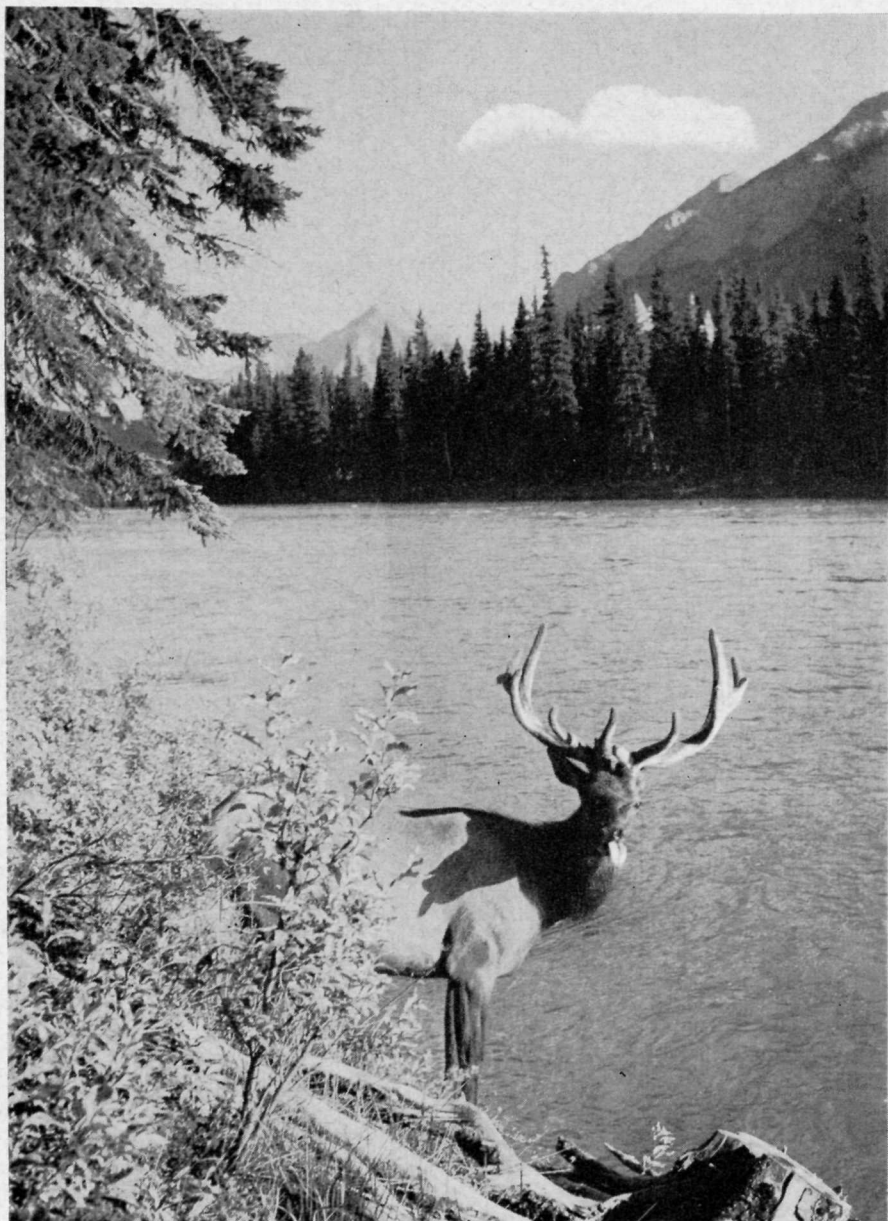


MAMMALS
OF BANFF NATIONAL PARK

BY A. W. F. BANFIELD

NATIONAL MUSEUM OF CANADA



Elk at Bow River, Banff National Park

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**THE MAMMALS OF
BANFF NATIONAL PARK, ALBERTA**

BY
A. W. F. Banfield

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The Mammals of Banff National Park, Alberta

INTRODUCTION

In 1885, an area of 10 square miles around the newly discovered hot springs in the Bow Valley of the Alberta Rockies was designated as Rocky Mountain National Park. This was Canada's first National Park. Since that date the park boundaries have been altered several times, and the name has been changed to Banff National Park. The present area of the park is 2,585 square miles. It stretches for 210 miles along the eastern flank of the Rocky Mountain from latitude $50^{\circ} 45'$ to $52^{\circ} 45'$ N. The western boundary is the Continental Divide. Six main mountain ranges, whose axes lie northwest-southeast, are contained in the park. The eastern boundary lies along the first crest of the Rocky Mountains where they rise abruptly from the Alberta foothills. The Park elevation varies from 4,362 feet at the eastern entrance on the Bow River to 11,902 feet at the summit of Mount Forbes. The main valleys of the park lie at elevations of about 5,000 feet. The surrounding mountain peaks rise to about 10,000 feet.

ACKNOWLEDGMENTS

I wish to express my appreciation of co-operation given by the Superintendents, Chief Wardens, and Wardens of the Park during the period of my investigations. Mr. H. U. Green, Special Wildlife Warden, has prepared a number of reports upon the park big game, which have been freely abstracted for the present report.

Professor G. J. Spencer, of the University of British Columbia, Dr. J. E. Moore, of the University of Alberta, and Dr. Austin Cameron, of the National Museum of Canada, kindly gave permission to examine specimens of mammals from Banff National Park in the collections under their care.

GEOLOGY

Three main types of mountain structure are found: fault block ranges with gradual-sloping western flanks and steep eastern cliffs; tightly folded anticlines forming "sawback" ranges; and columnar mountains with steeply eroded slopes, composed of caps of hard horizontal rock formation. In few areas of the world do the rocks provide a record of a longer period: the sedimentary rock series is exposed from the Precambrian to the Cretaceous and topped with Pleistocene deposits. The western part of the park is underlaid by Cambrian and Precambrian quartzites, the eastern part by a series of Devonian limestone ranges which have overridden Cretaceous and Triassic shales in the valleys. Sculpturing by mountain glaciers is everywhere evident in the U-shaped valleys, cirques, and moraines. There are a number of glaciers and snowfields. The most spectacular is the Columbia Icefield, and area of 150 square miles at the

northern tip of the park. Its glaciers feed rivers that flow into the Pacific Ocean, Arctic Ocean, and Hudson Bay. There are a number of large glacial lakes in the park.

CLIMATE

The climate of the park is characterized by long cold winters and short warm summers. The amount of rainfall varies in different localities. The western ranges have a much heavier winter snowfall and more frequent summer showers than the eastern ranges. Some areas, such as that of Lake Minnewanka, are in "rain shadows" and are, therefore, arid. The mean January temperature is about 15° F., the mean July temperature approximately 60° F. The extreme lowest recorded temperature between 1921 and 1950 was -59° F.; the extreme highest temperature for the same period about 100° F. The mean annual snowfall varies locally from 60 to 80 inches. The mean annual rainfall is about 10 inches, and the mean annual precipitation about 20 inches (Thomas, 1953).

VEGETATION

The soils of the park are quite primitive, being composed largely of glacial till, loess, and gravel. The mature soil, where developed, is a thin podsol.

The vegetation is as varied as the geology. Representatives of three main vegetative formations are found: coniferous forest, grassland, and tundra.

The grassland formation is represented by a few natural prairies in the river valleys near the eastern edge of the park, the two most famous prairies being the Kootenay Plains on the Saskatchewan River and the Ya-ha-tinda Ranch on the Red Deer River. Both those prairies are just outside the park boundaries. Ya-ha-tinda Ranch, however, is Crown land and is used as the winter range for the park horses. It is included in the discussion of mammal distribution in this paper. Smaller open glades occur in the Clearwater, Panther, Dormer, and Bow valleys within the park and are generally found in local areas of low rainfall. The absence of weathered stumps indicates that most of the glades are of great age. They constitute the main winter ranges for big game. The glades are particularly important where they occur on the mountain sides.

The tundra occurs at an elevation of about 7,200 feet in patches on rolling mountain tops above tree-line. The vegetation of the tundra includes alpine grasses, sedges, forbs, heaths, low-growing willows, and dwarf birch. At tree-line are found alpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea Engelmanni*), and alpine larch (*Larix Lyallii*). The tundra areas of the park are important summer ranges for most big game species.

Three climax forest types are found in the park. In the lower Bow Valley east of Banff and around Lake Minnewanka, small areas of the dry southern Montane Forest of Halliday (1937) are found. This type is characterized by the occurrence of stands of Douglas fir (*Pseudotsuga taxifolia*). The northern Boreal Forest from the foothills extends into the park from the east, ascending the river valleys to about 5,000 feet elevation. It is characterized by the occurrence of white spruce (*Picea glauca*). There

have been old burns in a number of these valleys so that stands of sub-climax lodgepole pine (*Pinus contorta*) and poplar (*Populus* sp.) are common. Most of the park, however, is clothed in dense Sub-alpine Forest characterized by Englemann spruce and alpine fir. The latter species is commonest at elevations above 6,000 feet.

The forest undergrowth is chiefly buffalo berry (*Shepherdia canadensis*) and dwarf birch (*Betula glandulosa*). Shrubby cinquefoil (*Dasiphora fruticosa*) is commonly found on over-grazed grasslands. Thickets of willows (*Salix* sp.) and alders (*Alnus* sp.) are common in forest glades and in swampy areas. They form important game habitats, especially in the climax Sub-alpine Forest.

Forest fires have been important factors in opening the climax spruce-fir forest and in providing sub-climax grass, thicket, and popular habitat for the larger herbivores, whose populations have fluctuated in response to the habitat made available. Recently, increased fire suppression has curtailed the formation of new habitat and threatens to restrict future populations of wapiti, deer, and mountain sheep in the park.

HISTORY OF EXPLORATION

The district where the park now is was one of the first to be explored in the Rocky Mountains, and David Thompson was the first recorded European to travel through it. During the summer of 1800 he and David McGillivray visited an Indian camp in the "Mountain Park" on the upper Red Deer River. This is thought to be the site of Ya-ha-tinda Ranch. Later the same summer they entered the mountains again along the Bow River Valley. It is not clear how far west they travelled, but they at least reached the present site of Exshaw, where they discovered mountain sheep. From their report, it seems likely that McGillivray had visited the area previously; he may even have reached the Columbia River.

Thompson visited the district again in 1807. This time he ascended the Saskatchewan River and crossed the Rocky Mountains by Howse Pass, descending the Blaeberry River to the Columbia Valley. This route was used by several later travellers including Alexander Henry in 1911. Both Thompson and Henry described the abundance of game in the Saskatchewan Valley (Parker, 1945, 1946).

The Saskatchewan Valley was hotly disputed by the Stony and Kootenay Indians, and the route through the Banff district was abandoned for the safer route through the Athabasca Pass (now in Jasper National Park) to the north. For several decades the Bow Valley had few or no white visitors.

In 1841, Rev. Robert Rundle, who had established a mission among the Stony Indians, visited an Indian camp at the present site of Banff. His influence with the Indians must have been great, for twenty years later the Earl of Southesk remarked on the peaceful and religious nature of the tribe in contrast to Henry's previous experiences of hostility.

Also in 1841, Sir George Simpson, Governor of the Hudson's Bay Company, traversed the park during his journey around the world. He entered the "Devil's Gap" from the east, passed Lake Minnewanka, which he named "Pechee Lake" after his Indian guide, crossed the Bow Valley to

Healy Creek, and ascended that creek to the Continental Divide at Simpson Pass. He then descended Simpson River to the Kootenay River. He was the first to note the "eye of the needle" in the Healy gorge.

After a lapse of almost twenty years, the main valleys of the park were traversed by explorers in 1858 and 1859. An expedition consisting of two parties, under the direction of Captain John Palliser, was seeking low passes through the Canadian Rockies. Palliser, leading the first party, ascended the Kananaskis River and crossed over into the Kootenay Valley by way of the Kananaskis Pass in August, 1858. Meanwhile, the second party, led by Dr. Hector, ascended the Bow River to Altrude Creek and descended the Vermilion Creek on the western slope of the Rockies to the Kootenay River. The party then turned north, ascended the Kicking Horse River, and crossed the Continental Divide again into the Bow Valley by way of the Kicking Horse Pass. Hector failed to discover Lake Louise, however. Turning north he ascended the Bow River to its headwaters, went down the Mistaya River, and turned eastward down the Saskatchewan River.

The next summer (1859) Dr. Hector again travelled west. His party went up the Bow Valley from the foothills as far as the Pipestone River. This time he crossed the Pipestone Pass and descended the Siffleur River to its junction with the Saskatchewan River. At that point he turned west and crossed Howse Pass to the Columbia Valley on September 7, following the trail that David Thompson took fifty-two years before. Many colourful local names were given to mountains and rivers by members of the expedition (Palliser, 1860).

The same year the Earl of Southesk undertook a hunting trip to the Rocky Mountains. His ultimate camp-site was in the Brazeau River country, now part of Jasper National Park. On his homeward route he travelled south, reaching the Kootenay Plains on the Saskatchewan River. He turned up the Siffleur River and crossed Pipestone Pass ten days after Dr. Hector had crossed it in the opposite direction. He continued on down the Bow River and passed out of the park area to the east. His diary provides a clear picture of big-game conditions in 1859 on the east slope of the Canadian Rockies.

Three prominent members of the Geological Survey of Canada carried out field investigations in the park area near the close of the nineteenth century. These were J. B. Tyrrell in 1883, Robert McConnell in 1886, and John Macoun in 1891. William Spreadborough accompanied Macoun and made a small collection of mammals, now in the National Museum of Canada.

In recent years, field investigations have been undertaken in the park by I. McT. Cowan and C. H. D. Clarke in 1930, R. M. Anderson in 1938, Clarke again in 1939 and 1940, Cowan during the period 1943 to 1946, and A. L. Rand in 1945. Reports prepared by these investigators covering their mammal observations have been consulted in the preparation of this paper.

PRESENT INVESTIGATION

It is intended to record in this report the mammal fauna, its distribution and habitat, presently known to occur in the park. An account is given of the current populations as recorded in the exploratory literature.

In order to provide a useful background for reports dealing with the management of the big-game resources of the park, some ecological data and like-history notes are also recorded.

I first undertook wildlife investigations in the park during the summer of 1946, when I joined the National Parks Bureau. Other field studies were conducted during the following winter and the summer of 1947. After an absence of two years, I returned to Banff in August, 1950, as resident mammalogist for the Canadian Wildlife Service, and remained there until October, 1953. Brief visits to the park were made in February, 1954, and June, 1956.

During those periods, field trips were made on horseback and on foot to many of the accessible areas of the park. In order to observe remote sections, several aerial surveys of big-game winter ranges were conducted in light aircraft. Wildlife observations by the park wardens were recorded on cards, indexed, and analysed annually, and past game conditions were discussed with several long-time residents of the park.

To determine the subspecific identity of the smaller mammals, a collection of 109 specimens was made. This collection may be found in the Royal Ontario Museum of Zoology and Palaeontology, Toronto, Ont. Other collections of small mammals from the park were examined at the University of British Columbia, Vancouver, B.C., the University of Alberta, Edmonton, Alta., and the National Museum of Canada, Ottawa, Ont.

ZOOGEOGRAPHY

Except for mountain peaks, the whole park was covered by valley glaciers of the Cordilleran Ice-cap during the last glacial period. By the location of terminal moraines these glaciers are known to have flowed eastward over the foothills as far as Calgary, where the piedmont glaciers probably met the Continental Ice-cap. During the post-Glacial period, the glaciers gradually receded up the valleys, exposing the mountain slopes and lower valleys. They now linger only at the head of a few valleys and in cirques along sheltered mountain ridges.

As the glaciers retreated, the climate moderated and vegetation gradually re-occupied the valley floors and crept up the mountain slopes. The various formations of vegetation followed in succession. First, the tundra vegetation, which had existed along the fringe of the Ice-cap, clothed the slopes; the grassland formation probably followed on the valley floors, and eventually the forests invaded the mountains. The Boreal Forest crept up the valleys from the foothills to the east, and the Sub-alpine Forest invaded the area across the low passes from the west.

The local postglacial environment has been recently studied in detail by Heusser (1956). The Cordilleran Glacial maximum trust has been estimated to have reached Calgary about 10,000 years ago. The postglacial optimum climate occurred about 3,000 to 3,500 years ago at Waterton Park. Then, between A.D. 1350 and A.D. 1650 a period of glacial advance followed. Many of the local glaciers achieved maximum recent advances in the first quarter of the eighteenth century, which has been called "the little ice age," but have receded irregularly since about 1850.

As soon as the vegetation was established, mammals colonized the park area by invading it from two directions. Some migrated up the

valleys from the east. Others came from the southern Rocky Mountain region, moving in from the southwest, having survived the glacial period in a Cordilleran refugium south of the 49th Parallel. Range expansions are still continuing and are most evident with the chipmunks and ground squirrels. The immigrants from the east included elements of both prairie and boreal forest faunas. Because of the dual nature of their origin, it is rather difficult to assign some of the present species to their correct faunal associations.

The present mammal fauna of the park is composed of several faunal groups. There is one survivor of the first biotic fauna to colonize the land—the Tundra Fauna. The Cordilleran Fauna, represented by 17 species, forms the largest recognizable component of the present fauna. The Boreal Fauna is represented by 11 species and the Prairie Fauna by 7 species. This leaves 18 species widely distributed in North America and difficult to assign to original areas.

The various taxonomic groups of mammals are unequally represented in the faunal components. For instance, a great number of the resident rodents belong to the Cordilleran Fauna, whereas a number of carnivores belong to the Boreal Fauna. One reason for the relatively rich big-game fauna of the park is that representative ungulates and carnivores of several faunas inhabit the region.

Because of the blending of mammal faunas on the east slope of the Rocky Mountains, intergradation between northern and southern forms, as well as eastern and western forms, is characteristic of many common small mammal populations occurring in the park.

The component species of the various zoogeographical units discussed above are given in the following lists. A tabular analysis of the zoogeographical units in the present fauna follows these.

Cordilleran Fauna 17 species:

Vagrant shrew, *Sorex vagrans*
Long-eared myotis, *Myotis evotis*
Pika, *Ochotona princeps*
Hoary marmot, *Marmota caligata*
Columbian ground squirrel, *Citellus columbianus*
Golden-mantled ground squirrel, *Citellus lateralis*
Yellow-pine chipmunk, *Eutamias amoenus*
Bushy-tailed woodrat, *Neotoma cinerea*
Heather vole, *Phenacomys intermedius*
Long-tailed vole, *Microtus longicaudus*
Water vole, *Microtus richardsoni*
Western jumping mouse, *Zapus princeps*
Grizzly bear, *Ursus arctos*
Mountain lion, *Felis concolor*
Mule deer, *Odocoileus hemionus*
Mountain goat, *Oreamnos americanus*
Mountain sheep, *Ovis canadensis*

Boreal Fauna 11 species:

Snowshoe hare, *Lepus americanus*
Least chipmunk, *Eutamias minimus*
Red squirrel, *Tamiasciurus hudsonicus*
Northern flying squirrel, *Glaucomys sabrinus*
Gappers red-backed mouse, *Clethrionomys gapperi*
Northern bog lemming, *Synaptomys borealis*
Marten, *Martes americana*
Fisher, *Martes pennanti*
Wolverine, *Gulo luscus*
Lynx, *Lynx canadensis*
Moose, *Alces alces*

Prairie Fauna 7 species:

Richardson's ground squirrel, *Citellus richardsonii*
Coyote, *Canis latrans*
Long-tailed weasel, *Mustela frenata*
Badger, *Taxidea taxus*
Wapiti, *Cervus canadensis*
White-tailed deer, *Odocoileus virginianus*
Bison, *Bison bison*

Tundra Fauna 1 species:

Caribou, *Rangifer* sp.

Uncertain affinities 18 species:

- Masked shrew, *Sorex cinereus*
- Water shrew, *Sorex palustris*
- Little brown myotis, *Myotis lucifugus*
- Silver-haired bat, *Lasionycteris noctivigans*
- Big brown bat, *Eptesicus fuscus*
- Hoary bat, *Lasiurus cinereus*
- Beaver, *Castor canadensis*
- Deer mouse, *Peromyscus maniculatus*
- Meadow vole, *Microtus pennsylvanicus*
- Muskrat, *Ondatra zibethica*
- Porcupine, *Erethizon dorsatum*
- Black bear, *Ursus americanus*
- Wolf, *Canis lupus*
- Red fox, *Vulpes fulva*
- Ermine, *Mustela erminea*
- Mink, *Mustela vison*
- Striped skunk, *Mephitis mephitis*
- River otter, *Lutra canadensis*

Table I. Analysis of Faunal Relationships

Fauna	No. of Species	Per Cent of Total Fauna
Cordilleran.....	17	32
Boreal.....	11	20
Prairie.....	7	13
Tundra.....	1	2
Uncertain affinities.....	18	33
Total present fauna.....	54	100

TREATMENT

An annotated list of the mammals known to occur within the park boundaries follows. Their former distribution and populations are described from historical records, and the accounts of present distribution and status are based upon personal investigations and current literature. The number and location of specimens taken within the park are also provided, as well as those specimens obtained by other collectors, which were examined in several Canadian Museums. Published records of specimens are also given to make the list of specimens as complete as possible.

The nomenclature used in this report follows that of Miller and Kellogg (1955), except in the following cases, where I have followed the authors indicated: *Sorex vagrans obscurus*, Findley, 1955; *Ursus arctos horribilis*, Rausch, 1953; *Ursus americanus*, Hall, 1928. Vernacular names were taken from the list proposed by Hall, *et al.* (1957).

The following abbreviations have been used for the Institutions where the specimens are held: U.B.C.—University of British Columbia Zoological Museum; U.A.—University of Alberta Zoological Museum; N.M.C.—National Museum of Canada; and B.M.—Banff Museum.

The present list comprises 54 species and 2 subspecies. Undoubtedly further investigations will disclose the occurrence of several other forms in the park area.

ANNOTATED LIST

Masked Shrew, *Sorex cinereus cinereus* Kerr

This species is generally the commonest shrew found in the park, although its numbers vary from year to year. It has been taken from tree-line to valley floor in a variety of habitats—brook-banks, meadows, and climax spruce forest.

Specimens were taken at Forty-Mile Creek, 6, and Cave and Basin, 1. Specimens examined were from Banff, 1 (U.A.); and Banff, 1; Bow Summit, 1; Spray River, 1 (N.M.C.).

Specimens have been reported from Banff, 3 (Jackson, 1928); and Egypt Lake, 37; Mount Assiniboine, 10 (Crowe, 1943).

Vagrant Shrew, *Sorex vagrans obscurus* Merriam

This species has similarly been taken from valley floor to alpine tundra. It seems to be commonest in the sub-alpine forest and tundra communities, where it generally outnumbers the masked shrew.

Only one specimen was secured at Sunwapta Pass at an elevation of 7,200 feet. Other specimens examined were from Banff, 4; Hillsdale, 1, Bryant Creek, 4; and Boom Creek, 3 (N.M.C.). The general altitude of those areas is from 4,500 to 5,000 feet. Banff townsite is in the montane forest area.

Crowe (1943) reported obtaining the following specimens: Egypt Lake, 31, and Mount Assiniboine, 27. These sites are at an elevation of approximately 7,000 feet.

Water Shrew, *Sorex palustris navigator* Baird

Water shrews are seldom found very far from the mossy banks of swift-flowing brooks in dense forests. They are uncommon and have a spotty distribution, generally in the sub-alpine forest, although specimens have been taken as low as at Banff townsite.

Specimens were obtained at Moraine Lake, 1, and Healy Creek, 2. Other specimens examined were from Banff, 2 (U.B.C.); Moraine Lake, 1 (U.A.); Banff, 1; Boom Creek, 1; Spray River, 3 (N.M.C.).

Two specimens from Banff were reported by Jackson; specimens from Egypt Lake, 2; and Mount Assiniboine, 7; were reported by Crowe.

Little Brown Myotis, *Myotis lucifugus alascensis* Miller

These bats are common in the Bow Valley; there are several summer colonies in the attics of Banff houses and in tourist lodges along the highways.

Miller and Allen (1928) listed 3 specimens from Banff under the eastern subspecies *lucifugus*. Crowe stated: "Two adults from Assiniboine resemble *pernox* in slightly larger cranial and external size and lighter colour, but are closer to *alascensis*."

With a larger number of specimens at my disposal, I have been able to compare them with other series from Alberta and British Columbia. Although one or two Banff specimens are rather light in colour, most of them seem to resemble the dark western *alascensis*. The park population seems to be best considered as belonging to that subspecies, although there is some eastern influence from prairie populations.

The following specimens were taken: Banff, 4; Mount Eisenhower, 1; Storm Mountain, 4. Others recorded from Mount Assiniboine, 2 (Crowe, 1943), and Banff, 3 (Miller and Allen, op. cit.).

Big-eared Myotis, *Myotis evotis pacificus* Dalguest

There are 2 specimens of this bat in the Banff Museum, collected at Banff on September 3, 1909, and in 1900 by Norman Sanson. This species has also been recorded nearby at Vermilion Crossing, Kootenay National Park, B.C., by Munro and Cowan (1944). Comparison of the Banff specimens with a series from the Kootenay station indicates that the Banff population is referable to the above subspecies. Colonies will probably be found in some buildings in the Bow Valley.

Silver-haired Bat, *Lasionycteris noctivigans* (Le Conte)

There are 2 specimens of the silver-haired bat in the Banff Museum, collected by Sanson at Banff in 1900. A specimen in the National Museum of Canada was collected at the Goat Creek Cabin by Warden Walter Child on August 21, 1939. It was preserved by C. H. D. Clarke, who also reported that a specimen was taken in 1930 at the Red Deer Ranger Station east of the park.

Specimens examined: Goat Creek, 1 (N.M.C.)

Big Brown Bat, *Eptesicus fuscus pallidus* (Young)

Big brown bats are frequently observed flying over Banff townsite on summer evenings. Two were shot in flight in the Bow Valley.

Crowe lists one specimen from Banff under the subspecies name *fuscus*, remarking that it was fully as dark as eastern representatives of this race. Engels (1936), reviewing the distribution of western forms of this species, states: "some *pallidus* are rich brown some almost white." My specimens are much paler than a series of eastern *fuscus* from Ontario. It seems advisable to refer big brown bats from the park to the western *pallidus*, which is reported from the prairies as well.

Specimens taken: Johnson's Canyon, 2. The Banff Museum contains a mummified specimen from Banff. Specimens recorded: Banff, 1 (Crowe, op. cit.).

Hoary Bat, *Lasiurus cinereus* (Beauvois)

The Banff Museum contains 3 specimens collected at Banff by Sanson. Two are labelled August 20, 1909, the third is labelled 1900. These bats generally migrate southward during the third week in August.

Clarke (1940) reported an injured hoary bat found by a forestry gang at Stony Creek on August 21, 1939.

Specimens examined: Banff, 3 (B.M.).

Pika, *Ochotona princeps princeps* (Richardson)

These interesting little mammals inhabit rock talus slopes on the mountain sides from about 6,000 feet to the limit of vegetation, about 8,500 feet, throughout the park. In a few localities they inhabit rock slopes at lower elevations, as on the shore of Lake Minnewanka. They are more typical, however, of the sub-alpine forest or about timberline.



Pika

The first mention of pikas in the exploration accounts is that of Palliser (1860). He reported that Doctor Hector observed them on Cascade Mountain in 1858. Tyrrell collected a pika at Lake Minnewanka in 1883, and Spreadborough obtained two specimens from Banff in 1891.

Two geographical subspecies of pikas, *princeps* and *lutescens*, are to be found in the park area. Cowan (1954) reviewed the distribution of pikas in Alberta and British Columbia. He agreed with Crowe (op. cit.) who wrote: "The effect (intergradation) is not entirely one of intermediacy, but rather one of various combinations of the characters of the two races, such as is sometimes known as 'checkerboard intergradation'."

The present subspecies was described from specimens taken by Thomas Drummond in 1826 near the headwaters of the Athabasca River. The exact type locality is not known, however. From his itinerary, the specimens may have been taken anywhere from the headwaters of the Smoky River south to Athabasca Pass at the source of the Whirlpool River in Jasper National Park. The latter location, which is on the Continental Divide, was accepted as the type locality by Howell (1924). The pikas found along the crest and on the western slope of the Rocky Mountains are

medium-sized, with a greyish summer pelage. The winter coat is faintly washed with yellowish brown, both dorsally and ventrally, according to Cowan (1954).

In Banff National Park, pikas from the ranges west of the Bow, Mistaya, and Saskatchewan rivers seem to resemble *princeps* more closely than *lutescens*.

Specimens were taken at Mummy Lake, 1; Egypt Lake, 1; Moraine Lake, 1; and Bow Summit, 2. Other specimens examined were from Waterfowl Lake, 1; Mistaya Creek, 2; Bow Summit, 1; Mount Assiniboine, 1; and Sunwapta Summit, 3 (N.M.C.).

The following specimens have been reported as intergrades: Egypt Lake, 7; Monarch Mountain Pass, 7; Assiniboine, 11 (Crowe, 1943); Pipestone River, 1; Baker Lake, 1; Thompson Pass, 1 (Cowan, 1954).

Alberta Pika, *Ochotona princeps lutescens* A. H. Howell

The type locality of the subspecies is on Mount Inglesmaldie on the south shore of Lake Minnewanka, Banff National Park. It is smaller and greyer than *princeps*. In recent studies of the genus this form is considered as a valid subspecies. Inhabiting the dry eastern flanks of the Rocky Mountains, it serves to illustrate Gloger's Rule in its pale coloration.

Specimens examined: Banff, 2; Lake Minnewanka, 1; Bryant Creek, 2; Boom Creek, 1; Boom Lake, 2; Cascade Mountain, 5; Mount Eisenhower (Castle), 1; and Hillsdale Draw, 2 (N.M.C.); Brewster Creek, 1; Pipestone Creek, 1; Cascade Mountain, 1; Bare Mountain, 2 (U.B.C.).

Published records: Banff, 2; Mount Inglesmaldie, 25; Ptarmigan Lake, 3 (Howell, 1924); Mount Inglesmaldie, 3; Stony Creek, 1; Brewster Creek, 1; Dormer Pass, 2 (Cowan, 1954).

Snowshoe Hare, *Lepus americanus columbiensis* Rhoads

Much of the forested area of the park is suitable habitat for the snowshoe. Frequently reported from the valleys but seldom from higher elevations, this species favours spruce bogs.

The population fluctuations of these hares in the Rocky Mountains are of particular interest. Soper (1921) described the dense hare population in western Alberta in 1912 and 1913. In the latter year he observed at least 25 hare at a time gambolling about a cabin clearing on the Wildhay River just outside Jasper National Park. Bob Jones, the late warden of that park, showed me his diary of a trip he took with an expedition from the U.S. National Museum from Jasper north to Hudson Hope, B.C., in the summer of 1914. On June 28, they camped at Shalebanks (on the Snake Indian River). That night they suffered from a plague of snowshoes, which nibbled their saddles and leather gear. For the rest of the trip they took care to hang their saddles and gear in the trees at each campsite to protect them from the troublesome hares. Hewitt (1921) reported his visit to the Rocky Mountain region of Alberta in 1915. Signs of recent hare abundance were everywhere, but the animals had almost completely disappeared.

Many long-term residents of the Banff and Jasper areas recall the plague of hares that occurred in the mountains from 1912 to 1914. They believe that the hare population has never reached comparable numbers since that period.

Clarke (1940) reported hares rare or absent at Ya-ha-tinda Ranch in 1930, but by 1941 he found them locally abundant in the Bow Valley (Clarke, 1942).

During my period of residence in the park, hares were never generally abundant, although there was a reported population peak on the Alberta prairies. In 1946 and 1947, tracks were rare in winter and were confined generally to pockets in bogs. During the period 1950 to 1953, tracks indicated a generally higher population level. By 1952 there was considerable winter sign in the lower Bow Valley, especially near Lake Louise and in the lower Cascade Valley.

Examination of predator faeces indicated that cougars, lynx, and wolves were preying quite heavily on snowshoes. By 1953 there was an increase in warden's observations of lynx as well.

The evidence suggests that the local mountain snowshoe hare populations have not shown the rhythmic fluctuations typical of populations elsewhere in northwestern Canada.

Specimens taken: Cascade Valley, 1.

Specimens examined: Banff, 1 (N.M.C.)

Hoary Marmot, *Marmota caligata oxytona* Hollister

Hoary marmots, or whistlers, are typical denizens of rock slides and alpine meadow slopes from tree-line to the limit of vegetation. They are generally distributed in suitable habitat throughout the park. Occasionally



Marmots

they are found in rock slides at lower elevations. Ex-warden Child reported that marmots formerly inhabited a rock slide at the mouth of Goat Creek (elevation 4,800 feet); however, a flood in 1950 washed out the colony. The possibility that it was a colony of *Marmota flaviventris* should not be overlooked in view of the former occurrence of a colony of that species at Waterton Park townsite, according to Moore (1952).

Palliser (1860) was the first explorer to report hoary marmots in the park area, when he observed them on Cascade Mountain and in Pipestone Pass in 1858. The Earl of Southesk (1875) reported marmots on the Siffleur River in 1859. There is a specimen in the Banff Museum taken by Robert McConnell at Devil's Head Lake (Lake Minnewanka) in 1886. Macoub collected a specimen near Banff in 1891.

The park specimens I examined appeared to be best referred to the present subspecies, which was described from Jasper National Park. However, Crowe referred his specimens to *nivaria* Howell, whereas, Cowan (1956) considers the marmots from the area south of Banff are more properly referred to *okanagana* (King).

Specimens examined: Consolation Lake, 1 (U.A.); Banff, 7; Castle Mountain, 1; Cascade Basin, 6 (N.M.C.).

Specimens reported in the literature: Monarch Mountain, 3; Farrow Pass, 1 (Crowe, 1943); Healy Creek, 1 (Cowan, 1956).

Richardson's Ground Squirrel, *Citellus richardsonii richardsonii* (Sabine)

The range of Richardson's ground squirrel does not reach the park boundary proper. It does extend, however, to Ya-ha-tinda Ranch, a few miles east of the park boundary on the Red Deer River.

This species of squirrel was first observed there by Clarke in 1930 (Clarke, 1940). He also reported it at Morley in the Bow Valley east of the park. During the summer of 1953, I saw one on the railway tracks at Exshaw station.

These ground squirrels have a shorter hibernation season than the mountain species. Squirrels were active in the Calgary area on March 15, 1951. They were seen latest near Morley on September 14, 1952. Richardson's ground squirrels have been much less common on the Canadian prairies since 1950, than previously encountered in 1939.

Clarke collected one specimen at Ya-ha-tinda Ranch in 1939, which is in the National Museum of Canada.

Columbian Ground Squirrel, *Citellus columbianus columbianus* (Ord)

This ground squirrel is one of the commonest and most widespread mammals in the park. It inhabits practically every grassland area from the valley floors to alpine meadows. It is an important summer food item in the diet of many predators from grizzly bears to golden eagles and is also an important intermediate host for the Rocky Mountain spotted-fever tick (*Dermacentor andersoni*) (Banfield, 1956).

The dates of first appearance of these squirrels from their hibernation in the Bow Valley have been recorded for a number of years. They are as follows: April 16, 1941 (Clarke, 1942); April 24, 1951; April 18, 1952. The last dates of appearance at low elevations are August 27, 1947; August



Columbian Ground Squirrel

27, 1952; and August 26, 1953. These squirrels remain active later at higher elevations. They were seen at Egypt Lake (elevation 6,800 feet) on September 16, 1951, and September 5, 1952.

Columbian ground squirrels were recorded by Southesk (1875) on the Siffleur River in 1858. Robert McConnell collected a specimen at Mount Eisenhower (Castle Mountain) in 1886.

Specimens collected: Hillsdale Meadow, 2.

Specimens examined: Mount Eisenhower, 1 (N.M.C.).

Specimens recorded: Hillsdale, 7; Egypt Lake, 9; Mount Assiniboine, 3 (Crowe, 1943); Banff, 6; Ptarmigan Lake, 3; Silver City, 2 (Howell, 1938).

Golden-mantled Ground Squirrel, *Citellus lateralis tesorum* (Hollister)

This ground squirrel inhabits rocky sites, such as talus slopes and rock slides, in the sub-alpine forest and tundra areas, from about 5,000 to 8,000 feet (Deception Pass). The lowest elevation at which it was seen was 4,900 feet at Johnson's Canyon. It also occurs at Lake Minnewanka (5,000 feet) but is absent from the vicinity of Banff townsite.

It hibernates at a later date than the Columbian ground squirrel. On August 31, 1952, *lateralis* was still active at Sunwapta Pass, but *columbianus* was in hibernation. The same situation prevailed on August 26, 1953.

Specimens were collected at Lower Waterfowl Lake, 1; and Spray River, 1. Other specimens examined were recorded from Banff (N.M.C.).

Specimens have been reported in the literature from Banff, 5; Canadian National Park (?), 5; Ptarmigan Lake, 2 (Howell, 1938); and Egypt Lake, 4; Mount Assiniboine, 10 (Crowe, 1943).

Least Chipmunk, *Eutamias minimum borealis* (Allen)

The least chipmunk is the most widely distributed chipmunk in the park. It may be found everywhere except west of the Bow River from the East Gate to Bath Creek, north of Lake Louise. North of that point it occupies all the park. As far as presently known, no least chipmunks occur in the forested areas west of the Bow River south of Lake Louise.

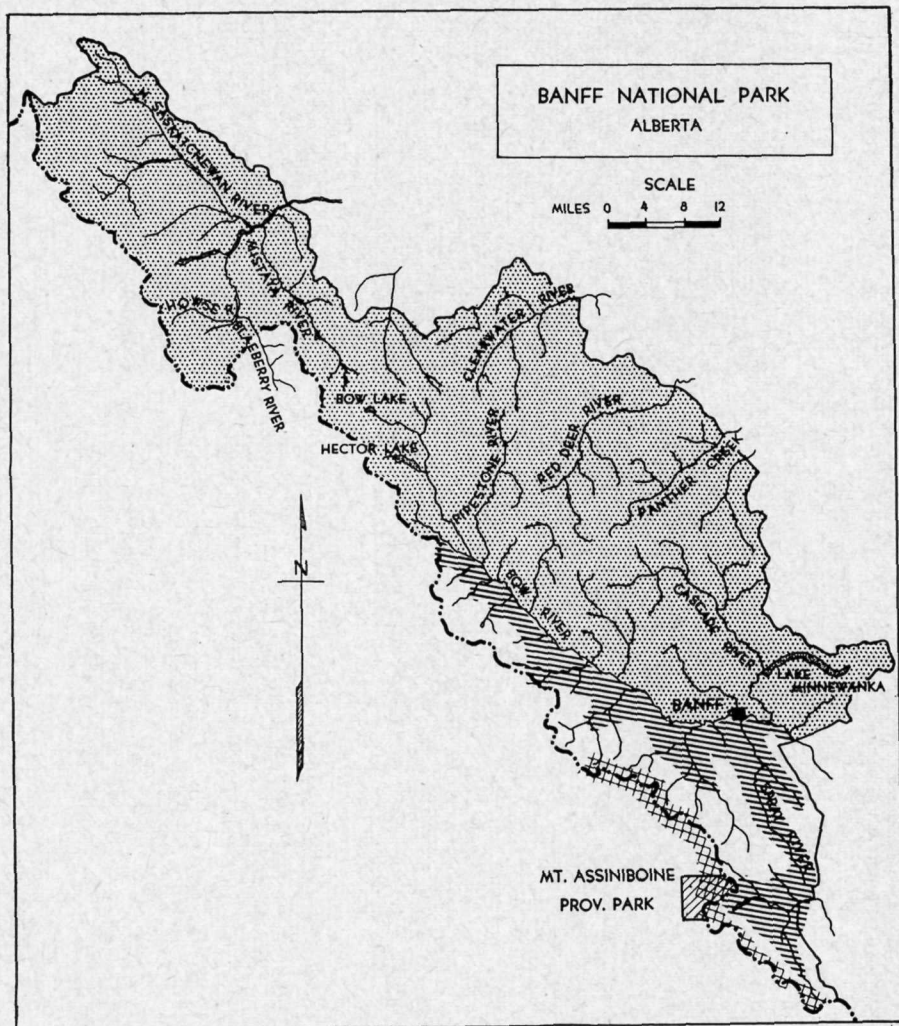


Figure 1. Distribution of Chipmunks. *Eutamias minimus borealis* (stippled areas); *Eutamias minimus oreocetes* (criss-cross sections); *Eutamias amoenus luteiventris* (oblique ruling).

Within its range in the park, it has been found from 4,300 feet (East Gate) to 7,500 feet (Cirque Peak). It is common in forest clearings, old brûlés, and the edges of meadows. However, it may be found in the sub-alpine forest up to tree-line.

It usually comes out of hibernation about the same time as the Columbian ground squirrel (April 24, 1951). However, remaining active much later than the ground squirrels, it has been observed as late as October 6, 1952.

The subspecies reaches its southern limit of distribution in the park area. Specimens from the northern part of the park are fairly typical in appearance. However, those from the southern part show some intergradation with *oreocetes*. Intergrades have been recorded by Crowe (1943) from Hillsdale. Anderson marked as intergrades 9 specimens from Banff and Cascade Mountain in the National Museum collection. I consider two of my specimens from the Vermilion Lakes to be intergrades.

Specimens were collected at Massive, 1; Vermilion Lakes, 2; Panther River, 1; and Corral Creek, 2.

Specimens were examined from Banff and Cascade Mountain, 9; Forty Mile Creek, 2 (N.M.C.); Sunwapta Pass, 1; Saskatchewan Crossing, 1 (U.A.); Hillsdale, 1; Panther River, 1; Divide Creek, 1; Baker Lake, 1, and Pipestone Creek, 1 (U.B.C.).

Published records: Banff, 6; Canadian National Park (?), 4 (Howell, 1929). Clarke (1940) reported taking one at Ya-ha-tinda Ranch in 1930.

Timberline Chipmunk, *Eutamias minimus oreocetes* Merriam

West of Bow River, from the valley floor up through the sub-alpine forest until timberline is reached, mammalogists have searched in vain for a chipmunk of the *minimus* group. Above timberline on the alpine tundra from about 7,200 feet to 8,000 feet, one finds a population belonging to this species.

The timberline chipmunk is smaller and greyer and has a shorter tail than the least chipmunk. It is rather scarce in the Egypt Lake area but is more commonly observed from Sunshine Lodge south to Mount Assiniboine. The northern specimens show intergradation with *borealis*.

Cowan (1946) considered that Crowe's (1943) identification of this subspecies in the southern part of the park would indicate an unexpectedly abrupt boundary between the two races. However, the altitudinal isolation of the two populations described above lends credence to Crowe's identification.

One specimen was collected near Sunshine Lodge. Crowe (1943) reported taking the following specimens: Egypt Lake, 13; Mount Assiniboine, 27.

Yellow Pine Chipmunk, *Eutamias amoenus luteiventris* (Allen)

The main centre of distribution of this chipmunk is in southeastern British Columbia. Cowan (1946) first pointed out that its distribution in western Alberta clearly indicated that it had penetrated through the Rockies to the east slope by way of a number of low passes. Its distribution in Banff National Park is confined to the area west of the Bow River

south of Kicking Horse Pass. In that area it is confined to the montane and boreal forest belts and the base of the sub-alpine belt from 4,300 feet to 6,000 feet (Marvel Lake). It does not reach timberline. Cowan (op. cit.) recorded one specimen from Mount Inglesmaldie, one of two stations east of the Bow Valley. The least chipmunk, however, has been identified at nearby Johnson's Lake. Another specimen was taken at the Lake Louise warden's cabin on the west side of the Bow River by Dr. J. E. Moore in 1952. That location is only about 200 yards from a bridge across the river that may be serving as a migration route.

Specimens were taken at The Cave and Basin, 5; Altrude Creek, 1; Kicking Horse Pass, 1. Specimens were examined from Lake Louise, 1; Banff Golf Course, 2 (U.A.); Banff, 7; Spray River, 5; Bryant Creek, 2 (N.M.C.).

Other specimens reported: Mount Assiniboine, 1 (Crowe 1943); Banff, 23 (Howell, 1929); Mount Rundle, 2; Brewster Creek, 5; Mount Inglesmaldie, 1; Healy Creek, 6; Spray River, 1; Marvel Lake (Cowan, 1946).

The ranges of the various races of chipmunks in the park are indicated in Figure 1.

Red Squirrel, *Tamiasciurus hudsonicus columbiensis* Howell

Red squirrels are commonly distributed throughout the three park forest types—montane, boreal, and sub-alpine, from the valley floors to timberline. Their numbers vary from year to year. Clarke (1939) reported them as common everywhere. Soper (1947) noted very few on his several visits to the park.

The red squirrels of the park have been tentatively assigned to the northern subspecies, although the southwestern form *richardsoni* (Bachman), which is characterized by darker tail, exerts an influence upon the squirrel populations in the southern part of the park.

In the park, the squirrels store great piles of spruce cones on stumps and roots, through which they burrow during the winter months. They are less arboreal at that period and more subterranean, or sub-nival, in habits, than at other times.

Specimens collected: Hillsdale, 1; Mount Eisenhower, 1. Specimens reported in the literature: Hillsdale, 1; Egypt Lake, 7 (Crowe 1943); Banff, 1 (Allen, 1898) listed under *baileyi*.

Northern Flying Squirrel, *Glaucomys sabrinus alpinus* (Richardson)

This elusive nocturnal squirrel is probably generally distributed throughout the park. It has seldom been observed, however, outside of aspen groves on the valley floors. Southesk (op. cit.) observed one at the Kootenay Plains on the North Saskatchewan River east of the park boundary. I found an occupied den in a hole in a live aspen poplar at Hillsdale in 1947. Clarke (1940) reported that Mr. G. W. H. Ashley, then a park warden, observed young at the old Spray River cabin at Goat Creek. Two adults regularly visited a Banff home during March and April, 1952, where they were fed on the window sill.

One specimen was secured at Banff.

Beaver, *Castor canadensis canadensis* Kuhl

The beaver has not been a continuous resident of the park during the past. There are no references to beaver in the journals of the explorers, although ancient beaver meadows and overgrown dams in the Bow Valley give mute evidence of former occurrence during the past hundred years.



Beaver

Green (1951) has made a special study of the park beaver. He has traced their recent history in the park from their first appearance in the lower Bow Valley at Altrude Creek about 1920. They rapidly expanded their range downstream to the eastern park boundary. The population increased as they colonized areas of sub-climax aspen growth. After the food supply had been exhausted, the population declined and some beaver moved out of the park. Many others travelled upstream to the headwaters

of brooks in the sub-alpine forest and tundra zones. I have found beaver colonies as high as 7,200 feet on the upper Red Deer River. Others occur on Pharaoh Creek (6,800 feet) and Cuthead Creek (6,600 feet).

For a number of years beaver censuses have been conducted in the Bow and Forty-mile valleys by Green. Assuming an index of 6 beavers to each occupied lodge and adding individual observations, he has estimated the following populations:

Table 2. Estimated Beaver Populations

	1938	1944	1946	1947	1950	1951	1952
Forty-mile Valley	210	—	7	—	0	—	—
Bow Valley	—	272	—	170	80	66	15

Ferris (1956) has recently taken a census of the park beaver population and reported the following active colonies: Bow River, 11; Vermilion Lakes, 8; Forty-mile Creek, 6; Johnson Lake, 6; Cascade River, 6; Panther River, 6; Red Deer River, 1; Spray River, 2; Saskatchewan River, 7. Assuming 5 animals to a colony, he estimated a total population of 255 beavers.

It is likely that the beaver population will continue to decline unless forest fires destroy the climax forests and produce another cycle of sub-climax aspen growth.

Specimens collected: Banff, 1 (skull only).

Deer Mouse, *Peromyscus maniculatus borealis* Mearns

The deer mouse is widely distributed throughout the forested area of the park. It inhabits all three forest zones. Specimens have been taken from 4,500 to 6,800 feet elevation. The species, however, does not seem to be so common as some of the voles.

The park population shows intergradation with two other subspecies: *artemisiae* (Rhoads) from southeastern British Columbia, and *osgoodi* Mearns from the prairies. Specimens from the montane forest show the strong influence of *osgoodi*. Comparison of park specimens with a small series of deer mice from the Northwest Territories has led me to conclude that the population is most closely related to the northern race.

Specimens collected: Spray River, 1; Cascade River, 1; Healy Creek, 2. Specimens examined: Ya-ha-tinda Ranch, 1; Scotch Camp, 2; Clearwater River, 1 (N.M.C.).

Specimens reported in the literature: Egypt Lake, 4; Hillsdale, 14; Mount Assiniboine, 20 (Crowe, 1943); Bryant Creek, Waterfowl Cabin, Spray River (Clarke, 1940).

Bushy-tailed Woodrat, *Neotoma cinerea drummondii* (Richardson)

The woodrat, or pack rat as it is locally called, is widely distributed in the park in suitable habitat. It occupies rock talus slopes and ledges in the three forest zones from the valley floors to timberline. Woodrat nests have been found at Pharaoh Lake (7,200 feet). Favourite habita-

tions for it are the many warden's patrol cabins scattered throughout the park, where it is unwelcome because of its offensive odour and the bulky nests of sticks it builds.

Specimens collected: Banff, 2; Spray River, 2. Specimens examined: Banff, 1; Saskatchewan Crossing, 1 (N.M.C.); Moraine Lake, 1 (U.A.); Banff, 1 (B.M.).

Specimens recorded: Egypt Lake, 6 (Crowe, 1943).

Gapper's Red Backed Mouse, *Clethrionomys gapperi athabascaae* (Preble)

"Redbacks" are the commonest small mammal in the park. Distributed throughout the three forest types from valley floor to timberline, they prefer the mossy logs and stumps of the climax spruce forest but may be found on the edge of clearings as well.

The park population of this subspecies also shows intergradation between northern, western, and prairie populations. By comparing park specimens with collections from northern British Columbia and the Northwest Territories, it was concluded that they resembled the northern race most closely. Specimens from the Banff townsite area show the influence of *galei* (Merriam) from the foothills, whereas specimens from Egypt Lake resemble the darker *saturatus* (Rhoads) from British Columbia (Crowe, 1943).

Specimens collected: Egypt Lake, 1; Healy Creek, 2; Banff, 3; Whisky Creek, 2; Cascade River, 3. Specimens examined: Spray River, 1 (N.M.C.).

Specimens reported: Egypt Lake, 83; Assiniboine, 32 (Crowe, 1943).

Northern Bog Lemming, *Synaptomys borealis chapmani* Allen

The bog lemming inhabits sphagnum bogs, alder swales, and stream-banks in the sub-alpine forest from about 5,500 feet to 7,000 feet elevation. It has been collected only a few times in the park but is undoubtedly more common than indicated by these specimens.

One specimen was collected at Egypt Lake. Specimens examined: Sunwapta Pass, 5; Boom Creek, 5 (N.M.C.); Moraine Lake, 1 (U.A.).

Published records: Egypt Lake, 7; Mount Assiniboine, 6 (Crowe, 1943).

Heather Vole, *Phenacomys intermedius levis* A. B. Howell

Although the heather vole is generally considered one of the rarest small mammals in North America, it has been found rather commonly in the park. It is usually found in the sub-alpine forest from about 6,000 to 7,000 feet, but specimens have been secured in the boreal forest at Hillsdale and near Banff at 4,500 feet.

This vole seems to prefer shrubby glades in the forest, but it also occurs among stumps and mossy logs in the forest edge. The population seems to fluctuate greatly.

Specimens collected: Boom Creek, 1; Sunwapta Pass, 3; Moraine Lake, 1. Specimens examined: Sunwapta Pass, 1; Moraine Lake, 4; Lake Louise, 2; Boom Lake, 1; Hillsdale, 1; Banff, 1 (U.A.); Brewster Creek, 1; Saskatchewan River, 1 (U.B.C.).

Specimens recorded: Banff, 2; Egypt Lake, 16; Mount Assiniboine, 8 (Crowe, 1943).

Meadow Vole, *Microtus pennsylvanicus drummondii* (Audubon and Bachman)

The meadow vole is widely distributed in the park in grass meadows and forest glades. It is commonest on the valley floors but has been taken as high as Egypt Lake (6,800 feet).

Specimens taken: Vermilion Lakes, 2; Boom Creek, 1; Cascade River, 1. Specimens examined: Spray River, 1; Banff, 4 (N.M.C.); Boom Creek, 2 (U.A.).

Specimens reported: Hillsdale, 9; Mount Assiniboine, 1; Egypt Lake, 1 (Crowe, 1943); Banff, 1 (Bailey, 1900).

Long-tailed Vole, *Microtus longicaudus vellerosus* J. A. Allen

These voles are commonly found in wet meadows and on stream-banks and lake shores, although they have been collected from the Bow Valley (4,500 feet) nearly to tree-line. However, they appear to be commonest along the brooks flowing through the sub-alpine forest belt.

Specimens examined: Banff, 1 (U.A.); Banff, 5; Boom Creek, 1; (N.M.C.).

Specimens reported: Assiniboine, 19; Egypt Lake, 10 (Crowe, 1943); Banff, 11 (Anderson and Rand, 1944); Bryant Creek, 1; Goat Creek, 1 (Clarke, 1940).

Water Vole, *Microtus richardsoni richardsoni* (De Kay)

The water vole is probably the rarest small mammal in the park. Its range is restricted to stream-banks in the alpine tundra zone. Although I did not secure any specimens in the park, I observed their burrows and runways at Helen Lake and Egypt Lake.

Specimens reported: Egypt Lake, 2; Mount Assiniboine, 1 (Crowe, 1943).

Muskrat, *Ondatra zibethicus cinnamominus* (Hollister)

The muskrat appears to be confined to the lower Bow Valley. The rushing mountain torrents do not offer it an ideal habitat. It is restricted to the lower valleys where the rivers flow slowly. A fluctuating population which seems to be governed by climatic factors is found in the Vermilion Lakes. Ferris (1956) counted 47 active lodges on the lakes. Stragglers have been observed at Massive and Forty-Mile Dam.

I am not aware of any specimens having been taken in the park.

House Mouse, *Mus musculus domesticus* Ruddy

Clarke (1940) reported the occurrence of the exotic house mouse in Banff houses. In 1952, I observed one running around a grocery store window. I am not aware of any specimens having been taken in the park.

Western Jumping Mouse, *Zapus princeps idahoensis* Davis

Jumping mice are commonly found in wet meadows and along stream-banks in all three forest zones from valley floor to tree-line. They are active from May to September. As with many small mammals, the park population shows intergradation with the northern race *saltator* Allen. The park population has been referred to the present subspecies by Crowe (1943).

Specimens taken: Banff, 5; Cave and Basin, 1; Spray River, 1; Egypt Lake, 1.

Specimens examined: Moraine Lake, 7; Banff, 1; Hillsdale, 2 (U.A.); Banff, 4; Bryant Creek, 3; Spray River, 4 (N.M.C.).

Specimens reported: Egypt Lake, 3; Hillsdale, 1; Mount Assiniboine, 14 (Crowe, 1943).

Porcupine, *Erethizon dorsatum nigrescens* Allen

Porcupines occur commonly throughout the sub-alpine forest belt in the park. They are rarely seen in the lower Bow Valley. Soper (1947) stated "I have seen examples at Moraine, Consolation, and Louise lakes and between Bow and Sunwapta Passes." Clarke (1940) reported porcupines at Clearwater River, Pipestone Creek, Waterfowl Lakes, and Bryant Creek.

During my investigations I found them common along the highway north of Lake Louise where they were attracted to the calcium chloride placed on the road to keep the dust down. I have also noted porcupines and signs of their winter feeding on bark, commonly along Boom Creek, Redearth Creek, and Pharaoh Creek. I undertook a series of experiments in chemical porcupine repellents along Boom Creek trail.

It is noteworthy that the porcupine is frequently preyed upon by wolverines in the park.

I am not aware of any park specimen.

Coyote, *Canis latrans lestes* Merriam

Coyotes are commonly distributed throughout the park during the summer months. They tend to concentrate in the lower valleys during the winter. Having been regularly observed along the road for some time or their cries heard from the wooded mountainsides, they are one of the characteristic predatory mammals of the park.

Millar (1915) reported that they were "very common everywhere." Soper (1947) wrote that they were "numerous in Banff National Park." Their numbers, however, vary from year to year. In 1946 and 1947, there was a considerable loss of coyotes in winter owing to mange. In 1951, they were particularly abundant about the townsite, where they ransacked garbage pails. The wardens were instructed to destroy 20 coyotes in the vicinity of Banff. They had no difficulty filling their quota. Predator control activities in the park during the winter of 1952-53 in connection with rabies prevention greatly reduced the population.

The coyotes in the park prey chiefly upon small mammals and caribou but take a certain number of deer as well. The relationship between coyotes and their big-game prey must be delicately balanced. I have observed doe mule deer and ram mountain sheep pursuing coyotes on rare occasions.

Specimens taken: Banff, 2; Hillsdale, 1.

Gray Wolf, *Canis lupus occidentalis* Merriam

From a review of the literature and the departmental reports, it seems that wolf numbers in the park have fluctuated greatly over the historical period. Indeed, wolves were absent from the park for about thirty years after 1900.

While they undoubtedly occurred regularly in the mountains at the advent of European explorers, there are few references to them. Simpson (1841) reported wolf tracks upon his descent from Simpson Pass. Palliser (1860) reported that wolves were poisoned with strychnine in the Athabasca Valley (Jasper National Park) by the fur traders. In January, 1859, Dr. Hector saw 4 carcasses of poisoned wolves at Jasper House. Southesk (1875) was an early writer to present the economic and aesthetic side of those predators. He wrote: "the wolves are detestable wretches, but do more good than harm to man, seldom attacking horses or human beings, and devouring carcasses and offal that would breed a pestilence if left to rot . . . but I confess to a liking for the wild melancholy, and almost musical, notes of the wolf."

By 1900, wolves were rare in the Banff area because of the previously mentioned wolf control, the extirpation of the bison, and a general decline in game numbers. Millar (1915) reported wolves to be rare south of the Athabasca. Clarke (1940) reported that wolves were rare in the forest reserves on the east slope of the Rockies during his visit in 1930. One, however, had been killed at the Red Deer Ranger station during the previous winter. Clarke later (1942) mentioned that another wolf had been killed in the Porcupine Hills and speculated that wolves had not been exterminated on the east slope and would probably spread into the park. This forecast turned out to be pretty accurate. Meanwhile, wolves continued to be scarce until the early forties.

Green (1951) traced the recent history of wolves in the park. After an absence of many years, Warden Naylor observed a pair of wolves at the junction of the Howse and Saskatchewan rivers in 1931. Clarke (1940) reported a wolf track on the North Saskatchewan River in the winter of 1938. In 1942, he reported tracks at Nigel Pass, and again in the North Saskatchewan Valley Warden Davis saw wolves in November, 1944, according to Green (1951). Cowan (1947) reported that wolves entered the Saskatchewan Valley during 1942-43. In 1943, a population was established in the Red Deer Valley and also in the Panther Valley. In 1944-45, they reached the Minnewanka area from the Ghost River Valley. Warden Woodworth saw the first wolf in the Bow Valley in February, 1945. During the winter of 1945-46, wolves were first observed in the Clearwater Valley. The first wolf track was observed in the Spray Valley in 1947. From that period on, a wolf population became established in the park. Favourite haunts were the Saskatchewan, Clearwater, Panther, Cascade, Johnston, Bow, and Spray valleys, where regular travel circuits were established.

Annual estimates of wolf numbers, based upon warden's reports of observations and track counts, have been tabulated by Green (1951) as follows:

<i>Year</i>	<i>No.</i>
1944	2
1945	7
1946	16
1947	48
1948	46
1949	40
1950	38

During the winter of 1952-53, wolf control operations were conducted in the park in connection with rabies prevention. Coupled with similar

control activities in provincial lands outside the park, the wolf population was greatly reduced. The 1953 population estimate was 4, and the population has increased only slightly to an estimated 10 to 12 in 1956.

Young and Goldman (1944) included Banff National Park in the range of *Canis lupus irremotus* Goldman, citing 7 specimens from Calgary. Cowan (1947) refers all wolves in Banff and Jasper National Parks to *occidentalis*. A review of the history of the recent colonization of the park area suggests that the wolves moved in from the north and from Provincial Forest areas to the east. In this case the population may be an intergrade between the two subspecies.

An excellent report upon the relationship of the wolf to its prey species in the park has been presented by Cowan (1947).

Three specimens were obtained from the East Gate on the Bow River.

Red Fox, *Vulpes fulva* (Desmarest)

Foxes have been uncommon in the park in recent years. Williamson (1916) reported them abundant. Soper (1947) reported animals seen and tracks noted during his investigations. Clarke (1940) saw 2 at Ya-ha-tinda ranch on June 14, 1939, and reported in 1942 one track near Banff.

Very few tracks were seen in the lower Bow Valley during my period of residence in the park. They were reported to be more common on the alpine tundra.

One specimen was obtained at Saskatchewan Crossing. The Banff Museum contains 3 specimens lacking data.



Black Bears in Park

Black Bear, *Ursus americanus cinnamomum* Audubon and Bachman

Black bears are commonly distributed in the park from the valleys to near timberline.

Alexander Henry was the first European to record the occurrence of black bears in the region. In 1811, he visited the Kootenay Plains where the Kootenay Indians from the Columbia Valley had hunted bears and other game (Coues, 1897). Simpson (1847) mentioned bear tracks on his descent of Simpson Pass in 1841. Palliser (1860) observed black bears while crossing Kananaskis Pass in 1858.



Black Bear

In recent years these bears have become a nuisance because of their depredations upon camp food caches and garbage containers and their habit of begging on park roadsides. These habits seem to have developed early, for Williamson (1916) reported that bears were frequently seen on the outskirts of Banff. Limited control of the worst offenders is exercised.

The following specimens were taken: Banff, 1; Mistaya River, 1. Other specimens recorded, Banff (Anderson, 1946).

Grizzly Bear, *Ursus arctos horribilis* (Ord)

Merriam (1918) listed six forms of grizzly from the park region. These were *horribilis dusorgus* Merriam, *canadensis* Merriam, *canadensis rungiusi* Merriam, *hylodromus* Elliot, *kluane impiger* Merriam, and *latifrons* Merriam. However, it is generally now believed that he failed to recognize the wide individual variation in these bears. I have followed Rausch (1953) in considering these bears to be conspecific with the European brown bear.

Palliser (1860) was the first to report observing grizzlies in Kananaskis Pass in 1858. Millar (1916) wrote "This animal occurs throughout the east slope region, but is everywhere scarce . . . I have seen grizzlies or their evidence in the Kananaskis Valley, at Pipestone Pass and the headwaters of the North Saskatchewan River." Clarke (1940) reported observing 3 in the Spray Valley, 2 at Bryant Creek, and one at the Little Pipestone River in 1939. He estimated the total park population to be 100 animals.

Although grizzlies are infrequently observed in the park, tracks and excavations of ground squirrel burrows indicate that they are widely distributed in the upper limits of the sub-alpine forest and upon the alpine tundra. I have observed grizzlies at Cuthead Pass, Bow Summit, and Sawback Lake. Other favourite haunts are the upper Spray Valley, Brewster Creek, Egypt Lake, Johnston Creek, Baker Lake, and the Pipestone Valley.

In the spring, these bears often come down to the river valleys to eat the fresh green vegetation. They are particularly fond of *Hedysarum boreale*. I observed one thus occupied near the Graveyards cabin on May 23, 1953. Others have been observed in spring at the Upper Hot Springs and Healy Creek cabin in the Lower Bow Valley.

In the past few years, grizzlies have appeared in the vicinity of Banff townsite in the autumn as well. One appeared at the town dump in the autumn of 1955.

It would be difficult to provide an estimate of the population in the park as they are notorious travellers. It seems likely that Clarke's estimate is a generous one.

One specimen was taken at Cuthead Creek. There is a skull in the National Museum from Panther Falls and a skin lacking skull, labelled simply "Banff."

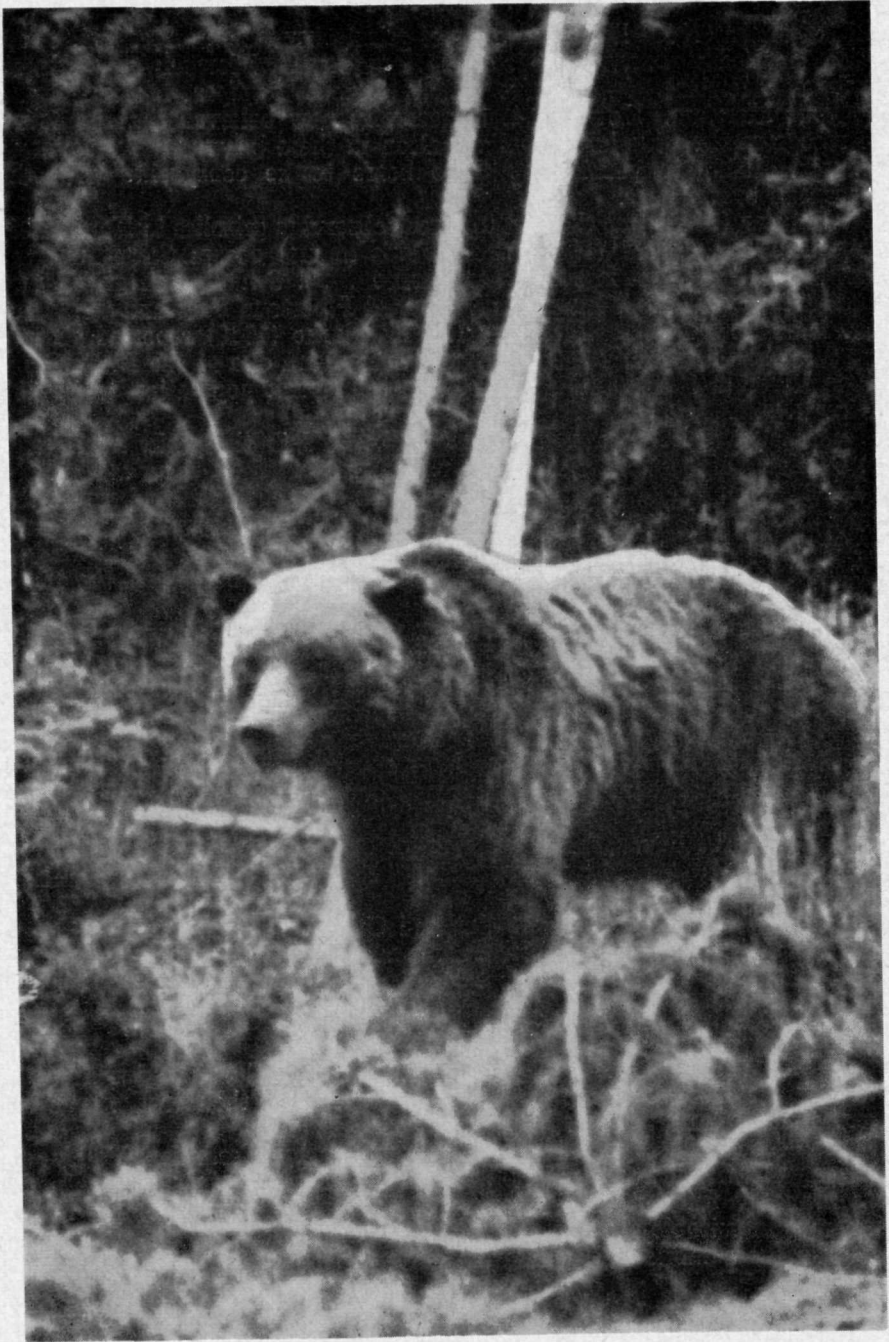
Marten, *Martes americana abietinoides* Gray

Marten are abundant in the climax boreal and sub-alpine forests. The animals themselves are frequently observed and their tracks seen on every suitable trail.

Palliser (1860) reported them in the nearby Vermilion Valley of Kootenay National Park in 1858. Clarke (1940) suggested that the park was probably fully stocked. Soper (1947) reported them to be "fairly numerous in suitable areas."

The food habits of the marten have been studied by Cowan and Mackay (1950).

A number of marten were live-trapped for restocking purposes in northern Alberta in 1946 and in Prince Albert National Park, Saskatchewan, in 1954.



Grizzly Bear

Specimens were obtained at Redearth Creek and Stony Creek. Other specimens examined: Boom Creek, 1 (U.A.) and Banff, 1 (N.M.C.)

Fisher, *Martes pennanti* (Erxleben)

The occurrence of the fisher in the park has not been firmly established. Tracks have occasionally been reported from the northern part of the park. Warden W. Black reported fisher tracks in the Mistaya Valley in 1946.

David Thompson traded fisher skins with the Kootenay Indians camped on the upper Red Deer River in 1800 (Tyrrell, 1916), but the locality from which the skins were obtained is unknown.

Ermine, *Mustela erminea invicta* Hall

Weasels are widely distributed in the park. Their tracks are frequently observed in the winter snow. I was fortunate to observe a weasel hunting pikas at Bow Summit in May, 1952. Their numbers vary from year to year. In 1952 they were very common.

Specimens taken: Banff, 2; Moraine Lake, 1. Specimens reported: Banff (Anderson, 1946); Banff, 1 (Hall, 1951); Canadian National Park (?), 1 (Hall, 1945).

Long-tailed Weasel, *Mustela frenata longicauda* Bonaparte

This species of weasel is not distinguished from the former species in warden's reports. However, it probably occurs less commonly. Clarke (1942) wrote the range of the subspecies as "including eastern slope of Rocky Mountains."

Two specimens were examined in the National Museum of Canada collected by Cowan in 1930 at Banff. Hall (1951) lists one specimen from "Canadian National Park, N.W.T."

Mink, *Mustela vison* Schreber

Tracks of mink are occasionally observed along southern park waterways. Williamson (1916) reported they were abundant in the park. Clarke (1940) reported observing fresh tracks at the junction of Goat Creek and the Spray River.

Workmen reported observing one at the Second Vermilion Lake on April 4, 1952.

I am not aware of any park specimens.

Wolverine, *Gulo luscus* (Linnaeus)

Wolverines are apparently widely distributed in the park. Their tracks are most commonly observed on the alpine tundra. However, they range into the river bottoms, especially in winter.

Williamson (1916) recorded them as abundant at Banff. Clarke (1940) reported observing tracks on Divide Creek, Bow Summit, and Wonder Pass. He (1942) reported the park as being fully stocked with wolverine.

In August 1947, I observed an adult and young visiting a fish camp at Baker Lake. In 1951, I trailed a wolverine for 4 miles up Johnston Creek. The same year, I had one follow me on Pharaoh Creek trail. In the winter of 1953-54, I observed a trail in the Bow Valley near Mount Eisenhower.

In recent years a number of wolverines have been live-trapped in the park by means of baited box traps at Lake Louise dump. These have been for filming and for zoological gardens.

One specimen was collected at Lake Louise. There is one specimen in the National Museum from Banff.

Badger, *Taxidea taxus* (Schreber)

The range of the badger in the park is restricted to grassland areas in the river valleys situated in the southeastern part of the park. Those valleys occupied are the Red Deer, Panther, Cascade, and Bow.

Clarke (1940) reported sight records from Scotch Camp and Stony Creek. I observed badgers at Hillsdale, Bankhead, and Flints Park during my investigations. In each case, the badgers were excavating the burrows of the Columbian ground squirrels, their chief prey species in this area.

I am not aware of any park specimens.

Striped Skunk, *Mephitis mephitis* (Schreber)

Skunks are restricted to the lower Bow Valley in the vicinity of Banff townsite. Clarke (1940) observed the species at the Ya-ha-tinda Ranch in 1930 and reported that it was "well known around the townsite of Banff." On an occasion during the summer of 1952, I noticed its unmistakable odour at Banff.

I am not aware of any park specimens.

River Otter, *Lutra canadensis* (Schreber)

Otters appear to be extremely scarce in the park. Mr. H. U. Green observed an otter crossing the road toward the Third Vermilion Lake on July 28, 1944.

Mountain Lion, *Felis concolor missoulensis* Goldman

The cougar, although one of the largest mammals in the park, is also the most secretive. Little is known concerning its range and numbers.

Palliser (1860) first reported the mountain lion in the park area. Dr. Hector killed one in the Vermilion Valley, Kootenay National Park, in 1858. Cougar tracks were also seen on the descent of the Howse Pass in Blaeberry Valley, B.C. Southesk (1875) reported that pumas (mountain lions) occurred in the Rocky Mountains, though probably not north of the Bow River. Millar (1915) wrote that it was a comparatively rare animal on the east slope. A few were reported killed adjacent to the south side of Rocky Mountain Park. The late Mr. F. A. Bryant reported that he killed one of the first cougars sighted in the Athabasca Valley, Jasper National Park, in 1930. From these reports it appears that during the past century the cougar has extended its range northward through the area.

Although the park now contains the home range of several cougars, it seems that the population has not increased much in the past few years. These animals do not appear to be so plentiful on the east slope of the Rockies as they are on the west.

Clarke (1940) saw one track in the Dormer Valley. A forestry gang was reported to have found a dead kitten at Stony Creek the same year. Clarke recalled hearing a cougar in the Clearwater Valley in 1930 and seeing cougar kills at Scalp Creek. He reported later (1942) that the wardens had seen seven tracks during the winter. Clarke saw one himself in the Bow Valley.

During my period of residence in the park, cougar tracks were observed regularly in the Bow, Cascade, and Spray valleys. A favourite "clawing post" was observed near Hillsdale cabin, from which the bark had been stripped for about 3 feet and lay shredded at the base. A cougar took up residence on the Banff Springs Hotel golf course during the winters and managed to kill a mule deer or elk with fair regularity. This animal was flushed from a road culvert on one occasion. On another occasion, a tourist reported observing a cougar stalking mountain goats, 6 miles west of Banff.

Specimens secured: Cascade Valley 1, Banff 1; other specimens examined: Banff, 5 (N.M.C.).

Lynx, *Lynx canadensis* Kerr

Lynx tracks are regularly observed throughout the park, but their numbers vary greatly from year to year. Williamson (1916) reported them as being abundant in Banff. That report followed the period of extreme hare abundance mentioned earlier. On the other hand, Clarke (1940) reported no recent sign. Warden Child was reported to have seen a lynx near Banff some years previously. However, Clarke later reported (1942) that the lynx population was increasing and that he saw three in the Bow Valley.

During my investigations, lynx were reported as scarce in 1946 and 1947. By 1953, their tracks were quite common, and the animals themselves were frequently seen. Since then they have decreased.

I am not aware of any park specimens.

Wapiti (Elk), *Cervus canadensis nelsoni* Bailey

The wapiti, like the wolf, has not been a constant resident of the park area in historical times. Thompson first mentioned wapiti in the Saskatchewan Valley in 1808, 1809, and 1810 (Tyrrell, 1916). Henry gave a fuller report of their occurrence (Coues, 1897). He described the Kootenay Indians' hunt for red deer on the Kootenay Plains of the Saskatchewan Valley. The meat was dried and made into pemmican. The name "red deer" was regularly applied to wapiti by English explorers because of its similarity to the European red deer (*Cervus elaphus*). Henry described the Indian camp at Kootenay Park or Pound near the Forks of the Saskatchewan River, where the Indians drove game over a precipice to their destruction. This site seems to have been near the junction of Glacier Creek and the Howse River within the park. Simpson (1841) reported red deer tracks on the Simpson River (Kootenay National Park). His hunter killed one in the Bow Valley for the camp larder. Palliser (1861) reported that Dr. Henry observed many "wapiti" tracks near Castle Mountain (Mount Eisenhower). There were many wapiti in the Saskatchewan and Kananaskis valleys in 1858.

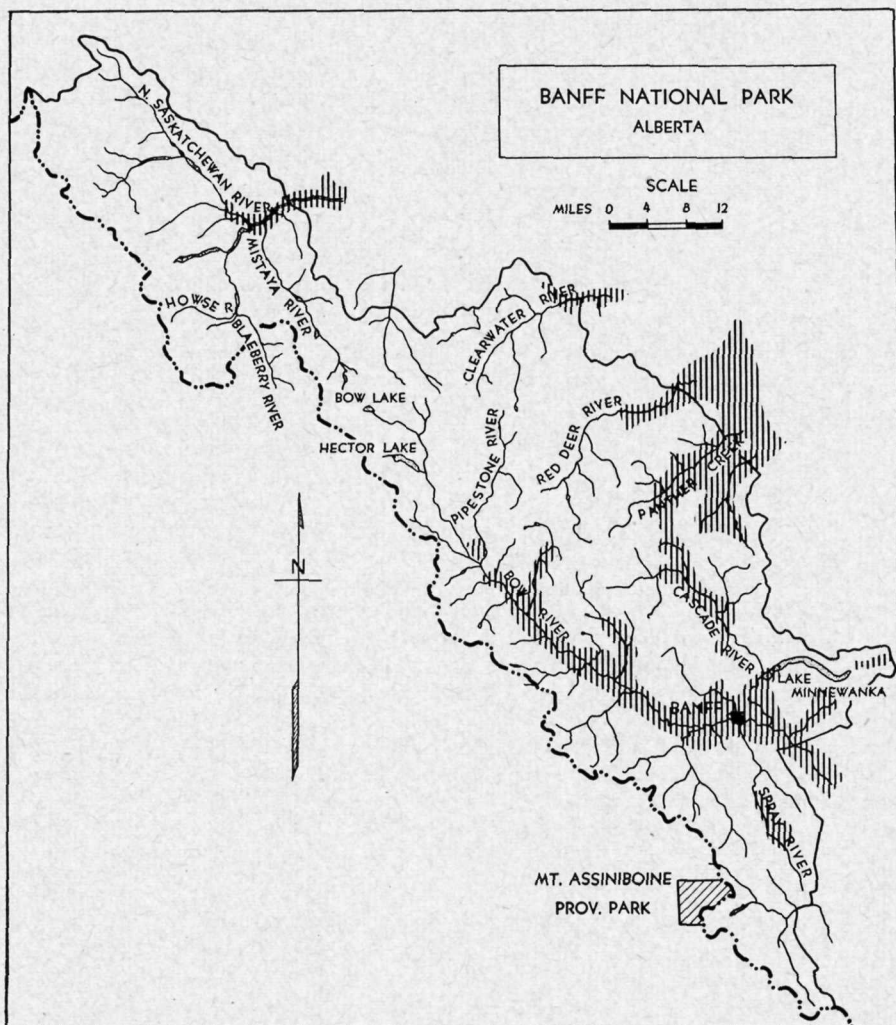


Figure 2. Winter distribution of Wapiti.

Some time after that period, the wapiti population declined almost to the vanishing point. Early settlers in the Banff area believed that the wapiti was extinct in the whole area (Green, 1957). Norman Luxton reported that wapiti in the foothills suddenly were exterminated about 1900. The exact cause, whether excessive snow, disease, or exploitation by Indians, is difficult to determine at this date, but many suggest that a mysterious malady wiped out the wapiti in the Canadian Rockies. Green reported that only the discovery of an occasional half-buried antler in the Bow Valley attested to the former occurrence of the species. Millar (1915) similarly reported them as being extinct in Banff National Park in 1916.

At least two small herds of native wapiti survived the period in isolated mountain valleys. One of these was in the Brazeau Valley, north of the park and the second was near Kananaskis Pass, just south of the park boundary. Hewitt (1921) published the following reports.

"Mr. R. C. MacDonald, of the Geological Survey of Canada, writing on December 12, 1916, states, 'Near the summit of White River and southwest of Mount Fox, B.C., I saw several herds of elk.'"

Mr. D. A. Nichols, writing on December 11, 1916, states, "In the section covered during 1915 and 1916 in British Columbia and Alberta, the big game, especially goat, elk, sheep, deer, and bear, were very plentiful. At the headwaters of the Palliser, Spray, Elk, and Kananaskis rivers, the elk, which were once nearly extinct, are increasing rapidly so that bands from 10 to 25 were seen quite frequently."

Mr. Bryan Williams, British Columbia Provincial Game Warden, in his 1914 report wrote, "Wapiti in southern East Kootenay are still doing well. In the northern part of the District, wapiti have been reported on the west side of the Columbia. They used to winter on the lower river benches." Again in his 1918 report he wrote, "A small herd of wapiti were reported pasturing around the south end of Elk Valley Game Reserve, and a larger herd is known to be in the vicinity of the headwaters of the White River." (Hewitt, 1921)

Mr. Erling Strom informed me that 25 years ago a small herd commenced to summer in the Assiniboine Valley. They gradually increased to 80 head and migrated to the Spray Valley in winter.

It is probable that, provided with adequate protection, those small nuclei of wapiti would have spread to repopulate the park. Certainly, they repopulate the Kananaskis, Spray, and Brazeau valleys. However, in 1917, steps were taken that greatly influenced the subsequent history of wapiti on the eastern slope of the Rockies.

According to Lloyd (1927), there were 32 wapiti in an enclosure at Banff. These had originally come from Manitoba. In 1917, 63 wapiti were introduced from Yellowstone, Montana; in 1918, an additional 41; and in 1920, 206 were shipped, of which 194 arrived safely and were released. The Superintendent's 1923 report gave a census of wapiti in the lower Bow and Cascade valleys: Canmore, 120; Deadman's cabin, 20; The Gap, 12; Banff Golf links, 20; Anthracite, 50; Stony Creek, 30; Cut-head Creek, 25; Hillsdale, 40; Redearth Creek, 20; total, 337. By 1927, they were common west of Banff where herds of 150 were observed in winter.

The progeny of the introduced animals rapidly increased to repopulate the greater part of the park. In 1940, Clark reported that wapiti were common and were increasing in the Bow Valley from Banff to Lake Louise, at Bow Summit, in the eastern valleys of the park, and at Howse Pass. The latter group he thought were native stock. By 1942, he reported the population was excessive.

Soper (1947) wrote, "In Banff National Park they are generally distributed in southern localities, east of Kootenay Park, being comparatively infrequent or rare over the higher terrain of the park to the north." Green (1957) reviewed the history and management of elk in the park. He gave the 1946 winter distribution as follows: mainly concentrated in the Bow Valley north to Mount Eisenhower. Warden

Pederson reported 64 elk in the North Saskatchewan Valley. Smaller groups occurred in winter at Divide Creek, Scotch Camp, Snow Creek, Cascade and Spray valleys, Pipestone Valley (1942-43), Egypt Lake (1945), Forty-mile River, and Johnston Creek (1947). He estimated 1,500 animals in the Bow Valley in the spring of 1945, and additional herds of 225 and 100 in the Cascade and Spray valleys respectively.

By 1944, the effects of the excessive population in the lower Bow Valley were quite evident in the destruction of young aspen and willows and in the peeling of bark from aspen trees. Since that date, about 2,000 animals have been removed in annual reductions, which have brought the population down to the carrying capacity of the ranges.

Within the past few years, the wapiti range in the park has expanded. The summer range now includes most of the grassland, alpine meadow, and tundra areas throughout the park. The bulls, especially, spend the summers high up near timberline. The cows frequently lag behind on the lower ranges to bear their calves. Favourite summer haunts are in the upper reaches of the Howse, Clearwater, Bow, Panther, Johnston, Cascade, and Spray valleys.

During the early years of their occupancy, the wapiti migrated to the open valley floors for their winter ranges. In recent years, however, the autumn migration to the valleys has been less pronounced, and large bands have spent the winters on wind-blown alpine grassland slopes. In that habitat they have competed with mountain sheep. The exhaustion of the valley ranges has probably played a large part in the change of range. However, the control program in the valleys and wolf predation may have been contributing factors as well. The main current winter ranges are found in the Bow Valley from Mount Eisenhower to Exshaw, the Cascade Valley including alpine slopes, the Goat Range in the Spray Valley, and the lower Dormer, Panther, Red Deer, Clearwater, and Saskatchewan valleys.

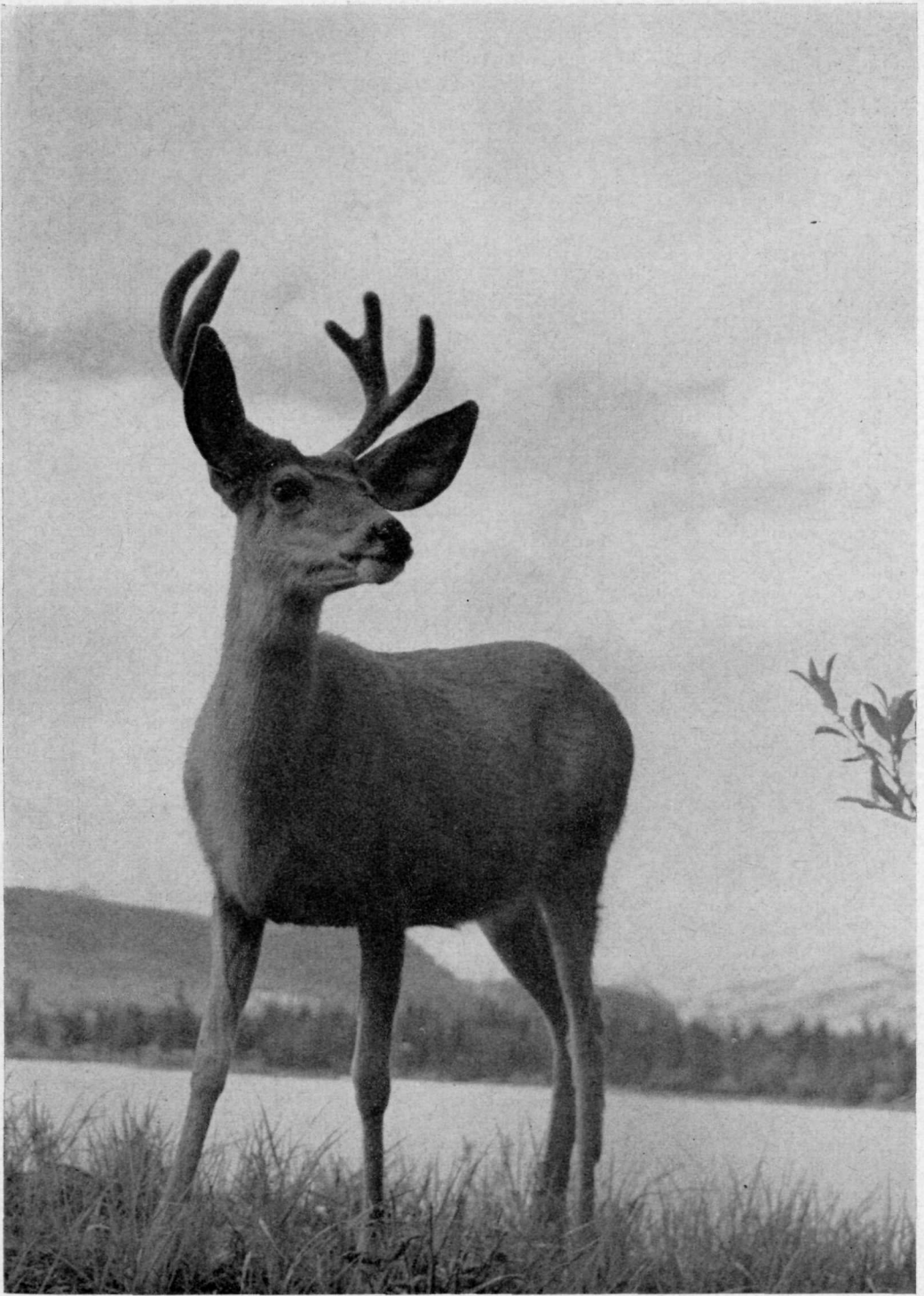
The herds generally try to winter as "high up" as possible. Heavy snow falls drive them farther down the valleys. In certain winters large numbers may drift outside the park to ranges in the lower Bow Valley, "The Corners," and Ya-ha-tinda Ranch. The bulls generally winter higher than the cows. The current winter range is outlined in Figure 2.

There are 6 old specimens in the National Museum of Canada from Banff; probably from the enclosed herd.

Mule Deer, *Odocoileus hemionus hemionus* (Rafinesque)

Although consistently reported in the park during the past century, mule deer are not abundant at present. According to Palliser (1860), Dr. Hector found mule deer in the Bow Valley in 1858. They were also observed in the Kananaskis Valley and Blaeberry River of British Columbia (Howse Pass). Southesk (1875) reported "jumping deer" as common in the lower Bow Valley. They were particularly abundant about Bow Fort in 1859.

After the establishment of the park, mule deer numbers in the Bow Valley increased. Williamson (1916) reported that deer roamed everywhere—even in the streets of Banff townsite. Since that time, mule deer have continued to be one of the unique features of Banff streets along with



Mule Deer

the occasional wapiti, moose, and black bear. Hewitt (1921) saw 16 deer within 10 miles of Banff in April, 1919, and reported that "In Rocky Mountains Park, mule deer are increasing in numbers, and may be seen almost any day in the vicinity of public roads and trails."

After the wapiti population began to increase rapidly about 1935-39, mule deer numbers commenced to decline because of the competition for food. They became scarce everywhere except in the townsite of Banff. Since about 1943, there has been little further decline in numbers; indeed, a slight increase has been evident in the past few years, according to wardens' observations.

Mule deer inhabit the valleys and forest glades. In summer they range higher on the mountain slopes. Bucks tend to concentrate at tree-line. Does remain lower. Mule deer may be found in any part of the park. In October, there is a marked migration to the valleys. In winter, they are confined to the lower valleys of the Saskatchewan, Red Deer, Panther, and Bow rivers. In the Bow Valley, the winter range does not extend beyond the Vermilion Lakes. The return migration occurs in May as the deer follow the retreating snowline up the valleys.

No specimens were collected or examined.

White-tailed Deer, *Odocoileus virginianus ochrourus* Bailey

The history of white-tailed deer on the east slope of the Rockies is rather uncertain. At present, white-tails are rare. Palliser (1860) reported seeing a white-tailed deer on the Red Deer River near Ya-ha-tinda Ranch. However, this observation may be disregarded along with Simpson's (1847) report of "antelope" tracks on Simpson Pass in 1841, as misidentification. Millar (1915) reported white-tails were increasing in the Rocky Mountains. Anderson's (1946) statement that they occurred "regularly in small numbers" and Soper's (1947) statement that "fair numbers regularly frequent southern portions of Banff National Park" certainly need further explanation.

Clarke (1940) first reported that white-tailed deer were restricted to certain localities at the eastern end of passes leading to the west slope of the Rockies in British Columbia. Cowan (1943) added several localities. At present, white-tailed deer are known to occur in small numbers in summer at Castleguard River, Alexandra River, "Graveyards" on the Saskatchewan River, Howse Pass, Lake Louise, Mount Eisenhower, and Palliser Pass. Occurrence in these locations is generally limited to the summer months, and it is concluded that the deer migrate into the park from winter ranges in British Columbia. However, because of the early appearance of white-tails in the "Graveyards" area in late May, when the passes were still snow covered, Cowan (1943) concluded that a small band had wintered in the lower Saskatchewan valley. Wardens have failed to confirm this supposition up to date. The current summer range is indicated in Figure 3.

According to wardens' observations, the number of white-tailed deer in the park varies each year. Generally, only a handful are reported, and there has been little indication of increase in recent years.

I am not aware of any park specimens. The local population has been tentatively referred to *ochrourus*, which inhabits southeastern British Columbia.

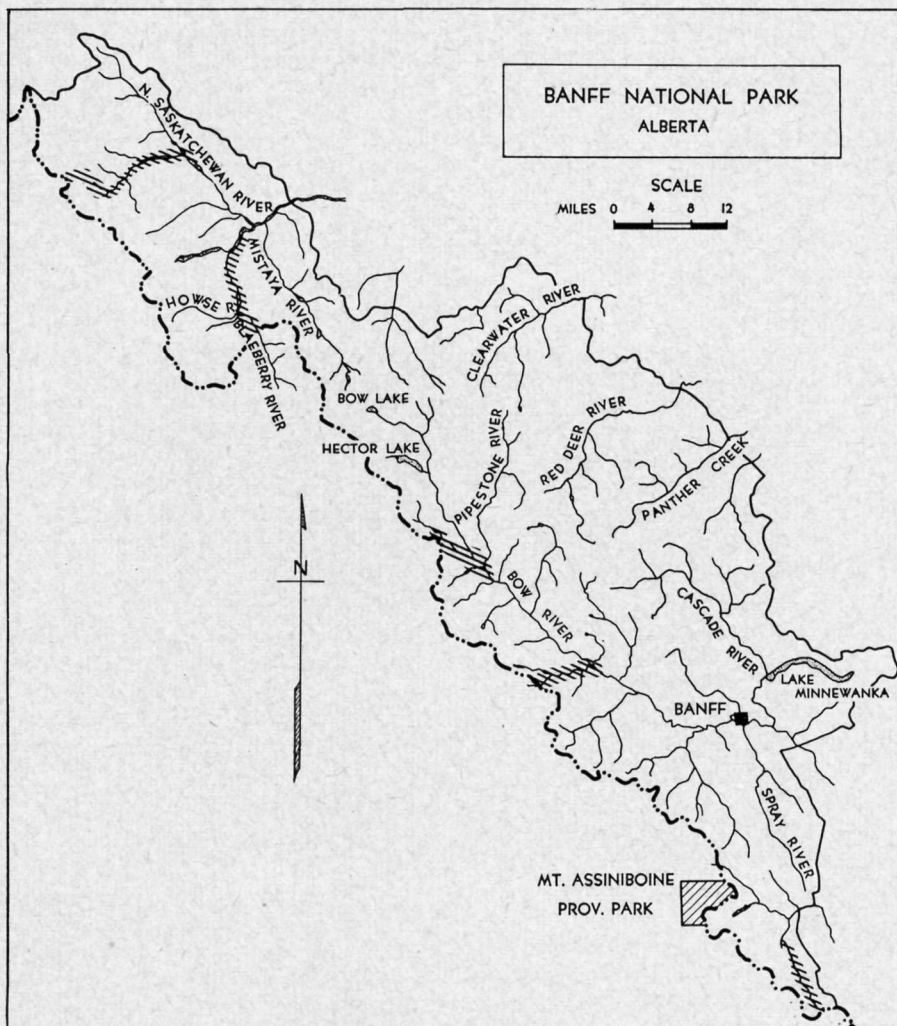


Figure 3. Summer distribution of White-tailed Deer.

Moose, *Alces alces andersoni* Paterson

The first European explorers found moose commonly distributed throughout the region. Simpson (1847) saw tracks on Simpson Pass in 1841. Palliser (1860) reported moose in the Kananaskis Valley. Dr. Hector found moose throughout the Bow Valley in 1858 and reported many in the Lake Louise area during that September. He also observed animals at Mount Molar in the Pipestone Valley and reported them as abundant in the Saskatchewan Valley. The Earl of Southesk (1875) killed three near Lake Louise on September 27, 1859.

The population, however, has fluctuated since the first reports. There have been reports of epizootics among the big game. Palliser (1860) was informed that many moose, wapiti, and buffalo were found dead about 1847 to 1848, and game had been locally scarce ever since. Millar (1915) wrote "(Moose) occur on the east slope in fair abundance north of the Clearwater River. In the south, only a few are known to range across the International Boundary." Most old-time residents of Banff report that moose were absent about the turn of the century and have appeared comparatively recently. Clarke (1940) reported that they were rare on the east slope as late as 1930. Moose reappeared in the lower Bow Valley about 1925.



Moose (mother and young)

It was reported that the Stony Indians of Morley recalled another epizootic among moose and wapiti about 1900, which had again decimated game populations on the east slope of the Rockies. Severe winter losses and forest succession following forest fires should also be considered as factors.

At present, moose are commonly distributed throughout the park. During the summer months, there is a tendency to drift up to tree-line. Many mature bulls are observed on the alpine tundra during that period. Cows seem to remain at lower elevations. In the autumn there is a drift toward the lower valleys where winter concentrations appear. However, many large bulls spend the winter high up on old "slides" regrown to willow and alder thickets. In summer moose frequent valley lakes and swamps where they feed on aquatic vegetation. Cows also seek islands on which to bear their calves.

The park population has arbitrarily been assigned to the northwestern *andersoni*, although Peterson (1952) noted some intergradation of the southern *shirasi* in the region. It seems likely that those two races have met in the

park area in recent years through range extensions. Cowan (1956) considered *shirasi* to be restricted to the area south of the Crowsnest Pass.

Specimens reported: Saskatchewan River, 1 (Peterson, 1952).

Caribou, *Rangifer* sp.

The range of "mountain caribou" in the Rocky Mountains extends as far south as the northern part of Banff National Park. It is uncertain whether there are any resident bands in the park. More likely, only wandering bands from Jasper National Park visit the area. Miller (1915) wrote "The occurrence of caribou on the east slope south of 53° is limited to the west side of the Athabasca river from the Miette south to Fortress Lake (Jasper National Park)."

Mr. James Simpson, Sr., a long-time resident of the northern part of the park, chronicled his caribou observations for Cowan (1943). In 1902 he followed the tracks of a cow and yearling down the Siffleur from the Clearwater Pass. A few years before, Indians had killed all but two from a small band in the same area. In August, 1940, he saw a lone bull feeding among his horses on Thompson Pass near Mount Castleguard. In 1943, Cowan observed tracks in the same area. In July of that year, the Superintendent of Jasper National Park observed a cow on the highway in the upper Saskatchewan Valley. Clarke (1940) reported that Warden Naylor saw a caribou near Mount Wilcox a number of years earlier. A member of one of Simpson's pack-trip parties observed a bull standing on the Saskatchewan Glacier.

The taxonomy of the various races of caribou described and their relationship to Eurasian reindeer are under study at present. Until this work is completed, the identity of the local caribou remains uncertain.

No specimens from the area are known.

Wood Bison, *Bison bison athabasca* Rhoads

It may surprise some readers to learn that bison were once widely distributed in the mountains now contained in Banff National Park. Although the historical records are sparse, they indicate that bison once occurred in some numbers. There is also the mute evidence of skulls, which have been found close to the earth's surface in many localities throughout the park.

David Thompson's diary (Tyrrell, 1916) records several encounters with bison within the park area. After first crossing Howse Pass in 1807, he retraced the route in subsequent years. In October, 1808, he killed 2 cows in the Saskatchewan Valley and an additional bull and 2 calves on Howse Pass. On June 20, 1810, he reported seeing a bison carcass snagged by a log in the Saskatchewan River and also shot a bull the same day. Later, in August, he again reported killing a bull in the upper Saskatchewan Valley.

However, it was Alexander Henry who gave us more significant details concerning bison. He ascended the Saskatchewan Valley to Howse Pass in 1811. On February 7, he reached the Kootenay Plains (just east of the present park boundary). He described the meadows, which took two hours to cross. They were clothed with a fine short grass, which supported large

herds of "wood" bison. The next day he reached Kootenay Park and reported that it was the western limit of the bison's winter range.

Later, Simpson (1847) reported observing bison tracks on Simpson Pass. The Palliser Expedition also encountered bison in the park area. Dr. Hector reported observing them in the Siffleur Valley and seeing dung in the Howse River Valley in 1858. William, an Indian guide, killed a bison in the Pipestone Valley that year. It was the last bison reported killed in the Park area. Southesk (1875) found only wallows and dung on the Kootenay plains in 1859. He reported that bison had last reached Bow Fort area in large numbers in 1850. By 1859 they were decreasing everywhere in the foothills.

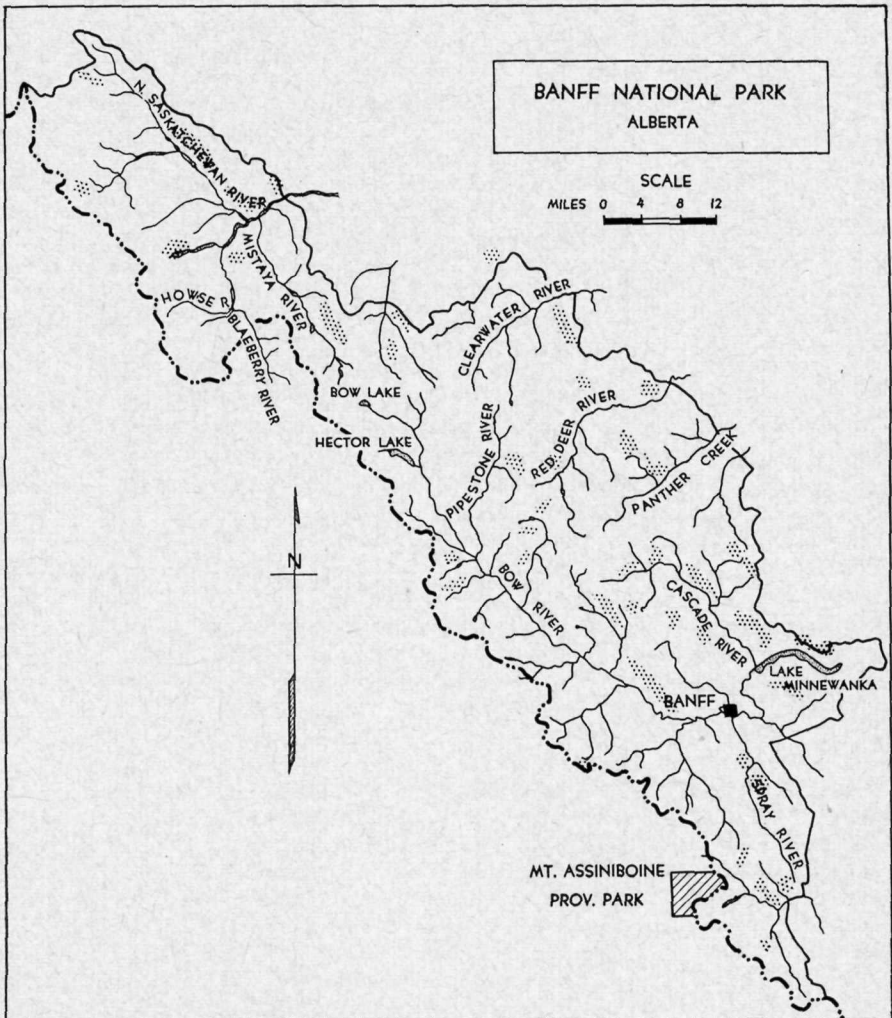


Figure 4. Distribution of Mountain Goats.

Clarke (1940) reported that skulls and wallows were still evident on the east slope in 1930. He noted wallows at Scotch Camp in the Red Deer Valley and at Indian Head Cabin. He found a skull at Waterfowl Lake and in the Spray Valley. I found a partial skull in a gravel bed on the Cascade River.

From the information at hand, it seems that the bison ranged into the alpine tundra in summer. In winter, they concentrated in a few of the lower valleys, such as the Saskatchewan, as far as the Crossing. Some old bulls spent the winters isolated on the passes.

I have followed Skinner and Kaisen (1947) in referring the park population to the wood bison *athabascae*. The reports of the early explorers substantiate this conclusion. Henry referred to them as wood buffalo and stated that they were confined to the mountain valleys. Palliser referred to them as the "thick-wood variety." These men were familiar with the plains bison and must have recognized the differences.

Mountain Goat, *Oreamnos americanus missoulae* J. A. Allen

The mountain goat, which was frequently reported seen by early explorers to the park area, is one of the characteristic larger mammals of the Rocky Mountains. Henry wrote of chasing three goats unsuccessfully on the mountain above Kootenay Pound in February, 1811 (Coues, 1897). Simpson (1847) observed goats above Lake Minnewanka and on Cascade Mountain above the present site of Banff in the summer of 1841. The Palliser Expedition observed goats at a number of locations. Dr. Hector observed them on Cascade Mountain in 1858. He shot a goat on Mount Ball and others on Mount Wilson. He also observed them on Mount Molar and in the Siffleur Valley in 1859. The Earl of Southesk saw four goats near Pipestone Pass on September 24, 1859. Robert McConnell collected a specimen at Bow Lake in 1885, now in the National Museum of Canada.

Millar (1915) wrote: "It is everywhere present along the east slope in numbers that it would be difficult to estimate, but certainly well up in the thousands. [Goats were] saved from exploitation by remote ranges."

Williamson (1916), writing of their distribution in the park, reported observing ten goats on the road west of Banff within 10 miles. He stated further "[Goats] are increasing in numbers in Rocky Mountain Park where they may be found in nearly all parts of the park, particularly on the Sulphur Range and on the high rocky ridge and summit of White River and west fork of Elk River" (south of the park).

From a comparison of early records with the current conditions, it may be concluded that goat numbers and distribution in the park area have changed little since they were first encountered. The possible exception is in the Goat Creek, Sulphur Mountain area, where mountain goats appear to have decreased in numbers during the past fifteen years.

Elsewhere, mountain goats inhabit suitable ranges throughout the park (See Figure 4). There is a tendency for goat numbers to increase as one travels from the foothills to the crest of the Rockies. They generally occupy alpine tundra slopes, rocky talus, slides, and ledges, which support a tundra vegetation of heaths and grasses. These areas usually occur above 6,500 feet, but goats occasionally descend to lower elevations

to visit game licks. "Goat licks" occur at Mile 6 on the road West of Banff, Mile 9 on the Spray River road, and near Flints Park in the Cascade Valley.

There is little regular seasonal migration among the bands, although the adult billies wander about during the summer months. In general the nannies and kids form herds and occupy fairly static ranges. Cowan (1943) recorded some of these nursery areas: Cone Mountain, Mount Fortune, Mount Peters, Mount Kentigern, and the basin of Drummond Creek, to which list I would add Mount Wilson, Mount Aylmer, and Cut-head Creek basins. The billies exploit the higher alpine slopes that are covered by deep snow in winter. At that season, goats occupy exposed ledges and slopes that tend to blow free of snow.

It has been frequently stated that mountain goats and mountain sheep will not occupy the same ranges. However, they are frequently observed together on the park ranges. Often, individuals of both species graze within a few yards of each other. Generally they stick close to their own kind. If the two species are observed on the same slope, usually the sheep will be on the grassy slope and the goats will be on the rimrock ledges above.

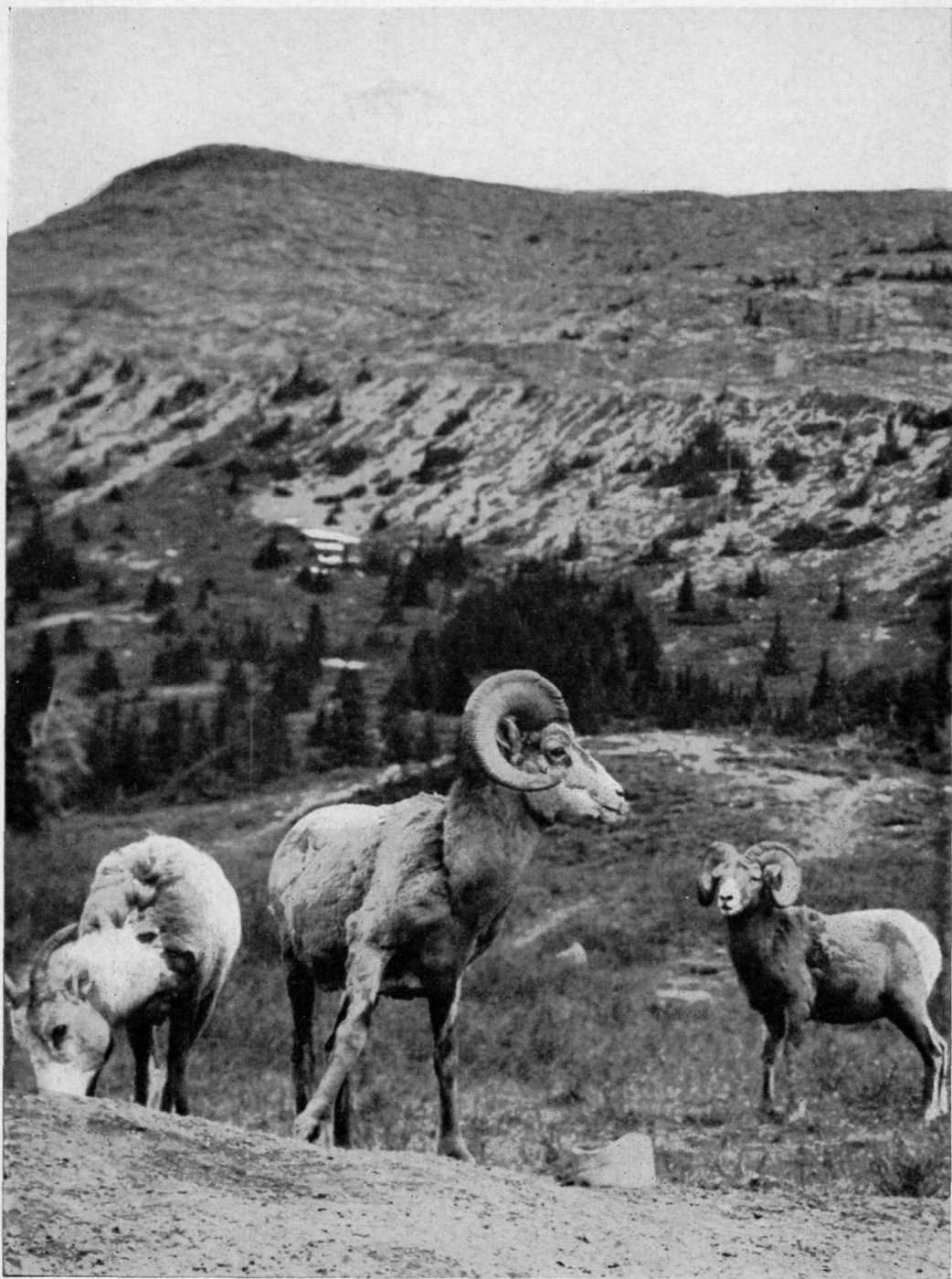
Specimens collected: Cascade Valley, 1.

Specimens examined: Banff, 6; Spray River, 1 (N.M.C.).

Mountain Sheep, *Ovis canadensis canadensis* Shaw

The mountain sheep population of the park is of special interest because of the proximity of the type locality of the species. On November 30, 1800, Duncan McGillivray and David Thompson secured the first specimen, which formed the basis of Shaw's scientific description, near the present site of Exshaw. McGillivray's account provides an interesting record of local conditions at that time and bears quoting in part (Thorington, 1947):

"In the fall of 1800 I was on an excursion, on horseback, through the plains that are situated between the Saskatchewan and Mississourie [*sic*] Rivers, along the rocky mountains, accompanied by Mr. Thompson, a gentleman in the North-West Company's employ, five Canadians and an Indian guide. Returning back to the north, we followed the course of the Bow River into the heart of the mountains, with a view to examining them; and on the 30th November at noon, we halted at the first ridge to graze our horses, and to ascertain our latitude. [Easily identified as "The Gap" about five miles west of Exshaw, from Thompson's narrative (Tyrrell, 1916). It was once included in the park boundaries.] At a little distance ahead appeared a small herd of animals which we took to be a species of the deer which are very numerous in that country. While Mr. Thompson was taking a meridian altitude, I went forward with the Indian, to have a shot; and on nearer approach, was very much surprised to find, instead of deer, a herd of about twenty animals that were utterly unknown to me. Pleased with the discovery, I advanced very cautiously, keeping myself concealed from their view, to the distance of about sixty yards. Here I halted and was examining them with all the curiosity that is natural for a man to feel on seeing an unusual appearance, when the Indian impatient at my delay and fearful of discovery, fired his gun, and



Mountain Sheep
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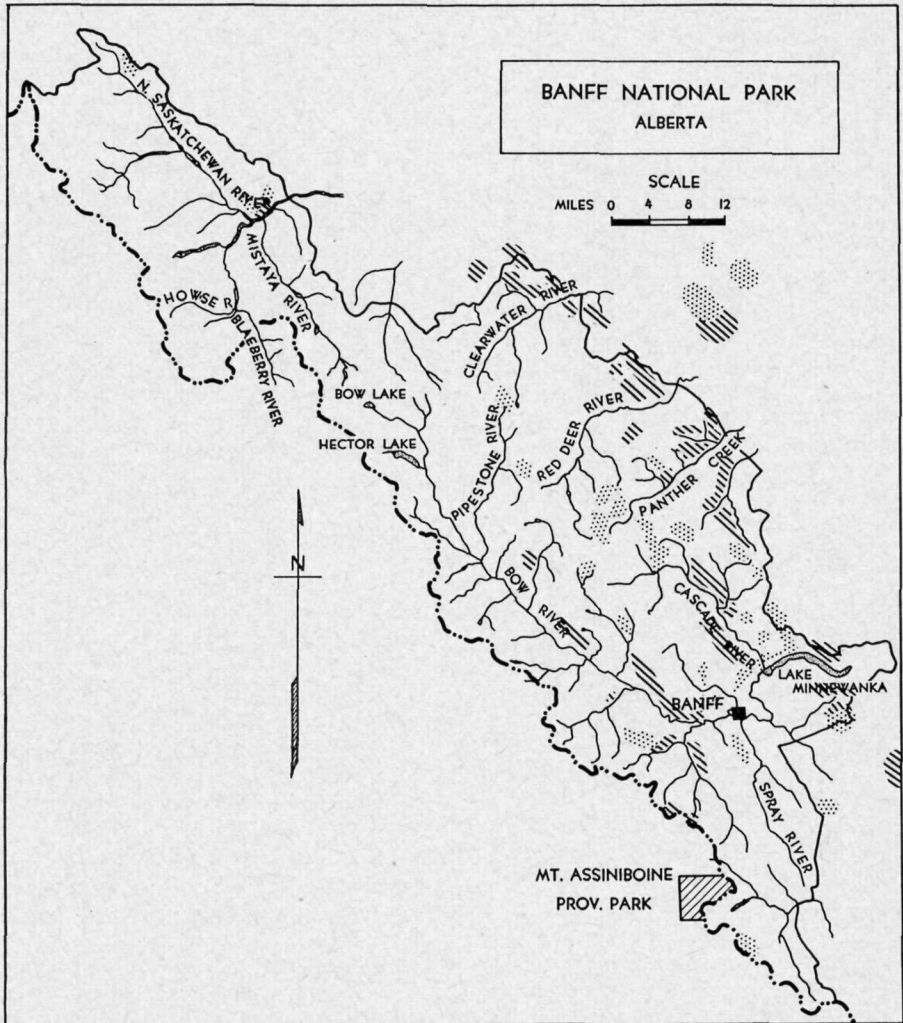


Figure 5. Summer (stippled areas), and Winter (oblique ruling), distribution of Mountain Sheep.

killed a female on the spot. The herd, alarmed by the report, took to flight, and made for the rocks. Angry at the Indian's impatience, I pursued them with eagerness; he followed; and, in the course of the afternoon, we killed four more, two of which were young. I had the satisfaction to shoot a large male . . . and I have preserved his skin with a view to presenting it to the Royal Society. During the winter I had frequent opportunities of hunting this tribe which enabled me to make a few observations on it that may be of advantage to naturalists, toward ascertaining the genus or species of this animal.

"It is only to be met with in the rocky mountains, and generally frequents the highest regions which produce any vegetation though some-

times it descends to feed at the bottom of the valleys, from whence, on the least alarm, he retires to the most inaccessible precipices

"The mountain ram, or sheep, though not very often seen, is to be met with, in considerable numbers in some parts of the mountains. I have, on several occasions, seen herds of twenty or thirty, but generally not more than two or three of them together In winter they frequent the southern declivity of the mountains, to enjoy the sunshine, the lower regions and the valleys at that season being covered with a great depth of snow."

In David Thompson's narrative there are only brief references to having killed sheep in the upper Saskatchewan Valley during his trips over Howse Pass in October, 1808; August, 1809; and June, 1810 (Tyrrell, 1916).

Alexander Henry's journal (Coues, 1897) provides an excellent description of sheep numbers and distribution in the Saskatchewan Valley in 1811. He saw sheep tracks near a cave on the first mountain range, on his ascent of the Saskatchewan River. From that point on, his hunters encountered many sheep. He observed a band of 30 rams below the Kootenay Plains on February 7, and others on the slopes above the Plains. However, he reported that they did not occur as far as Kootenay Park.

Simpson (1847) saw sheep above Lake Minnewanka and on Cascade Mountain in 1841. He recorded their tracks on the descent of Simpson Pass in British Columbia.

Palliser's (1860) account also has several references to sheep in the area. Dr. Hector noted a large band of sheep on Cascade Mountain on August 18, 1858. A single sheep was observed near Saskatchewan Crossing. His Indian hunter, called Nimrod, told Dr. Hector that it was the limit of their range in the mountains. Later he shot mountain sheep farther down the Saskatchewan near the Kootenay Plains. He recorded observing 100 rams and other bands of ewes and lambs on the last ridge of mountains before the foothills. Dr. Hector also noted sheep on Pipestone Pass and hunted others on Bighorn Creek (in 1859).

The Earl of Southesk (1875) observed many bands of mountain sheep north of the park boundary, but on his return route through the park in September, 1959, he observed a band at the headwaters of Pipestone Creek.

Millar (1915) estimated the sheep population in Rocky Mountain National Park to be between 500 and 700. He estimated an additional population of 200 to 450 to inhabit the mountains between the park and the Athabasca River. (Some of this area is within the present park boundary.) Williamson (1916), after reporting that sheep had almost disappeared from the Rockies, described their occurrence in the park. "You can hardly travel along the automobile road from Banff to Castle without running into a flock of 30 or more Wardens report 90 sheep having been seen in one flock."

Hewitt (1921) reported on conditions about 1919. Within a range of 10 miles west of Banff, there were an estimated 375 mountain sheep. He reported that it was not an uncommon sight to see 30 ewes and lambs on the road at the Vermilion Lakes in summer. Early in 1919, 52 sheep had been observed on Cuthead Mountain, 71 near Massive, and a large flock on the Three Sisters Mountains. He scored the hunting by Stony Indians as responsible for their decline outside the park.

Green (1949) summarized his observations on the distribution and ecology of mountain sheep in Banff National Park. According to the Park Superintendent's report for 1914, 100 sheep were counted south of the Bow River and 550 north of the River. According to Green's informants, the sheep population was substantially larger in the 1920's than at present. As reported by Hewitt, the Sawback range supported between 300 and 400 animals. Warden J. E. Stenton reported that with James Simpson, Sr., he had counted between 600 and 700 sheep on the Palliser Range during this period. Large bands were similarly recorded for the Clearwater, Panther, and Red Deer rivers. About this time, 50 mountain sheep were donated to the British Columbia Game Conservation Board for restocking sheep ranges near Spence's Bridge, B.C. (Lloyd, 1927).

Clarke (1940) reported that there were over 100 sheep at Ya-ha-tinda Ranch during the winter of 1930. He also observed them in 1939, at Dormer, Red Deer, Clearwater, and Pipestone creeks; and at Banff, Lake Minnewanka, and Sulphur Mountain. In 1941, he (Clarke, 1942) added several other localities: Mount Bourgeau, Sulphur River, Goat Range, and Mount Assiniboine. Clarke was the first investigator to relate their distribution pattern in the park to snowfall, as outlined later.

Cowan (1943) collected a great deal of information on sheep distribution, biology, and ecology during his field investigations in the park. After examining the remains of 40 sheep near the Sulphur Springs on the Panther River, he concluded that epizootics had been an important factor in reducing the sheep population in recent years. He found evidence of heavy mortality among sheep during the years 1935, 1936, and 1941. James Simpson, Sr., told him of a previous epizootic among sheep in 1931. The cause or causes of these epizootics have not been determined. Cowan observed chronic actinomycosis among the sheep as well as verminous pneumonia caused by infestations of lung worm (*Protostrongylus*). Recently, in 1952, the Minnewanka sheep band suffered from an outbreak of contagious ecthyma, which was identified by Dr. Duthie of the Veterinary Research Laboratory, Lethbridge. No mortality was noted, and the conditions were later cleared up.

The present distribution, migrations, and population of mountain sheep in the park may be outlined with fair accuracy from aerial surveys, ground patrols, and wardens' observations. The summer and winter distribution, based upon 1953 records, is outlined in Figure 5.

Although sheep are widely distributed throughout the park, they are generally restricted to certain mountain slopes because of their special food requirements, climatic tolerances, and need for escape terrain. Some of these requirements are so obvious that good sheep habitat can be instantly recognized. The fact that special requirements such as soil and vegetation are not easily recognized explains their absence from some areas that appear to be suitable. In general, sheep occupy grassy slopes, which may be permanent or temporary subclimax associations resulting from burns. These slopes may be found from approximately 4,600 feet at the Vermilion Lakes to the limit of vegetation at approximately 8,500 feet elevation. The exposure is generally southwest or south as first described by McGillivray. Low snowfall is a requirement for winter ranges. The maximum tolerated annual snowfall is probably about 60 inches. Strong westerly winds blow the favourite steep slopes relatively

free of snow during much of the winter. Rimrock in close proximity to the feeding slopes is required for escape from predators. Some low rolling hills, although favourable sheep range, are not occupied during periods of wolf activity. On the other hand, the slope must not be so steep that erosion prevents the establishment of a grass turf.

The winter sheep range north of Banff is restricted to the eastern ranges where the snowfall is much lighter than on the Continental Divide. South of Banff, there are small numbers of sheep on the Continental Divide as far north as Citadel Pass. However, sheep numbers south of the Bow Valley have declined in recent years. The last sheep reported on the Goat Range were seen in 1943. North of the Bow Valley, large numbers of sheep find winter range on the flanks of the valleys of Lake Minnewanka, Carrot Creek, and the Bow, Cascade, Dormer, Panther, Red Deer, and Clearwater rivers. The most westerly bands occur in winter on Copper Mountain, Mount Eisenhower, Baker Creek, and Mount Wilcox.

In summer, there is a considerable westward drift toward alpine meadows in high cirques. Favourite summer haunts are Sulphur Mountain, Mount Bourgeau, Mount Aylmer, Johnston Creek, Pipestone Pass, Cuthead Pass, upper Panther River, Snow Creek Pass, Mount Wilcox, and Nigel Pass. A large number of sheep have been ear-tagged by warden J. E. Stenton at Lake Minnewanka, and a smaller number by special warden H. U. Green at the Vermilion Lakes. By using different coloured tags, a small amount of exchange between the bands has been observed. The sheep licks at the Vermilion Lakes and Lake Minnewanka draw sheep from a considerable distance.

From all available information, the park sheep population was estimated to be approximately 625 in 1953. The segregated band counts were as follows: Citadel Pass, 2; Sulphur Mountain, 25; Mount Bourgeau, 5; Carrot Creek, 15; Lake Minnewanka, 90; Sawback Range, 30; Mount Eisenhower, 15; Baker Creek, 10; Cascade River, 100; Dormer River, 90; Panther River, 50; Bare Mountain, 40; Tyrrell Creek, 40; Ya-ha-tinda Ranch, 35; Clearwater River, 25; Indian Head Creek, 30; Mount Wilson, 10; Three Sisters, 3.

A comparison of the historical records with current data leads one to conclude that sheep ranges and populations have changed very little from those described 100 to 150 years ago. McGillivray's notes indicate that the size of bands he met were similar to those now observed. Indeed, I counted 23 sheep at "The Gap" in 1953, where he collected the type specimen from a band of 30 sheep in 1800. A small band of sheep still inhabits the southern shoulder of Mount Wilson on the Saskatchewan River, which Indian guides pointed out to Henry and Hector as the westernmost sheep outpost in the area. Generally, sheep bands still occupy the same restricted slopes upon which they were observed by the explorers.

It is reported that there was a larger population in the park during the period 1919 to 1935, indicated by the observations of Hewitt, Stenton, and Simpson. There are several factors to be considered in explaining the present decline.

The sheep range on the southern end of the Sawback Range is now thickly covered with a young forest of Douglas fir. This range was examined in July, 1953. The large mature trees showed old burn scars. Cross-sections of the younger fir trunks showed about thirty annual rings,

suggesting that the slopes were probably open grassland with a few old sentinel firs when Hewitt (1921) reported a local population of 375 sheep. It should also be remembered that the period of sheep abundance coincided with a small, but expanding wapiti population, which reached excessive numbers after 1935. During the past decade, the wapiti have seriously competed with sheep for the limited winter grass supply.

It is, therefore, concluded that the sheep population increased during the early part of this century, without competition from wapiti, wolf predation, or human utilization. In recent years, the population has declined because of an increase in wapiti competition, wolf predation, and shrinking ranges resulting from forest regeneration on temporary grassy slopes.

Specimens collected: Hillsdale Draw, 1.

Specimens examined: Banff, 1 (N.M.C.).

Specimens reported: Hillsdale, 2; Johnston Creek, 3; Banff, 5; Sawback Range, 3 (Cowan, 1940).

DELETION

Raccoon, *Procyon lotor hirtus* (Nelson and Goldman)

Anderson (1946) reported a specimen of raccoon from Banff and included the park within its natural range. The specimen has been examined; its label indicates that it was prepared by Norman Sanson from an animal captured in Ontario. There are no other reports of this mammal in the park.

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