand their range (19). Due to their speed, size and palatability, these animals have a potential as game, and in the future their hunting may be regulated.

Present, southern jackrabbit populations are low. This current reduction may be related in part to increasing red fox populations. It remains to be determined that in view of increasing off-season hunting,

the jackrabbit should be managed as a recreational sport species.

c. Snowshoe Hare. The snowshoe hare or snowshoe rabbit is found throughout Manitoba from the 49th parallel to the tree line (137). Prior to settlement, this species was found in low densities along tree and shrub bordered watercourses of the parkland. The fire suppression which resulted in tree growth in the prairie and parkland regions (1870-1930) has caused the snowshoe hare to expand its range in the south. Criddle (39) studied the snowshoe hare extensively and found that in the southern area, rabbit populations required early succession habitats of aspen, willow, oak, hazelnut and wolf willow stands to maintain high populations. These woody plants provided both food and cover. Fire in the boreal forest zone is currently common, and in this area rabbit populations have increased due to the regrowth of young trees and shrubs. Food species include aspen, willow and hazelnut (39).

Snowshoe hares are violently cyclic in Manitoba, and a nearly regular 10 year cycle occurs (56, 76). Rabbit cycles are important in that they affect the abundance of important furbearers such as the lynx (76) and to a lesser degree the fisher and marten (126). The cycle of the snowshoe hare in Manitoba has been unbroken by man's land use practices (19). At present, the southern prairie and parkland snowshoe hare populations are declining due to extensive brush clearing and overgrazing that eliminates habitat (19).

Snowshoe hares create pest problems by damage to seedling trees in farmstead and field shelterbelts and in orchards. Damage occurs during the winter when snow depths allow the rabbits to reach and strip the bark from the upper trunk and branches (19).

The snowshoe hare is at present considered a non-game species; however, as the demand for recreational hunting grows, this animal may be classed as a sport species and managed by an annual season.

d. Cottontail Rabbit.

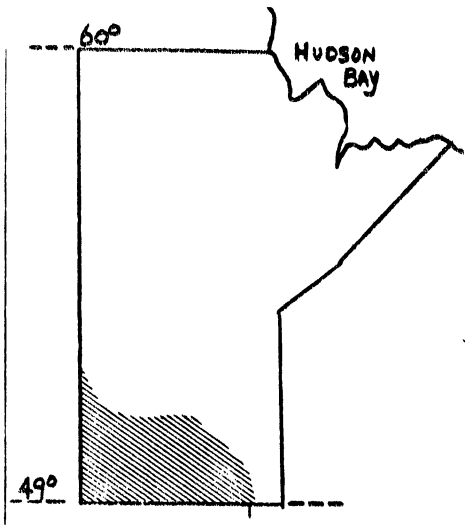


Fig. 48. Distribution of cottontail rabbit.

The cottontail rabbit was unknown in Manitoba prior to 1912 when the first sightings of this animal were made at Emerson located on the Minnesota border (137). The first recorded specimen was collected by Norman Criddle at Treesbank in 1914 (19, 137). Since 1914, the cottontails have expanded their range northward (4), and by 1946 they had become common throughout cultivated areas of the Province. The cottontail utilizes farm buildings and abandoned burrows of other animals to shelter in. The expansion of the cottontail range appears to be associated with the developments of human habitation and extensive agricultural cropland, but the decrease in southern area snowshoe hare populations may have been a factor. Cottontails seemingly do not thrive in areas of high snowshoe rabbit densities and a dominance relationship

may be involved (personal observation). Today, cottontails are most common in southern towns and villages and live in close association with men (19).

The cottontail frequently becomes a pest species damaging gardens, nurseries and orchards but has no status as a game species and does not exist in high densities (19).

e. Pocketgophers. Soper (137) records three species of pocketgophers in Manitoba. The most common prairie and parkland species are the Richardson and Dakota pocketgophers. The Mississippi Valley pocketgopher is relatively rare and restricted to an area adjacent to the United States border.

Pocketgophers persist in high densities on forage croplands, and such land use may have resulted in increased populations. These animals create economic problems by diggings and tunnelings in gardens, pastures and hayfields (19). Bird (19) states that populations may be increasing due to the declining populations of most raptorial birds but this is not verified.

f. Voles and White-Footed Mice. Soper (137) lists four species of white-footed mice and fourteen species of voles as resident to Manitoba. For practical purposes, I will group these species together as mice in the following discussion.

Populations of the meadow mice (voles) appear to be cyclic in Manitoba (41, 19, 137). Mouse cycles are largely unaffected as to timing by land use practices, and populations on or near cultivated areas could be increasing. This increase may be linked to increased supplies of quality foods in the form of fertilized grains, grasses and legumes and

decreasing populations of some of their predatory animal species such as crows, hawks and owls (19).

In years of high populations, these small rodents can cause extensive damage to cereal and forage crops and small shrubs and trees. The only effective control appears to be to allow increases in the populations of their natural predators, but proper cultural control including the intensive late fall cultivation of fields can be a factor in reducing mouse populations (147). These relationships have been widely studied in the United States. Future Provincial research in this field could provide the answers to these questions in Manitoba.

g. Norway Rat and House Mouse. Both the Norway, or brown rat, and the house mouse are non-native immigrants residing in Manitoba. Present populations of these two animals in the Province originated by natural immigration from adjacent areas or by accidental introduction. Seton (126) did not record the presence of the Norway rat in Manitoba. The first record was provided by Criddle in 1929 (19). Since 1929, the Norway rat has spread to all areas where man has created a habitat of unprotected litter, garbage and buildings. The rat is common in most towns and cities and also on many rural farmsteads. Damage is caused by chewing and defecations in granaries, barns, houses and business establishments. The rat is unknown in areas where human habitation does not exist, and control appears to hinge on the elimination of unprotected habitats of wooden floored buildings, garbage and scrap piles and human wastes. The use of concrete floors in granaries, barns and other buildings facilitates rat reduction (19).

Seton (126) first reported the house mouse in 1901; since then it

has spread Province-wide and occurs as far north as the coast of Hudson Bay. House mice are associated with human dwellings, but the mouse is able to exist in the wild state during summer (19, 137). In winter, house mice return to buildings and farm granaries. Stored grain can be protected if damage is serious.

h. Porcupines. Porcupines occur wherever there are trees in Manitoba but are most common in the heavily forested areas of the transition and boreal forest zones (137). These rodents damage trees by eating the bark from trunks and branches, but the economic significance or extent of this type of damage is unknown. Artificial control of porcupines, although possible, is not generally practiced (19).

i. Woodchuck. The eastern woodchuck inhabits all of Manitoba in an area extending from the American border north to the tree line (137). This animal is most abundant in the eastern portion of the Province and in the transition zone. The woodchuck has never been reported as an economic problem in Manitoba, perhaps because populations in agricultural areas are low (137).

3. Discussion.

Problem species and attempts at their control will undoubtedly continue in Manitoba.

Some pests can be readily controlled by either direct reduction (hares, porcupines) or by habitat modification (Norway rat, house mouse, meadow mice).

There are also pests for which no obvious control is now known (blackbirds) but concerning which much intensive research is presently going on in the United States. The answers may be available soon (147).

Of prime importance in problem species control in Manitoba appears to be alleviation of damage to cereal and oil crops caused by blackbirds and of damage by the Norway rat in urban areas and on farmsteads. Damage by mice, jackrabbits and snowshoe hare to shelterbelts and fruit trees is also a periodic problem to be solved.

SUMMARY AND CONCLUSIONS

Land use, including use of firearms, settlement, cultivation, fire or control of fire, and recently increasing mechanization, transportation and the use of pesticides, by modern man has greatly changed both the diversity and abundance of Manitoba's wildlife.

By 1870, bison, antelope, muskox and grizzly bears had been eliminated from the Province, principally by heavy shooting. In the prairie, aspen parkland and southern transition zones, white-tailed deer replaced them. Now, even deer populations are declining, mainly because of increased brush clearing, intensive cultivation and overgrazing.

Mule deer and elk have been reduced by a combination of shooting and extensive cultivation of their former optimum habitats. These species survive only in protected and limited National Park and Forest Reserve habitats. Woodland caribou found in the boreal forest zone and barren-ground caribou native to the tundra are declining, apparently because of damage to their habitat by fire which removes essential food sources of moss and lichens. Since 1930, moose populations and ranges have increased with brushy food and cover which result from fire in the northern transition and boreal forest zones. The black bear and timber wolf maintain their numbers in these zones but have been eliminated from the southern agricultural regions.

Polar bears, which are protected by law and whose habitat has not been modified, maintain a stable population.

Northward range expansions of moose, black bear, white-tailed deer and magpies have occurred.

Prairie chickens did not occur in Manitoba two centuries ago. They

came in with limited subsistence agriculture and became quite abundant. However, prairie chickens are now practically all gone from the Province because of increased acreages of cultivation which eliminated native grassland. Ring-necked pheasants and wild turkeys have been introduced and have established wild populations. The introduced Hungarian partridge is still spreading and increasing.

Native upland game and waterfowl have lost habitat to brush clearing, filling, drainage and cultivation but remain in moderate densities throughout the Province. Furbearers were practically eliminated by 1870, but through regulated management are again abundant.

Wildlife encouraged by agriculture such as the red fox, jackrabbit, cottontail rabbit, striped skunk, magpie and blackbirds have increased. Some introduced species that rely on man's creation of a habitat, such as the Norway rat, house mouse, house sparrow and starling, do considerable damage.

Present indications are that most species of Manitoba's wildlife will continue to be important natural resource assets only as long as their habitat is maintained. An extensive change of habitat resulting from current land use practices is presently occurring in the privately-owned southern half of the Province in the tall grass prairie, aspen parkland and transition zones.

Private and publicly supported land management involving agricultural land use practices of intensive cultivation, brush clearing, herbicidal spraying, overgrazing and drainage have reduced and continue to reduce both the total area and production potential of most wildlife habitat. In addition, these practices tend to create a homogeneous habitat which

reduces the diversity of wildlife species that the land will sustain.

The importance of wildlife production on such private land cannot be overemphasized. History indicates that these present agricultural areas were once the most productive habitat for wildlife.

It is unlikely that much can be done to reconcile agriculture and wildlife production in these privately owned areas. White-tailed deer, ducks, sharp-tailed and ruffed grouse, Hungarian partridge and furbearers will be produced as incidental by-products of other land use practices unless the production of such wildlife becomes economically beneficial to the land owner.

If waterfowl (ducks) are to be maintained at high population levels, a mutually beneficial reconciliation between conservationists and agricultural interests on private lands is essential.

Since wildlife in these areas is largely an agricultural by-product, game administration could profit from and save time by using the agricultural education machinery (Extension Agencies) to educate the public in wildlife values. In addition, these same agencies could co-operate to incorporate those soil and water conservation techniques proven of benefit to wildlife.

Habitat management for wildlife production on the extensive crown lands is feasible, and here lies the future base for most wildlife production. Land agencies which currently dictate policies regarding land use on crown land will influence the ultimate productivity of these areas for moose, woodland caribou, sharp-tailed, spruce and ruffed grouse, ptarmigan and furbearers. Fire and fire prevention utilized as wildlife habitat management measures have not been evaluated, and the possible

importance of this tool to create or maintain habitat in this forested, undeveloped area should not be overlooked.

The climate of northern Manitoba is severe and environmental resistance is high. Experience gained from costly attempts at pheasant introductions indicates that most future non-endemic wildlife introductions should be curtailed. The more logical approach to wildlife management is to preserve or create better habitat and to relieve land use or environmental pressures and competition from the existing native or successfully introduced species. The restocking of native wildlife to "burned out" areas seems feasible providing the habitat has been restored prior to any re-introduction program.

In the future, the opening of Manitoba's vast northern areas to conventional travel will facilitate various usages of currently isolated and unavailable wildlife resources; this will be particularly advantageous to recreational hunting and may relieve increased hunting pressure on the southern wildlife populations.

Manitoba has many biologists, but there is a need for personnel trained in wildlife management.

Research by wildlife biologists designed to provide data enabling co-operating wildlife managers to formulate game management areas and policies and accurately to regulate the wildlife on these areas is necessary. Ecological studies on species interactions and the effects of pesticides and herbicides on wildlife and habitat should not be overlooked. In addition, studies on plant and pasture ecology and wildlife relationships would be valuable.

Also needed is an accelerated research program based on habitat

research and emphasizing economic and biological wildlife relationships to agriculture. However, prior to any such gathering of data, assurance that the findings will be effectively incorporated and utilized should be firmly established.

Game law enforcement and habitat preservation are both essential to wildlife conservation. While a recent emphasis on game law enforcement appears to have been instrumental in salvaging remnants of a once-abundant wildlife resource, the need for generating more public concern regarding game law enforcement and wildlife welfare is still evident. However, in most instances the ultimate welfare of wildlife species cannot be separated from habitat maintenance, and in these instances law enforcement alone will prove insufficient to insure the perpetuation and abundances of species.

Wildlife has been an integral, accepted part of Manitoba's culture but this concept has failed to insure its abundance. The idea that wildlife belongs to the public and as such is free does not guarantee its production on private land. Wildlife produced on private land, where most of the recreational and threatened species occur, usually costs the landowner money. This cost arises from crop depredations by the species, taxes which must be paid, and often damage by the public who utilize the wildlife.

The desire of the public for continued wildlife abundance implies certain responsibilities. Those private and public individuals who wish to insure its abundance may in future find that economic compensations are necessary. The economic loss that the landowner incurs from the maintenance of wildlife habitat on his land must be financially compen-

sated partially or in full by those who utilize the benefits generated by the wildlife resource. This is necessary if the habitat is to be expected to remain in use solely or in part for wildlife production.

Public education on wildlife conservation, biology and management appears to be inadequate and in most cases non-existent at the school or early age level (see Appendix section--Manitoba Federation of Game and Fish Associations.) Extension work involving the teaching of basic principles of wildlife values, habitat needs, population dynamics and conservation practices would be beneficial when initiating such education programs.

Economic support for wildlife research, habitat, maintenance and public education appears far from adequate, and federal, provincial and municipal responsibilities or commitments in these fields have not been clearly defined (112). It is hoped that the current multiple-use approach to land use will co-ordinate such governments, departments and agencies' endeavors in the field of wildlife conservation in Manitoba.

Since wildlife is a product or "crop" of the land, the concept of multiple-use of land should be interpreted to include designated use for specified wildlife purposes. Simultaneous use of the same piece of land for several purposes is often difficult since many uses compete with as well as supplement each other. What normally develops is dominant single use at the expense of other competing uses, the dominant frequently being the agricultural industry or hydroelectric developments at the expense of other natural resources such as wildlife.

Some recreational wildlife species are exhibiting pest tendencies. Protection of the product of the landowner, private or public, or com-

pensation for losses attributable to wildlife appear to be in order. The cost of this type of management should realistically be shared by the producer and especially by those who benefit financially and recreationally or derive aesthetic or scientific values from wildlife diversity or abundance.

Manitoba has been recognized as the leading Province in the management and production of wild furs. Also, the Province has become one of the first to remove bounties as a means of control of predatory species.

It is evident that much experience and knowledge have been gained and time saved by a close liason between resource conservation agencies both within Manitoba and in other areas of North America. However, there appears to be an excessive time lag in the incorporation of information on wildlife management gained by experience and research in other similar situations or areas.

Organizations and agencies exist with the capacity either to destroy or maintain the habitat essential to wildlife production; the impact and result of land use policies and practices on wildlife habitat will ultimately decide the fate of wildlife populations in the Province. Decisions on land use made by public and private individuals and organizations dictate the diversity and abundance of wildlife that the land will sustain. If wildlife species are valuable and are to be maintained, considerations of their habitat needs should soon be incorporated into all land use policies and practices.

The aesthetic, recreational, financial, scientific and social benefits of wildlife should be carefully considered prior to any decisions that will promote or reduce their abundance.

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APPENDIX A

BIRDS AND MAMMALS

A. Upland Game Species
Hungarian partridge, Perdix perdix
Pinnated grouse or prairie chicken, Tympanuchus cupido
Ring-necked pheasant, Phasianus colchicus
Rock ptarmigan, Lagopus mutus
Ruffed grouse, Bonasa umbellus
Sharp-tailed grouse, Pedioecetes phasianellus
Spruce grouse, Canachites canadensis
Wild turkey, Meleagris gallopavo
Willow ptarmigan, Lagopus lagopus

B. Waterfowl
American goldeneye, Bucephela clangula
Baldpate, Mareca americana
Blue winged teal, Anas discors
Bufflehead, Bucephala albeola
Canada goose, Branta canadensis spp.
Canvasback, Aythya valisineria
Cinammon teal, Anas cyanoptera
Common teal, Anas crecca
Coots, Fulica americana
Gadwall, Anas strepera
Greater scaup, Aythya marila
Green winged teal, Anas carolinensis
Lesser scaup, Aythya affinis
Mallard, Anas platyrhynchos
Pintail, Anas scuta
Rails, Rallus spp.
Redhead, Aythya americana
Sandhill crane, Grus canadensis
White-fronted goose, Anser albifrons frontalis
Wilson's snipe, Copilla gallinago
Wood duck, Aix sponsa

C. Furbearers and Big Game
1. Furbearers
Arctic fox, Alopex lagopus
Badger, Taxidea taxus
Beaver, Castor canadensis
Black bear, Ursus americanus
Bobcat, Lynx rufus
Coyote, Canis latrans
Fisher, Martes pennanti
Grey squirrel, Sciurus carolinensis
Grizzly bear, Ursus horribilis
Least weasel, Mustela rixosa
Longtail weasel, Mustela frenata
Lynx, Lynx canadensis
Marten, Martes americana
Mink, Mustela vison

Muskrat, Ondatra spp.
Northern flying squirrel, Glaucomys sabrinus
Otter, Lutra canadensis
Polar bear, Thalarctos maritimus
Raccoon, Procyon loter
Red fox and genetic strains blue, cross, silver, Vulpes fulva
Shorttail weasel, Mustela erminea
Striped skunk, Mephitis mephitis
Timberwolf, Canis lupus
Wolverine, Gulo luscus

2. Big Game
Barrenground caribou, Rangifer tarandus
Bison or Buffalo, Bison bison
Cougar, Felis concolor
Moose, Alces alces
Mule deer, Odocoileus hemionus
Muskox, Ovibos moschatus
Pronghorn antelope, Antilocapra americana
White-tailed deer, Odocoileus virginianus
Woodland caribou, Rangifer caribou

D. Non-Game Species
Birds
Bald eagle, Haliacetus leucocephalus
Brewer's blackbird, Euphagus cyanocephalus
Burrowing owl, Speotyto cunicularia
Common or bronzed grackle, Quiscalus quiscula
Cooper's hawk, Accipiter cooperii
Crow, Corvus brachyrhynchos
Ferruginous (Rough-legged) hawk, Buteo regalis
Golden eagle, Aquila chrysaetos
Goshawk, Accipiter gentilis
Great horned owl, Bubo virginianus
House sparrow, Passer domesticus
Long-eared owl, Asio otus
Magpie, Pica pica
Marsh hawk (Harrier), Circus cyaneus
Red-tailed hawk, Buteo jamaicensis
Red-winged blackbird, Agelaius phoeniceus
Rusty blackbird, Euphagus carolinus
Screech owl, Otus asio
Sharp-shinned hawk, Accipiter striatus
Short-eared owl, Asio flammeus
Snowy or Arctic owl, Nyctea scandiaca
Starling, Sturnus vulgaris
Swainson's hawk, Buteo swainsoni
Yellowheaded blackbird, Xanthocephalus xanthocephalus

2. Mammals
Cottontail rabbit, Sylvilagus floridanus

Franklin's ground squirrel, Cittelus franklini
House mouse, Mus musculus
Meadow mice or voles, Microtus spp.
Moles, Scalopus, Condylura spp.
Norway rat, Rattus norvegicus
Pocket gophers, Thomomys spp.
Porcupine, Erethizon dorsatum
Richardson ground squirrel, Citellus richardsonii
Snowshoe hare, Lepus americanus
Striped or thirteen-lined ground squirrel, Citellus tridecemlineatus
White-footed mice, Peromyscus spp.
White-tail jackrabbit, Lepus townsendi
Woodchuck, Marmota monax

TREES AND SHRUBS

American elm, Ulmus americana
Aspen poplar, Populus tremuloides
Balsam or black poplar, Populus balsamifera
Birch, Betula spp.
Black spruce, Picea mariana
Blueberry, Vaccinium spp.
Caragana, C. arborescens
Chokecherry, Prunus virginiana
Cranberry, Viburnum opulus
Green ash, Fraxinus nigra
Hazelnut, Corylus americana
Jackpine, Pinus banksiana
Juniper, Juniperus horizontalis
Lichens, Cladonia, Cetraria spp.
Maple, Acer negundo
Oak, Quercus spp.
Pincherry, Prunus pennsylvanica
Poison ivy, Rhus radicana
Raspberry, Rubus idaeus
Red osier dogwood, Cornus stolonifera
Rose, Rosa spp.
Saskatoon, Amelanchier alnifolia
Tamarack, Larix laricina
Western snowberry, Symphiocarpos occidentalis
White spruce, Picea glauca
Willow, Salix spp.
Wolf willow, Eleagnus commutata

PERENNIAL, ANNUAL AND BIENNIAL GRASSES AND FORBS

Alfalfa, Medicago sativa
Barley, Hordeum spp.
Brome grass, Bromus spp.
Buckwheat, Polygonum spp.
Bulrush, Sciurpus spp.

Canada thistle, Cirsium arvense
Cattail, Typha latifolia
Clover, Melilotus spp.
Corn, Zea mays
False ragweed, Iva xanthifolia
Fireweed, Epilobium spp.
Flax, Linum spp.
Meadow fescue, Festuca spp.
Oats, Avena spp.
Peas, Pisum sitiva
Phragmites, Phragmites spp.
Pigweed, Erigeron spp.
Ragweed, Ambrosia spp.
Rapeseed, Brassica spp.
Rye, Elymus spp.
Sedgegrass, Carex spp.
Sow thistle, Sonchus arvensis
Sunflower, Helianthus spp.
Wheat, Triticum spp.
Wheat grasses, Agropyron spp.
White top, Scolochloa festucacea
Wild barley, Hordeum jubatum
Wild oats, Avena fatua

APPENDIX B

ORGANIZATIONS AFFECTING WATERFOWL AND OTHER WILDLIFE

A. Ducks Unlimited (Canada) in Manitoba

Ducks Unlimited (D.U.) is a U.S.-financed, private waterfowl conservation organization active in Manitoba. Head offices for all Canadian D. U. work are located in Manitoba's capital city of Winnipeg (90). D.U. owns no land.

Lacey (84) states that D. U.'s concern is centered in the agricultural area of southern Manitoba. The prairie potholes of the aspen parkland are the most productive duck habitat in the Province but recent droughts have accelerated drainage and filling damage to this habitat by facilitating access with drainage and bulldozing equipment (139, 19, 84). Brush clearing and drainage are closely associated; in brush clearing the debris of trees and shrubs is frequently pushed into wetland areas thus destroying their value to waterfowl. Clearing and drainage as combined practices can be a major factor in pothole destruction (84).

Ducks Unlimited attempts to stabilize, create, salvage or improve wetland areas of duck production and at the present time has completed 125 new projects in southern Manitoba which include 321,974 acres of water. Wetland habitat is restored through engineering involving the construction of dams and dikes designed to increase the desirability and permanency of key potholes and marshes (84).

Extensive destruction of waterfowl habitat has also resulted from hydroelectric power projects such as the recent development of the Grand Rapids Hydro-Electric Reservoir in north central Manitoba. Annual duck production losses in the actual reservoir area are estimated at 103,000; this is the total pre-reservoir area production. The Grand Rapids storage

area (1.6 million acres) also reduced duck production (by flooding) of the Saskatchewan River delta by 40 percent; this area originally produced 330,000 ducks annually. To compensate for this damage the provincial government in 1962 leased D. U. 150,000 acres of wetlands west of The Pas (located on the Saskatchewan River delta).

The Pasquia reclamation area (135,000 acres) has been drained by P.F.R.A. for agricultural production. Prior to drainage the area produced an estimated 28,000 ducks annually. The 1964 total production was estimated at 3,000 birds (84). This northern area is at best marginal for farming due to the consistently short frost-free period and the normally abundant late fall rains which prevent harvest. Crops have been sporadic (95).

The southern area of Manitoba contains many D.U. projects primarily aimed at controlling water levels and increasing the permanency of key areas in times of drought. In this region, the most destructive land use of waterfowl habitat has been in the Interlake and Westlake regions in the vicinity of Lakes Winnipeg and Manitoba where large ditches drain thousands of acres of wetland into Lake Manitoba, Lake Winnipeg and Lake St. Martin. Some of this drainage was carried out with incomplete planning, and the resulting sub-marginal agricultural land was obtained by needless waterfowl habitat destruction (84). In 1963 and 1964, D. U. (under an A.R.D.A. agreement) carried out extensive wetland inventories in these areas. In response to these evaluations the Manitoba Government set aside wetland areas totalling 94,960 acres that are not to be drained and placed partial drainage restrictions on 33 other marshes totalling 33,445 water acres.

If D. U. work is carried out on private land, voluntary land easements

(non-financial) are at present the only method of acquisition considered feasible (84).

Ducks Unlimited has experimented with carp removal in the Delta Marsh on Lake Manitoba; habitat is recovering after the exclusion of carp was achieved by screening off inlets to marsh areas. D. U. also co-operates on problems of crop depredation, marsh edge feeding and co-operative banding studies. Spring and fall populations of duck surveys are routine procedure (58).

Ducks Unlimited co-operates in its water engineering projects with the Water Rights Control Board of Manitoba and informs them of (and obtains clearances on) every project undertaken. Three hundred and fifty voluntary private citizens of Manitoba annually act as "key men" to assist D.U. in its productivity and population censuses (84). Two important features of D.U.'s work are its radio and T.V. information and education programs which attempt to keep the public informed of waterfowl conditions and problems (90).

B. A.R.D.A.

The Agricultural Rehabilitation and Development Act is designed to boost the economic and social development of Canada's rural areas. Manitoba signed a general agreement on A.R.D.A. with the Government of Canada in December of 1962. Under the agreement, Manitoba initiates qualifying programs, pays one-half the capital cost of each project, and is responsible for administering and maintaining each project. A.R.D.A. agreements permit two major types of program: (1) Development or action programs involving adjustments in land use, soil and water conservation, and rural development, and (2) research and investigation useful in developing the

action programs in the listed categories.

Implicit in the land adjustment programs is the principle that land now in marginal agriculture be transferred to a more effective, profitable use. For example, marginal farm land could be converted to forest, recreational or wildlife use. The soil and water conservation program is aimed at achieving higher production from good agricultural land. Examples of acceptable projects are drain construction, soil conservation through seeding land to forage crops and multiple-use lake level control projects (7).

1. Conversion of Land to Wildlife Use. The demand for parks and recreation sites and pressures on wildlife populations for hunting continue to grow. To provide for these requirements, a program of acquisition of lands suited to recreation and wildlife use has been carried out. Marginal land has been acquired around the Delta Waterfowl area and Grant's Lake to allow for management of water lands to improve wildlife habitat in the public hunting area (7).

2. Research Related to Adjustments in Land Use. Studies and inventories designed to provide information on the alternative uses of land have been carried out. Areas studied for usefulness as wildlife areas have been the Interlake, West Lake and Riding and Duck Mountain areas of Manitoba. The study of the effects on wildlife of the Pembina River development proposals (dams) and the Portage diversion project (drains) have also been carried out; an overall demand and use patterns for wildlife resources in Manitoba is presently underway (7).

3. Soil and Water Conservation Programs. The Oak Lake, Fish and Dennis Lake projects involving control of the lake outlets and flow through construction of fixed crest dams and dikes have been completed. Wildlife

habitat value of the lakes will be maintained by the fixed crest which prevents seasonal fluctuations in the lake levels (7).

Poyser (112), provincial A.R.D.A. co-ordinator, suggests that to date only minor funds received under the A.R.D.A. agreement have been used for projects directly relating to wildlife, mainly for acquisition of marginal agricultural land and habitat research and inventory which will be used for establishing permanent wildlife habitat areas. Projects underway are outlined in the preceeding paragraphs.

Future possibilities under A.R.D.A. are the allocation of crown lands highly suited to wildlife habitat for long-term wildlife use and the maintenance of wetlands on privately-owned land (112). Some pilot action has been taken to maintain wetland habitat areas on private land and the scope and scale of this project is under consideration at all times, but to date the Federal policy and finances for this type of program are not clearly defined. The program of multiple use inventory for all lands under the Canadian Land Inventory is underway and may give some impetus to crown land allocations and maintenance of wetlands on private property (112).

Manitoba has 135.5 million acres of land and 25.1 million acres of fresh water. More than three-fourths of all land is crown land under provincial jurisdiction and 1.5 percent of crown land under Federal government jurisdiction; only 21.7 percent of the land is alienated or owned by private individuals or corporations (85). Production of wildlife could be an alternate use of many areas, particularly wetland areas. Eagles (52) suggests that to aid in the costly financing of wetland acquisition, Canada could use a "Duck Stamp". Bird (20) felt that under A.R.D.A. much could be accomplished through inter-departmental co-operation in the develop-

ment of wildlife resources both on public and private lands.

During 1964, A.R.D.A. financed the D.U. wetland inventory in the Interlake area. This resulted in total or partial governmental restriction of drainage on 128,405 acres of wetlands (84). Co-ordination of agencies, a principal feature of A.R.D.A. resulted in the formation of a wetlands and marsh management committee composed of personnel of the University of Manitoba, Delta Waterfowl Research Station, Canadian Wildlife Service, Ducks Unlimited (Canada), the Manitoba Department of Agriculture and the Wildlife Branch of the Department of Mines and Natural Resources. The Wildlife Branch has since initiated studies on marsh management at Delta, the Steep Rock Marshes and at Cedar Lake (157).

C. P.F.R.A.

The Prairie Farm Rehabilitation Act was passed by the federal government of Canada following the disastrous droughts of the 1930's which severely set back agricultural production on the prairies of western Canada. The main purpose of P.F.R.A. is to conserve and create water resources in the prairie provinces of Alberta, Saskatchewan and Manitoba and to attempt to limit (where feasible) the effects of drought on the local agricultural economy.

P.F.R.A. (a federal government agency) has, since its formation, been active in the construction of small dams, stock watering ponds and farm dugouts for local water storage. Cooch (30), in a survey of P.F.R.A. dugouts and farm ponds in Manitoba, found 43.5 percent of these artificial water storages were used by waterfowl (ducks); the ponds also served as watering areas for upland gamebirds. He suggested that water storage facilities (subsidized by P.F.R.A.) should be constructed in low areas of

natural drainage and the spoil banks flattened; in this condition they are potentially productive for waterfowl. Livestock, if they are using the water storages, should have restricted access to small sections of the impoundment. Overgrazing of the edge invariably resulted in reduced usage by waterfowl. Cooch (30) stressed that artificial water storage areas, while beneficial, were by no means a suitable substitute for natural pot-holes.

D. The Manitoba Federation of Game and Fish Associations.

Local sportsmen's clubs in Manitoba are organized into a non-governmental, co-ordinated group known as the Manitoba Federation of Game and Fish Associations. The "Federation" was conceived in the early 1880's but was formally incorporated in 1945 (142). The 1965 membership of 10,500 is grouped into 114 locals, 23 of which are located in Winnipeg. The balance of the locals are scattered throughout the Province from Flin Flon and Snow Lake in the north to Sprague in the southeast. Each local has its own executive, and each president of a local is automatically elected to the Provincial Executive (based on membership, a local may have from one to six additional Provincial Executive members).

The Province is divided regionally into six zones each with a vice-president (to the overall president) and various committee members working with him.

Provincial committees include Big Game, Upland Game, Waterfowl, Safety, Junior Rifle, Forestry, Finance, Magazine and Land Use; these committees report to the Provincial Executive at the discretion of the Provincial President (of the Federation), whose term of office is two years. Head office (located at Winnipeg) is staffed by the Executive

Director, Editor and a full-time secretary.

The aims of the "Federation" are best expressed by its Conservation Pledge, "I pledge myself as a Canadian to conserve and faithfully defend from waste the natural resources of my country; its soils, its waters, its minerals, its forests and its wildlife" (156f).

Close co-operation is maintained with the Wildlife (or Game) Branch of the Provincial Department of Mines and Natural Resources, the Canadian Wildlife Service (federal) and with Provincial Wildlife Conservation officers (142). Education of the public through the press, T.V. and radio is carried on continually, but the best means of contact is the Federation-owned magazine "Wildlife Crusader" which is published bi-monthly and distributed to all members. Stevenson (142) reports that this publication is considered the best outdoor resource conservation magazine in Canada.

In January of 1965, the Federation voted to establish an annual $500 bursary to be given to qualified biologists doing wildlife research work in Manitoba (142).

The Federation has become involved in various projects, the most noteworthy of which are: The junior rifle clubs (a youth training program of safety and sportsmanship), the promotion of wildlife habitat improvement, introductions (wild turkeys, pheasants), sanctuary establishment and conservation education (142).

The "Federation", due to its large membership and co-ordinated effort, is an important lobby in wildlife policy-making, but it presumably could become more effective with increased membership and expansion of its locals to all areas of the Province.

Locals of the Federation actively promote or sponsor various game

competitions (largest deer, most predators killed, etc.); these are used to promote interest.

The membership of the Federation (rural and urban) may in future form the nucleus for conservation education leadership in youth groups (4-H club programs) and as such would be an invaluable asset to the Province's wildlife program.

Extension work with the Federation, emphasizing the basic concepts of biology, wildlife management and conservation would be a logical approach to more informed and effective sportsman's groups. Emphasis on wildlife habitat preservation and restoration could form the basic approach in education for the Federation.

It can be noted in Manitoba that the most active and strongest clubs (membership) occur in areas that are relatively poor in wildlife resources; the areas amply endowed with wildlife are less active or even unorganized. It seems the value of wildlife to the public is enhanced by a lack of it in their everyday experiences.

Most of Manitoba's threatened local wildlife populations occur on private land and formation of the Manitoba Federation of Game and Fish Associations represents the beginning of the necessary private interest in wildlife and its conservation in the Province (156f,g; 142).

E. Manitoba Department of Agriculture and Conservation.

The Provincial Department of Agriculture and Conservation is comprised of eleven separate divisions responsible to the Minister of Agriculture. Many of these divisions are directly involved in land use and resource management which ultimately affects wildlife diversity and abundance. The more important divisions and some potential implications follow.

1. Extension Service Branch. This branch carries out an extensive rural information and education program throughout the agricultural areas of the Province. The 41 rural agricultural extension agents are influential in determining many of the varied land use practices carried out by local farmers, nearly all of which affect some forms of wildlife. Wildlife conservation and management could be a phase of rural development under the present emphasis to fully incorporate the concepts of A.R.D.A. in the rural areas. The agricultural representatives also administer the 4-H club program in the rural areas; this program teaches valuable youth education and is participated in by over 10,000 rural young people aged 10 to 21 (95). The incorporation of a wildlife management project into the 4-H club program could be extremely valuable in promoting basic resource conservation at the local level.

The present extension-service-administered subsidy for drainage surveys on private land is considered detrimental to waterfowl wetland habitat.

2. Livestock Branch. The land use phase of land management stressed by this department is forage production and good pasture management; such programs are valuable to both agriculture and sustained wildlife production. However, the present policy promoting a doubling of the beef-cattle population in Manitoba must be regarded as a threat to wildlife habitat, since continued overgrazing will eventually be detrimental to both livestock and wildlife (95).

3. Soils and Crops Branch. The prevention of soil erosion by wind and water through good soil conservation practices is a valuable resource conservation measure. The extension programs of gully stabilization, field

shelterbelt planting and increased acreages of forage crop production could be valuable to wildlife, providing the requirements of the game birds and animals are given prior consideration. Municipal weed control districts emphasizing herbicidal spraying of brush on pastures and roadsides may be destroying valuable wildlife habitat at little gain to the local economy.

4. Manitoba Crop Insurance Corporation. The insurance of crops against loss has proven a popular self-sustained program with Manitoba farmers (in areas where the policy is offered.) Inclusion of insurance coverage for losses attributable to wildlife (duck depredation) may in future be a valuable addition to the present limited coverage (95). The cost of such insurance may realistically be a social cost, shared by both sportsmen and landowners.

5. Water Control and Conservation Branch. The acts administered by this branch have a potentially profound effect on wildlife. Acts directly involved include: The Dyking Authority Act, the Land Drainage Agreement Act, the Rivers and Streams Act and the Watershed Conservation Districts Act.

These "acts" include all phases of municipal drainage organized as "Drainage Maintenance Districts". Also included are the construction of flood control dams and reservoirs including those developed as joint flood control and power projects.

The wide scope and implications of the water work of this branch are extremely important to wildlife conservation. Water control and conservation are particularly important to waterfowl but the local flooding or flood control projects carried out affect nearly all fish and wildlife to some degree. If the detrimental effects on wildlife of water control are

to be avoided, wildlife's necessities should be studied and incorporated into the projects (95).

INSECTICIDES AND WILDLIFE IN MANITOBA

Baker (11) maintains that the ever-expanding pesticide program in North America poses the greatest threat wildlife has ever faced; however, Rudd and Genelly (121) point out that neither past alarmist predictions or mass undesirable consequences of the use of insecticides have proven to be correct. However, the controversy continues and the problems are presently complex and little understood since final results of the effects of pesticides are definitely not known.

There has been a great expansion in the use of insecticides and a large influx of new chemical poisons in recent years. In anti-insect campaigns, agriculturalists and foresters often stress "eradication" instead of the more reasonable and logical "control". This attitude has implications that could, in future, be detrimental to wildlife as it implies the use of much wider coverages and heavier dosages of broad spectrum (kill) insecticides.

Two areas of concern in Manitoba involve the mosquito abatement programs and the agricultural area grasshopper control program (23). The grasshopper problem in Manitoba could precipitate a major expansion of the fight against insects. Bossenmaier (23) states that aerial spraying has been employed in grasshopper control since 1945, but has never been a major method of pesticide application. Manitoba generally has not the need or the strong encouragement to develop such intense, rapid and often unruly insect control programs as some of those carried out in the United States. Agricultural entomologists in the Province have recently prohibi-

ted the agricultural use of chlorinated hydrocarbons and in 1963 restricted dealerships in insecticides to those who had passed qualifying examinations in insecticidal use. In Manitoba, all dealers in insecticides, pesticides and herbicides are now licensed, qualified people, presumably knowledgeable in the proper use, dosage and restrictions of each insecticide licensed for sale in the Province. The insecticides that have been legalized for sale are characterized by short residue and a specific kill range (95).

Pesticide programs in Manitoba are not currently creating urgent wildlife problems. Bossenmaier (23) found no evidence that poisoning of insects had at any time seriously affected beneficial fauna. Manitoba has not experienced mass forest or agricultural spraying. In the grasshopper control programs, the selection of chemicals and their application has shown considerable respect for wildlife (23).

Most grasshopper control is on cropland and is of an on-the-spot type of treatment done by the local operator using a broom-type ground applicator of low pressure. The use of medium dosages of short residue, specific chemicals is well within the limits necessary for safeguarding wildlife (23, 95).

Bossenmaier (23) also states that the past recommendations of wildlife biologists have always received objective consideration, but cautions that in future the wildlife workers should be on the lookout for danger signals, such as proposed mass applications of insecticides to forests, wetland, rangeland and wildland or the introduction of new chemicals, heavier dosages or any insect control program that appears misinformed, misguided or poorly organized (23).

APPENDIX C

"1080" IN PREDATOR CONTROL IN MANITOBA

Sodium fluoroacetate (1080) is an extremely toxic chemical for which there are no known effective antidotes. Canidae such as the dog, fox, coyote, and timber wolf are highly susceptible to the poison. A degree of selectivity can be attained in controlling coyotes and wolves through using small amounts of this chemical at bait stations. Compound 1080 should never be used around residences where dogs and cats are present.

"1080" poison was first used as a method of predator control in Manitoba in 1959. Its primary use was for coyote control in municipalities and local government districts. These local governments must legally request the use of all poisons, and the landowner on whose property the bait is placed must also sign an agreement.

In the past, if a municipality or local government district accepted the 1080 program, they did not have to pay bounties. As of 1965, all government support for bounties has been cancelled. The regulations on 1080 are as follows:

> After a municipal council has decided to sponsor the program and has made formal application to the Wildlife Branch, the Agricultural Representative of the Extension Service, Manitoba Dept. of Agric. is asked to proceed as follows:
>
> (a) Arrange and select bait stations in troubled areas.
> (b) Describe and discuss with the municipal Councillors the nature of the poison and necessary precautions.
> (c) Selection of bait stations:
> (i) Maximum of one station per township. The local conservation officer for your area can help in advising where to place these baits.
> (ii) Baits should be placed in open areas away from bush and creek beds.
> (iii) Baits should be kept away from buildings, roads, and frequently used trails by at least half a mile.
> (d) Publicity should be given to the program to warn people about the toxicity to dogs and to keep dogs from running in bait areas.

The Wildlife Branch buys the horses and prepares all the bait at a central station. Technicians will make and place the bait and inspect and pick up the bait in the spring.

The "1080" bait method on the basis of fire years of use has been a very effective method of controlling coyotes, much better than the system of bounty payments (95).

Copy of L.G.D. or Municipal agreement on "1080" or other poisons used in predator control as follows:

THIS AGREEMENT made in duplicate this day of , 19 .

BETWEEN

THE RURAL MUNICIPALITY OF
herinafter called the Party of the First Part, and HER MAJESTY THE QUEEN IN RIGHT OF MANITOBA, represented herein by the Honourable the Minister of Mines and Natural Resources,
hereinafter called the Party of the Second Part,

WITNESSETH AS FOLLOWS:

WHEREAS the Party of the First Part has requested the Party of the Second Part to conduct an experimental program using 1080 for the eradication of coyotes;

AND WHEREAS the Party of the Second Part is prepared to accede to the said request subject to certain conditions;

In consideration of the Party of the Second Part conducting an experimental program using 1080 for the eradication of coyotes in said Municipality, the Party of the First Part agrees:

1. To protect and save harmless the Party of the Second Part from and against any and all claims for damages which may arise within the said Municipality from the use of the poison commonly called 1080;

2. To use its best endeavours to publicize and give notice within the Municipality of the dangerous nature of said 1080 to humans and farm animals;

3. To pay the Party of the Second Part a contribution of $100 towards the cost of conducting the said experiment on the basis of five poison bait stations, additional stations to be paid for at the rate of $20.00 per station;

4. To assist the officials of the Party of the Second Part and officials of the Department of Agriculture to select the sites for the said stations, including an agreement with the owner for the temporary use of the land required for the stations.

IN WITNESS WHEREOF the Rural Municipality of has hereunto affixed its seal, attested by the hands of its proper officers in

RURAL MUNICIPALITY OF

_____
Reeve

_____
Secretary-Treasurer

ACCEPTED:

_____
For Minister of Mines and
Natural Resources

A copy of the Landowner Agreement follows:

A G R E E M E N T

IN CONSIDERATION OF the benefits accruing to me and to be derived by me from the control and destruction of coyotes and other predatory or nuisance animals on the land hereinafter described, I, the undersigned, owner or lawful occupant of the said land, do hereby grant permission to Her Majesty the Queen in the right of the Province of Manitoba represented and acting by the Minister of the Department of Mines and Natural Resources of the said Province and by employees of the Department of Mines and Natural Resources,

to enter upon the following land, that is to say: .....
Sec. Twp.

....
Rge. Mer.

.....

..... in the said Province, and to place and set out on the said land sodium fluoroacetate, any other poison bait and cyanide guns at such places and in such quantities as an employee of the said Department may consider necessary, for the purpose of controlling and destroying coyotes and other predatory or nuisance animals on the said land and on the adjoining lands.

AND for the consideration aforesaid I do hereby agree to hold blameless Her Majesty the Queen, the said Minister and employees and her or their agents and co-operators, of and against all damages and claims for damages resulting from the accidental killing of any domestic animal or other animal of value through the action of any of the said poisons upon the said land.

DATED THIS ..... day of ..... A.D. 19....

At ..... in the Province of Manitoba.

.....
Owner or lawful occupant

.....
Witness