

REPORT ON THE MAMMALS OF  
WATERTON LAKES NATIONAL PARK.

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BY

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## INTRODUCTION

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Waterton Lakes National Park, the southern unit in the Rocky Mountain chain of National Parks, is of particular interest to biologists because of its unique position in the southwest corner of Alberta, with boundaries on the Montana and British Columbia borders.

It is one of the smaller National Parks, with an area of approximately 204 square miles. The eastern slopes of the Rocky Mountains extend into the Park and form a narrow belt in this area. The Park has its western boundary on the continental divide. Part of the foothills area is contained by the northeast section of the Park. The main axis of the Rocky Mountains lies in a northwest-southeast direction. Thus, the rivers drain north out of the mountains onto the prairies. The Park contains two drainage systems, the Waterton River, including the Waterton Lakes, and the Belly River valley, the basin of which lies to the south in Glacier National Park.

The lower valleys are generally covered with a dense forest of lodgepole pine (*Pinus contorta latifolia*), white spruce (*Picea glauca*), and groups of Douglas fir (*Pseudotsuga taxifolia*). At higher altitudes the dominant conifer is the alpine fir (*Abies lasiocarpa*). There are also stands of limber pine (*Pinus flexilis*), white-bark pine (*Pinus albicaulis*), and alpine larch (*Larix Lyallii*) at altitudes of 7,200 to 7,500 feet, near the timberline.

Above the timberline are limited areas of alpine meadow. These are generally isolated on mountains and do not form extensive alpine ranges such as those in Banff and Jasper Parks. The abrupt eastern faces and gradual western slopes are characteristic of the mountains of Waterton Park. Under the eastern faces are numerous small lakes and talus slopes covered with an alpine flora. These

slopes are the summer range of many of the larger game mammals.

The foothills area and river bottoms are covered with grassland vegetation and clumps of aspen (Populus tremuloides) and balsam poplar (Populus balsamifera). Many slopes and valley bottoms formerly were forested. These forests were later destroyed by fire, and now the dry local climate limits vegetation to grassland.

Waterton Lakes National Park has received the attention of several zoologists, but there has not yet been any extensive report on the fauna of the area.

The area was first explored by Lieut. T. Blakiston, R.A., in 1857, a member of the famous Palliser expedition seeking passes to the Pacific in British Territory. Much of the early history of the Park is associated with J. G. "Kootenay" Brown who first viewed the Waterton Lakes in 1865 and remained there to become the first park superintendent.

The famous American biologist, Elliott Coues, visited the area in 1874 and collected specimens of mammals and birds, some of which formed the basis of description of new forms. In 1895, W. S. Spreadborough made a collection of mammals at Waterton Lakes for the National Museum of Canada. In the summer of 1922 and 1923, additional mammal specimens were collected by C. H. Young, of the National Museum of Canada.

In 1938 Dr. R. M. Anderson carried out wildlife investigations in the mountain National Parks for the National Parks Service.

In 1945 Dr. I. McT. Cowan spent two weeks in the Park and submitted a report covering the elk situation.

#### INVESTIGATION

The present investigation was carried out with the following aims:



- (1) An investigation of the ranges and populations of the larger mammals.
- (2) A study of the natural ranges of the Park with particular reference to the grazing of domestic stock.
- (3) An annotated list of mammals observed.

The period from July 30 to August 5, and August 8 to September 10 were spent within the Park. During this time 717 miles were travelled by vehicle, horseback, boat, and on foot. The routes traversed are indicated in figure 1.

The present report is based primarily on personal observation and studies. However, much valuable information was obtained from the Park wardens and has been incorporated into the report. This information, where quoted, is accompanied by the authority.

The report is presented in three sections dealing with larger mammals, range studies, and annotated list.

#### A.

Rocky Mountain Elk (Cervus canadensis nelsoni).

During the early years of this century elk were unknown in the Park vicinity, although weathered antlers testify to a much earlier presence of the animals. F. H. Riggall, of Twin Butte, first saw elk in the district about 1920. During the succeeding years a few elk drifted into the area from Glacier National Park and the Flathead country. The first elk to leave the Belly River valley were seen on the ranch of Max Bradshaw in 1932. These animals increased annually until heavy damage to feed stacks was caused in 1936 and succeeding years.

Dr. I. McT. Cowan (1945) stated that he believed the summer population of the Park to be about 500. From personal observations and inquiries this summer, the author considers this estimate to be too high.

During the investigation, no live elk or carcasses were found. Thus, no data on the population dynamics could be obtained.

Tracks of elk with calves were observed in the Boundary, Cameron, Bauerman, Sofa, and Belly River regions. It is believed that the majority of elk which summer in the Park are cows, calves, and occasional young bulls.

The present summer and winter elk ranges in the Park are shown in figure 2. The migration routes joining these ranges normally follow the connecting valleys.

The present summer elk population is estimated as:

Belly River	30
Dungarvan - Galwey basin	25
Cameron valley	5
Bauerman valley	10
Blakiston valley	5
Sofa Mountain	10
Bertha valley	5
Alderson valley	5
Boundary valley	15
Total	<u>110</u>

The winter elk population of the park is estimated as:

Belly River Valley	1000
Oil Basin	200
Badlands	200
Pass Creek	100
Boundary Cabin	<u>20</u>
Total	1520

The Park population increases fifteenfold in the winter because of immigration of elk from other areas, including that portion of the Belly River, in Glacier National Park, the Castle



and Sage River valleys of Alberta, and the Akamina valley of British Columbia.

Elk depredations on ranchers' green feed and hay-stacks are well documented in Cowan's report and will not be enlarged upon here. Information at hand indicates that about 450 elk were slaughtered on adjacent ranches during the winter of 1946-7.

In general the elk winter ranges are in excellent condition, with little sign of heavy utilization of browse. There are early signs of utilization of willow (Salix sp.) and aspen in the Indian Springs area, where 200 elk wintered last year.

Signs of severe local over-browsing were noted at the Boundary Cabin, Waterton Lake. At this site the aspen, balsam poplar, willow, lodgepole pine, and mountain maple (Acer Douglasii) were severely "leaf and twig" browsed. There was destructive stripping of maple bark. The reason for this local condition seemed to be the presence of a salt block. This block should be removed during the winter months.

Food habits. The following plants were found to possess a high palatability for elk.

<u>Populus tremuloides</u>	-	Aspen
<u>Acer Douglasii</u>	-	Mountain Maple
<u>Astragalus alpinus</u>	-	Alpine Vetch
<u>Amelanchier alnifolia</u>	-	Saskatoon
<u>Cornus stolonifera</u>	-	Dogwood
<u>Salix sp.</u>	-	Willows

The National Parks Service is committed to an elk reduction program in co-operation with Provincial authorities to alleviate depredations on the surrounding ranches. It is recommended that 200 head be removed from the Park winter ranges. These animals should be taken from Crooked Creek, Belly River,

and Indian Springs areas.

It is also recommended, as an experiment, that salt blocks be placed in the upper valleys of Crooked Creek and Belly River, in an effort to keep the elk within the Park during winter months.

Rocky Mountain Mule Deer (Odocoileus hemionus hemionus).

The mule deer is by far the commonest large mammal in the Park. During summer months deer may be observed, or tracks noted, anywhere within the Park. A map of the summer range of the mule deer in the Park, would include the total area of the Park, with the exception of the highest peaks and steepest rock walls. Mule deer tracks were observed at 7,900 feet on Mt. Carthew during the present study, and several deer were observed among bighorn sheep on the many talus slopes above 7,000 feet. In general bucks and barren does tend to work high up into the alpine country during the summer, and does with fawns remain in the river valleys, often frequenting the winter range.

Population Dynamics. The deer observed have been classified in table (1). All possible duplications have been eliminated from the observations.

Table 1.

<u>Class</u>	<u>Number</u>	<u>Percentage</u>	<u>Percentage of</u>
Adult bucks	8	16.6%	Adult population
Adult does	40	83.4%	" "
Yearlings	2	5.0%	Does
Fawns	13	32.5%	"

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The percentage of bucks in the adult population is surprisingly low. Dr. Cowan (1944) reported 33 per cent bucks and 67 per cent does in Banff and Jasper Parks. Consideration



should be given to the possibility that bucks, being at higher altitudes, are less frequently observed.

The survival of yearlings is probably because of the severity of the previous winter. Considering the possibility that some fawns might still have been cached, the percentage is considered satisfactory, and indicates a stable or slightly increasing population.

Lethal Factors. All deer observed seemed to be in good condition. Most does with fawns were thin and some showed signs of delayed moult, but these are normal conditions. The bucks and a majority of does seemed to be in good flesh. No specimens were taken for pathological examination.

From a casual observance of coyote scats and carcass remains, it would seem that coyotes are taking an average number of deer during the winter.

Seven carcasses, three adult and three senile does and one buck calf, were found in a heavily browsed grove of Douglas firs (Pseudotsuga taxifolia), immediately east of the Pass Creek Cabin. These deer had died of starvation. In the Pass Creek flats many other firs had been heavily browsed. There is apparently a local over-population of mule deer on the winter range. This condition is either caused or aggravated by the salt block at the Pass Creek Cabin.

Distribution. The winter mule deer range is indicated in figure 3.

Population. It was impossible to estimate the population of mule deer from the summer observations. Mr. Holroyd, in a letter of January, 1947, estimated the number of mule deer then on the winter ranges at 1,700. This seems to be a reasonable figure.

Food Habits. The following plants were observed to be eaten by deer during the summer months:

<u>Xerophyllum tenax</u>	- Beargrass (flowering stalks)
<u>Veratrum grandiflorum</u>	- False Hellebore
<u>Erythronium grandiflorum</u>	- Glacier Lily
<u>Betula fontinalis</u>	- Water birch
<u>Hedysarum americanum</u>	- Hedysarum
<u>Astragalus alpinus</u>	- Alpine vetch
<u>Amelanchier alnifolia</u>	- Saskatoon
<u>Acer Douglasii</u>	- Mountain maple
<u>Cornus stolonifera</u>	- Dogwood
<u>Vaccinium membranaceum</u>	- Whortleberry
<u>Lappula floribunda</u>	- False forget-me-not.

White-tailed Deer (Odocoileus virginianus ssp.).

The white-tailed deer is noted occasionally in the Park. It is most commonly observed around the townsite during the winter.

Yellowstone Moose (Alces americana shirasi).

The moose has only recently re-appeared in the Park. Dr. Anderson made no mention of the moose in his report of 1938. That the moose formerly occurred in the area is proven by the large head at the headquarters buildings which was dug out of a swamp in the Stoncy Creek area many years ago.

This re-colonization of the Park is in line with a general increase in moose in the area south of the Crow's Nest Pass as reported by E. S. Huestis, Alberta Game Commissioner. E. Beatty, Chief Naturalist of Glacier National Park, reports a recent increase in that Park also.

Population Dynamics. In table 2 are classified the observations after elimination of all possible duplication.

Table 2.

<u>Class</u>	<u>Number</u>	<u>Percentage</u>	<u>Percentage of</u>
Adult bulls	3	43.0%	Adults



Table 2. (con't)

<u>Class</u>	<u>Number</u>	<u>Percentage</u>	<u>Percentage of</u>
Adult cows	4	57.0%	Adults
Yearlings	0	0%	Adult cows
Calves	4	100%	Adult cows
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Total	11		

This sample is too small to be significant, but it does suggest a successful calf crop. All these animals were observed at salt licks in the Cameron and Blakiston valleys. There were abundant signs of moose in these valleys. All animals observed seemed in good condition. No carcasses were found and no specimens taken for pathological examination.

Distribution. The present winter and summer ranges are indicated in figure 4.

Population. The present moose population is estimated at

Cameron Creek	-	15
Bauerman Brook	-	10
Lakes district	-	7
Sofa Mountain	-	3
		<hr/>
Total		35

Bighorn Sheep (Ovis canadensis canadensis).

The bighorn sheep has been a constant resident of the Park since its inception. In 1936 the sheep population suffered from an epidemic disease which decimated certain bands. There seems to be some confusion as to the probable cause of the epidemic. It occurred simultaneously with an epidemic at Many Glaciers, Glacier Park, and it is reasonable to assume that it was verminous pneumonia, as diagnosed by Marsh (1930) for Glacier Park. The Sofa Mountain band apparently suffered most from the epidemic and has since shown little increase in numbers.

Population dynamics. The observation and mapping of bighorn ranges was considered a major project of the investigation. The observations, with possible duplications eliminated, are listed in table 4.

Table 4.

<u>Class</u>	<u>Number</u>	<u>Percentage</u>	<u>Percentage of</u>
Adult rams	16	42%	Adult population
2 and 3 year rams	6	16%	" "
Adult ewes	16	42%	" "
Lambs	6	37.5%	Ewes
Yearling	1	6.2%	"
Total	45		

Cowan, in his studies in Banff and Jasper Parks, found that the sex ratio was 50-50. It is reasonable to assume that this also holds true in the Waterton Lakes bands, suggesting that all the summer ewe ranges were not found. This is borne out by other data presented later.

The satisfactory reproductive rate for this season and the extremely poor survival from last year are noteworthy.

The bighorn observed seemed in excellent condition. No carcasses or signs of predation were found and no specimens were taken for examination.

Distribution. The local population of a mammal can best be estimated during the winter when the animals are concentrated. Wardens and park residents supplied the following data on winter ranges:

The bighorn sheep of the Park are divided into bands. These bands generally remain separate, although on the summer ranges, a certain amount of mixing is possible. The water barrier separating the Vimy band from the other bands makes an exchange of animals unlikely. No doubt this has played an important part in the slow recovery of this band from the 1936 epidemic.

The following winter ranges are indicated in figure 5.

1. Vimy. This range is a rocky promontory jutting into Waterton Lakes opposite the townsite. The vegetation consists of shrubby spruce and aspen clumps.
2. Carthew Lakes. This range consists of several alpine slopes above the timberline at an altitude of 7,000 to 7,900 feet. The more important of these slopes have a south or southwest exposure. The steepness of the slopes probably helps to keep them free of snow in winter.
3. Mount Rowe. This range, at an elevation of 7,500 to 7,900 feet, is on the souther exposure at the timberline and includes some alpine slopes and clumps of scrubby alpine fir, white-barked pine, and limber pine.
4. Bellevue Hill. This is the most important winter range, and consists of the lower slopes of Bellevue and Mount Galwey at an altitude of 4,800 feet to 6,000 feet. It covers approximately two square miles. The area is generally grassland, with some aspen groves and groups of spruce and Douglas fir.
5. Lakeview Ridge. This is an extensive range of grassland and aspen groves which is more or less persistent due to xerophytic conditions. It has an area of approximately one square mile and lies at an altitude of 5,400 to 5,900 feet.

The summer bighorn sheep ranges are indicated in figure 6. During the summer months the behaviour of these bands varies one from another.

The Vimy band leaves its winter range and works up Hell Roaring Creek onto the slopes of Vimy ridge, and some sheep work over the alplands as far as Sofa Mountain lookout. This



band summers at altitudes ranging from 6,500 to 7,800 feet. There is not sufficient data on hand to draw conclusions as to the segregation of the sexes during the summer.

The Carthew band does not completely disperse from the winter ranges. Small groups of rams may be regularly observed on the slopes above the Carthew Lakes. The rams spread out in small groups along the talus slopes of Cameronian, Carthew, Alderson, and Richards mountains. It is doubtful if any of these rams descend below 6,500 feet.

The sexes do not appear to be completely segregated. Groups of ewes and immature rams work along the ridge of Cameronian Mountain, cross the Cameron Creek Canyon, and summer on the alplands of Crandell Mountain. These are the animals which appear regularly at the salt block at Rocky Point on the Akamina Road. Other ewes summer on the talus slopes of Mount Cameronian, and a ewe and lamb were observed above Bertha Lake in the early autumn.

The Mount Rowe band apparently moves little from its winter range. The sheep move around Mount Rowe and summer on the talus slopes above the Rowe Lakes and on Mount Lineham.

The movements of the Bellevue band are probably best understood at this date. In early summer the rams begin a general westward movement up the Blakiston and Bauerman Brook valleys. They have been observed en route on the southern slopes of Anderson peak. These particular rams are probably the ones that summer on Mount Bauerman. The majority of rams migrate along the southern face of Glendowan and Avion ridge until they reach the talus slopes under the continental divide in the lakes district. These slopes at Lost, Twin, Peck's and Lone Lakes are at an elevation of 6,300 to 7,900 feet.

At present little is known of the movements of sheep from Lakeview ridge. It is probable that they summer on the Northern slopes of Mount Dungarvan.

Population. The wintering sheep population, based on the observations of the Park staff during the past winter, is estimated in table 5.

Table 5.

<u>Band</u>	<u>Observation</u>	<u>Observer</u>	<u>Estimated Population</u>
Vimy	8 rams & ewes	DeVeber	20
Carthew	40 - 50	Bailey	45
Rowe	17	Ashman	17
Bellevue	40	Christiansen	40
Lakeview	1	Barnes	3
Total			125

Assuming a 50-50 sex ratio, it is possible to test the accuracy of this estimate by listing the observations on the summer ranges.

Of the Bellevue band the following were observed on

summer ranges:

<u>Ram ranges</u>	Lost Lake	1	(Christiansen)
	Twin Lakes	4	
	Peck's Basin	2	
	Lone Lake	3	
	Bauerman	7	
	Total	17	

Therefore 17 of the assumed 20 rams were observed.

Ewe ranges Galwey slopes 5

R. Bailey observed 17 ewes and lambs here in late June.

Carthew band

<u>Ram</u> ranges	Cameronian Mt.	7
	Carthew	10-12 (Bailey)
	Crandell	1
	Bertha	1
		<hr/>
	Total	20

Therefore 20 of the assumed 22-23 rams are accounted for.

<u>Ewe</u> ranges	Crandell	3
	Cameronian	9
	Bertha	1
		<hr/>
	Total	13

Therefore 13 of the assumed 22-23 ewes are accounted for.

Of the Rowe band, only two rams at lower Rowe Lake and one ewe at the head of Rowe valley were accounted for.

Of the Vimy band, two rams were observed by tourists on the Crypt trail and five ewes were observed last fall at the head of Crooked Creek.

Considering the fact that the lambing grounds and ewe ranges have not yet been fully accounted for, the estimate of 125 Bighorn sheep seems a fair one.

Food habits. The following plants were eaten by Bighorn sheep:

<u>Dryas octopetala</u>	- White Dryad
<u>Dryas drummondi</u>	- Yellow Dryad
<u>Lappula floribunda</u>	- False forget-me-not
<u>Veratrum viride</u>	- False Hellebore
<u>Erythronium grandiflorum</u>	- Glacier lily
<u>Pentstemon</u> sp.	
<u>Pedicularis contorta</u>	- Alpine Lousewort
<u>Eriogonum piperi</u>	- Sulphur plant
<u>Eriogonum subalpinum</u>	- Umbrella plant
<u>Trollius albiflorus</u>	- Globe flower



Montana Mountain Goat (Oreamnos americanus missoulae).

The mountain goat is one of the most spectacular of the Park mammals and is regularly observed at high altitudes by the many tourists who take to the Park trails. Goats are seldom observed below 6,000 feet altitude in the Park and reach this level above Bertha Lake.

Little is known of the seasonal movements of these mammals. It is generally believed that they do not change their ranges with the seasons and that they manage to make a living off windblown, exposed slopes, and rock faces, where the scanty alpine vegetation is exposed.

An interesting observation was made by Warden Christiansen last winter when he saw a mountain goat walk down the Pass Creek road and climb Bellevue hill. This winter observation of a goat a long way from its summer range suggests some winter movement to lower elevations.

Population Dynamics. The total number of goats observed during the investigation are listed in table 6, with all possible duplications eliminated.

Table 6.

<u>Class</u>	<u>Number</u>	<u>Percentage</u>	<u>Percentage of</u>
Adult billys	16	59.3%	Sexed adults
Adult nannys	11	40.7%	" "
Unsexed	4		
Yearlings	1	9.1%	Females
Kids	3	27.4%	"
Total	35		

The percentage of males indicates that not all the summer nanny ranges were found. The percentage of kids and yearlings is low, suggesting a declining population. But the small sample count must be considered. This may not be a true sample of the total population.

Lethal factors. All goats observed seemed in good condition. No carcasses were found or specimens taken for pathological examination.

One mature billy observed in the Festubert basin was noted coughing repeatedly. This suggests an infection by the hair lungworm (Protostrongylus stilesi).

Distribution. The ranges occupied by known bands of mountain goat are indicated in figure 7.

These ranges may be described as talus slopes and alplands, including the rock faces above the slopes which are utilized as lookouts, resting sites, and escape terrain. These ranges are at an altitude of from 6,000 to 8,000 feet and include the majority of the suitable peaks.

Many of the talus slopes are occupied by bands of both sheep and goat. There seems to be little friction between the animals, although they ususally keep to their own bands and seldom mix.

During the summer months the sexes are segregated, and although they may occupy the same ranges, they do not seem to mix. The higher talus slopes of the continental divide seem to be billy range while the eastern slopes at the heads of upper valleys are occupied by nannies and kids.

Population. The present Park population of mountain goats is estimated by bands in table 7:

Table 7.

<u>Band</u>	<u>Observed</u>	<u>Observer</u>	<u>Estimated Population</u>
Sofa Lookout	0		2
Crypt Lake	0		3
Bertha-Alderson	12	Bailey	12

Table 7. (Cont'd)

<u>Band</u>	<u>Observed</u>	<u>Observer</u>	<u>Estimated Population</u>
Cameronian	1		1
Forum Lake	1	Ashman	1
Rowe Lakes	1	"	3
Lineham Lake	6	Solman	6
Goat Lake	16	Christiansen	16
Blakiston	3		6
Lost Lake	6		6
Mt. Bauerman	6		6
Pecks Basin	2		2
Lone Lake	2		2
Mt. Festubert Basin	7		7
" " Valley	0		4
Ruby Ridge	0		3
Total	63		80

#### Carnivores

Rocky Mountain Black Bear (Euarctos americanus cinnamomum).

The black bear is the commonest of the larger carnivores in the Park. They are commonly observed on all roads and park trails at low and medium altitudes. Certain black bears are regularly observed in the townsite at garbage bins and at the nuisance grounds. During the current season there were about seven bears which frequented the townsite, and it was reported that during the last week of August there were approximately 25 bears observed at one time at the nuisance ground.

Population dynamics. During the investigation, 12 black bears were observed after all possible duplications were subtracted. These are classified in table 8.



Table 8.

<u>Class</u>	<u>Number</u>	<u>Percentage</u>	<u>Percentage of</u>
Adult black	5	75%	Total bears
Adult brown	2	25%	
Immature black	1	28.5%	Adult bears
Immature brown	1		
Cub black	3	43%	" "
Cub brown	<u>0</u>		
Total	12		

It is this subspecies of bear which shows the highest percentage of the brown or cinnamon colour phase. From the data presented above, 25 per cent of the bears belong to the brown colour phase.

It will be noted that the reproductive increment of this season is 43 per cent of the adult population. If a 50-50 sex ratio is assumed, this would indicate an increment of 86 per cent to the adult female population.

This small sample suggests that there is a large annual increase and yearling survival among the black bears of the Park.

There were no reports of disease among the bears. No carcasses or signs of disease were found. No specimens were taken for examination.

Control Methods. This bear causes a continual problem in the National Parks of Canada and the United States. In general, the control methods applied are similar in the two countries.

The control measures applied in Canada are:

- (1) Tourist education - "Do not feed the bears."
- (2) Live-trapping and removing the bears.
- (3) Frightening the bears.
- (4) Destruction of the nuisance bear.

These methods all produce limited results. Bears live-trapped and removed to remote areas generally appear back in the original locality in varying lengths of time, depending on the distance they were taken. In August a female black bear and two cubs were live-trapped in Waterton Lakes townsite and released in the Belly River valley; yet within a week the adult and one cub were again in the townsite and the second cub joined the group soon after.

The destruction of the nuisance animals forms a vacuum into which other animals flow, provided that the attraction is still there. In this way no lasting effect is achieved by destroying the bears.

In the American parks, considerable attention is paid to another method of control, that of garbage disposal. The "nuisance ground", a familiar sight in the Canadian parks, is unknown. It is replaced by complete incineration of all garbage. In Glacier National Park all garbage from camp sites and hotels is picked up at 4 p.m. and the garbage pails washed with a strong disinfectant which discourages the attentions of bears. After 4 p.m. no garbage may be deposited in the receptacles until the following day. With this method of control, there has been little trouble with black bears around hotels and camp sites. It has been necessary to destroy only three bears in Glacier Park in the past three years. This compares favourably with Canada's policy, whereby many bears are destroyed annually as nuisance animals.

When one considers the Canadian parks and the bear problem, there is a striking exception to the rule. All the parks have a continuous bear problem with the notable exception of Riding Mountain National Park, where there is an efficient incinerator.

The primary attractions for bears in the immediate vicinity of the townsites are the nuisance grounds and garbage containers. After the flow of garbage to the nuisance grounds ceases, the bears begin their destructive patrol of cottages and out-buildings.

The methods used in the Canadian parks to combat the bear nuisance problem are temporary arrangements that do not strike at the source of the problem. Until methods are directed at the source of the problem there will be no permanent solution to the bear problem. The source of the problem is the readily available garbage at the nuisance grounds and townsite containers. If these sources of available garbage were removed, the number of problem bears would be greatly reduced. Steps should be taken to dispose of all townsite, campsite, and hotel garbage by complete incineration in modern, efficient incinerators, and the daily collection of garbage and sterilization of containers should be instituted.

Grizzly Bear (*Ursus horribilis* ssp.).

Grizzlies are regularly seen on many of the trails to the higher lakes during the summer months. In spring they often appear at lower altitudes in the main valleys, even appearing on the golf course. At this season they are feeding on the roots of *Hedysarum boreale*. They also clean up any winter-kill carcasses that may remain on the winter game ranges.

The summer ranges of this animal seem to be along the backbone of the continental divide and adjacent promontories such as the Mount Alderson complex and Mount Dungarvan. They inhabit the alpine slopes and amphitheatres at or above the timberline, and are seldom observed below 6,000 feet. The summer range is indicated in figure 8. It is believed that most recent observations were made in these areas. There is reason to believe that there are no grizzlies on the Sofa complex east of Waterton Lakes.



Population. Grizzly bear observations during the past summer that were brought to the author's attention are listed in table 9. From these observations the grizzly population is estimated.

Table 9.

<u>Location</u>	<u>Observed</u>	<u>Estimated</u>
Goat Lake	1	2
Twin Lakes	3 (2 cubs)	3
Lone Lake	2 (1 cub)	2
Carthew Lakes	2	2
Dungarvan	1	3
Rowe Valley	2	1
Alderson		1
Others		2
Total	10	16

No information was obtained on the feeding habits of grizzlies. There are a few complaints of grizzly predation on domestic stock from year to year in the vicinity of Waterton Lakes Park.

Mountain Coyote (Canis latrans lestes).

During the investigation, four coyotes were observed in the Cameron, Blakiston Valleys, and Waterton Lakes areas. Their tracks were observed on most Park trails, and a group was heard in full chorus in the Upper Rowe valley. The summer distribution of coyotes apparently covers the total area of the Park with the exception of the highest and most rocky terrain.

During winter months the coyotes concentrate on the elk and deer winter ranges at low altitudes on the "badlands" and in the Pass, Belly, Stoney, and Crooked Creek Valleys.

Examination of these winter ranges in summer produced many signs of winter utilization by these animals. There were

numerous beds, scats containing deer, elk calf, and snowshoe hare remains, and also an occasional deer leg. From the warden's reports, coyotes are fairly common at this time. Their predation on the mule deer can not be considered serious at the present time, considering the fact that some mule deer died of starvation last winter.

Northern Rocky Mountain Wolf (Canis lupus irremotus).

The wolf remains a rare straggler to the Park. No new data on its occurrence was obtained this year. If the peak of the wolf cycle is passed, as Dr. Cowan believes, it is doubtful that an increase in the wolf population will occur in this Park.

Northern Rocky Mountain Cougar (Felis concolor missoulensis).

There has been no increase in the number of these mammals or their tracks observed in the Park this year. It appears that the Park area is included in the regular circuit of two or **three** cougars. Tracks have been observed in the Pass Creek and Belly River valleys with some regularity. Two animals were seen at close range last year.

American Badger (Taxidea taxus taxus).

The badger is fairly common and is distributed over the foothills area within the Park. Their dens and diggings are one of the characteristic sights of the badlands. Their range in the Park is shown in figure 9. It is also the range of several other smaller mammals including the pocket gopher (Thomomys talpoides andersoni).

The badger is not looked upon with much favour on the golf course where it digs up Columbian ground squirrels (Citellus columbianus) on the fairways. Under the artificial conditions of golf course management, an ideal habitat for ground squirrels is produced. This provides a great attraction for ground squirrels which re-colonize the area as quickly as their predecessors are trapped or shot. The badger, too, finds an abundant food supply there.

Missouri River Beaver (Castor canadensis missouriensis).

The population of beaver in a given area fluctuates greatly over a period of years, because the food supply available from water courses runs out.

In Waterton Lakes Park there is much evidence of earlier beaver activity in areas where beaver no longer exist. Such sites are in the following drainages: Bauerman Brook, Blakiston Brook, Cottonwood Creek, Stoney Creek, Crooked Creek, Indian Creek, Belly River, Galwey Creek, and the Waterton River system.

The sites occupied by beaver during the summer of 1947 are indicated in figure 10. This list includes 13 active beaver lodges and five sites where single beavers have been operating.

From recent beaver population studies carried on in the U.S. Rocky Mountain National Park by Packard in 1947, an estimate of six animals per active lodge is a fair estimate of the population. On this basis, the beaver population in Waterton Lakes Park is about 83.

There are still many sites in the Blakiston Brook, Belly River, Crooked Creek, and Cameron Creek areas which could support beaver colonies as far as the supply of aspen (Populus tremuloides) and willow (Salix) is concerned.

Considering the large areas of aspen in the Park, 83 is a low population of beaver. Human activities largely account for this.

Beaver are looked upon with disfavour by some of the Park staff because of the cutting of trees and flooding activities around the dam. It should be pointed out that these are natural occurrences. Both the beaver and aspen belong to an association which is only one stage in the natural forest succession to a climax white spruce forest. The beaver dam, with flood-killed willows, is also a primary stage in the development of a climax forest through a wet meadow line of succession.

The live-trapping of beaver and destruction of ponds is only warranted where the beavers are working close to buildings or roads, thus endangering property. The destruction of beaver dams in the parks away from buildings and roads, because they are felling trees, or because the dam is unsightly, should not be tolerated.

During past years there has been considerable poaching of beaver by Indians in Waterton Lakes Park. The Indian Timber Limit within the Park boundary makes the detection of poaching in the area extremely difficult.

The third way in which man has influenced the beaver population in Waterton Lakes National Park is by the presence of domestic animals there. Several beaver sites are located in the area occupied by domestic stock during the summer. The beaver sites are used as watering holes and resting sites in the shade of the surrounding trees.

The activity of domestic stock around the beaver dams is detrimental in several ways. First, the numerous paths into the ponds and the constant defecation in the water tends to pollute the ponds and make them untenable for beaver. Second, the cattle try to cross the beaver dams and break them down. Third, the constant presence of these animals about the dam sites deprives the area of cover, and destroys the food supply by breaking down small trees and breaking limbs of the large trees while the dam sites assume the appearance of a farm yard by the continued accumulation of defecations. As several beaver ponds are near the Park roads these constitute a roadside nuisance.

## B.

### Range Studies in the Waterton River Valley.

The problem of domestic stock grazing in Waterton Lakes National Park has recently received increased attention. In discussions it has been associated with the recent sortie of elk from the Park during winter months, and the subsequent depredations on ranchers' haystacks and green feed.



During the present investigation much time was assigned to studying the natural rangeland in the Park, in order that the Department would have complete scientific data on the present status of the range. This would form the basis of wise utilization of the range.

The methods used in the study consisted of mapping the winter ranges of the native mammals and of the domestic stock grazed on the Park on permit; a physical description of the natural ranges; clipping random plots to study range productivity; studying the composition and density of the main groups of plants by the Clarke (1942) point sample methods; and finally, by recording the present status by photographs.

The winter ranges and food habits of the various native mammals have been discussed at length elsewhere in this report. The summer range of domestic stock in the Park is indicated in figure 11. It is noted that this range is very similar to the winter range of native mammals, thus providing the basis for direct competition in proportion to the similarity of food requirements between the various mammals.

#### Description of Natural Ranges.

Pass Creek. The lower valley floor below Coppermine Creek is a temporary grassland resulting from forest fire, and is held in this condition by xerophytic conditions. Domestic stock is prevented from ascending the valley any appreciable distance by a stock fence at Pass Creek Cabin. The vegetation consists of grasslands, scattered aspen poplar groves, and sparse clumps of conifers.

The Badlands. This area, which constitutes the foothills area of the Park, probably consists of terminal moraines from the extinct Waterton valley glacier. Because of its moraine origin, the soil is poor and gravelly. The vegetation is probably a permanent grassland, with clumps of willows and aspen poplars in the hollows.

The Waterton River Valley. This is low alluvial river bottomland. The vegetation consists of open meadows, aspen groves, and some larger groups of balsam poplars and cottonwoods (Populus trichocarpa).

Belly River Valley. The conditions are similar to those of the Waterton valley.

Crooked Creek Basin. This is a drainage system for the northern talus slopes of the Sofa Mountain complex. The vegetation is largely aspen poplar (Populus tremuloides), with numerous wet meadows caused by poor local drainage and abandoned beaver dams. There is also extensive grassland on the northern Park boundary.

Clipping Studies.

In order to obtain an estimate of the productivity of the ranges, standard areas of ground vegetation were clipped, air-dried and weighed. The unit of measurement was one square foot. A total of ten square feet was clipped from the Pass Creek valley and "badlands". The locations of the clip plots were picked at random. Therefore it is reasonably accurate to state that the following productivity figures represent the average production of the ranges with domestic stock grazing on them.

The clippings were made on August 28 and September 5 after the year's growth was over. The amount of grazing by native mammals was negligible during the summer, as the area was frequented only by occasional mule deer. During this period there had been perhaps 1,500 cattle and horses on the Park ranges.

Sample plot No.	1	-	6.5	gms.)	
	No. 2		12.3	"	Badlands
	No. 3		12.3	"	
	No. 4		11.8	"	
	No. 5		12.1	"	
	No. 6		3.4	"	Pass Creek flats
	No. 7		31.1	"	
	No. 8		2.2	"	
	No. 9		8.8	"	
	No. 10		6.9	"	

These samples give an average yield of 10.7 grams of forage per square foot, which is equivalent to 1020 pounds per acre. This is above the average yield for submontane grasslands as given by Clarke (1942).

The construction of two or three enclosure plots on the Park ranges is recommended in order to measure the productivity and utilization of the ranges. During the present study there was no way of accurately measuring the utilization of the ranges by domestic stock.

In general, the plots containing good stands of natural grasses such as numbers 2, 3, 4, 5, and 7 showed no grazing. Plots such as numbers 1, 6, 8, 9, and 10 showed heavy stock grazing. If these plots are averaged independently, they give averages of 15.9 grams per square foot for ungrazed plots and 5.5 grams per square foot for grazed plots. This suggests that the grazing of domestic stock on the Park ranges removes about 65 per cent of the forage. This forage is therefore not available to the elk and mule deer which winter on the ranges and use the same grasses.

Density Studies. The composition and density of the various classes of plants on the range was measured by the point sampler, a method developed by Clarke (op.cit.) and fully explained in the annual reports of Dr. I. McT. Cowan.

One thousand points were taken on the range north of Pass Creek.

Composition of the ground vegetation was found to be:

Grasses and Sedges	33.3%
Herbs	10.0%
Shrubs	5.6%
Mosses	19.2%
Lichens	0.5%
Bare Ground	31.4%

This composition compares favourably with the over-utilized ranges of the Athabaska valley as reported by Cowan (1946).

It should be pointed out, however, that the bare ground, mosses, and lichens account for over 50 per cent of the cover, while many of the herbs are useless barnyard weeds.

The high percentage of moss on the range indicates unfavourable conditions for maximum grass growth, due in part to heavy utilization by domestic animals.

Mr. A. E. Porsild, Chief Botanist of the National Museum of Canada, carried on botanical investigations in Waterton Lakes Park in 1945. His views on the subject of grazing by domestic stock were sought, and in a letter dated October 4, 1947, he stated:

"To my great surprise, large herds of cattle and horses are permitted to graze within the Park and all natural grassland is over-grazed or destroyed by them. As a result of grazing, many prairie species and some farm weeds have invaded the lower foothills and slopes south of Red Rock Canyon. The flat between Waterton River and the Hills is so heavily grazed by cattle and horses that the vegetation is quite similar to that outside the Park gate. I presume that this was once natural prairie and would probably return to prairie if not grazed. At present I would classify it as pasture."

In view of all the considerations set forth above, the immediate withdrawal of grazing permits for horses and cattle within Waterton Lakes National Park is recommended. The biological reasons for this recommendation are summarized below:

1. It has been shown that, during the summer, domestic stock utilize about 65 per cent of the natural forage on the winter ranges of elk and mule deer.
2. The ranges themselves show indications of over-utilization in the high percentage of mosses, lichens, and bare ground.



3. The natural submontane grassland of the Park has been replaced by cow pasture conditions through introduction of pasture weeds and elimination of natural vegetation.

4. The grazing of domestic stock around beaver dams has destroyed the natural conditions.

5. The presence of domestic stock on the same ranges as native mammals produces a serious risk of the infection and depletion of the wildlife by diseases introduced by the domestic animals.

There are good reasons, other than biological, why grazing should cease in the Park. Many of these are already on file and will not be considered here.

It would be naive to believe, that if no grazing of domestic stock were permitted in the Park, the elk and deer would immediately cease their depredations on the surrounding ranches. In the long run, however, with good natural ranges, population controls, and salt blocks, the depredations of elk could be kept to a minimum.

## C

Annotated List of Mammals.

Sorex c. cinereus. Cinereus Shrew. One specimen was observed on the Bertha trail on August 15th. The National Museum of Canada has specimens taken by C.H. Young in 1922 and 1923 from the Belly River drainage, and Waterton Lakes. This shrew seems to be fairly common at elevations below the timberline.

Sorex o. obscurus. Dusky Mountain Shrew. One specimen was taken at the Superintendent's residence on August 20, 1947. The National Museum has specimens taken by C.H. Young in 1922 and 1923, at Belly River, Bertha Creek, Linnet Lake, and Waterton Lakes. A dusky shrew was taken from the stomach of a cutthroat trout (Salmo clarkii) caught September 4 at Lineham Lakes, altitude 7,100 feet. This shrew apparently ranges higher than the former species.

Sorex palustris navigator. Mountain Water Shrew. A dead specimen was found on the Upper Sofa Creek on August 10; a second water shrew was observed alive at Bertha Lake, August 15. Specimens collected from the Belly River, Bertha Creek, and Waterton Lakes by C.H. Young in 1922 and 1923 are in the National Museum. This shrew occurs regularly along all permanent water courses, up to moderately high altitudes.

Myotis l. lucifugus. Little Brown Bat. A series of seven adults and sub-adults were taken from a group roosting in the attic of the Waterton River warden's cabin on August 26. The average measurements of these bats were: total length 89mm, tail 40mm, hind foot 9.5mm, weight 7.4 grams.

C.H. Young of the National Museum also collected this bat on August 24, 1923, at Waterton Lakes.

A specimen of bat bedbug (Cimex pilosellus), an ectoparasite, was found on one of the specimens collected this year. This species is not the human parasite.

This bat is the common little brown bat of the Park, occurring at low altitudes.

Myotis evotis pacificus. Northwestern Big-eared Bat. Two specimens were collected from the rafters of Camp 2 cabin on the Chief Mountain Highway. The species was formerly taken by C.H. Young on August 18, 1922.

Euarctos americanus cinnamomum. Rocky Mountain Black bear. Considered elsewhere in this report.

Ursus horribilis. Grizzly bear. Considered elsewhere in this report.

Canis latrans lestes. Mountain coyote. Considered elsewhere in this report.

Canis lupus irremotus. Northern Rocky Mountain wolf. Considered elsewhere in this report.

Martes americana abietinoides. Selkirk Marten. A marten was observed on the Alderson Lake trail on July 13, 1946. During the present investigation numerous marten scats were observed on several of the wooded trails in the Cameron, Rowe, and Bauerman valleys. Warden Christiansen reported that during the winter months marten tracks were numerous in the Bauerman Brook area. Eli Ashman reported that marten were fairly common on his trapline, in the Akamina Brook area of British Columbia.

Mustela erminea invicta. Little Rocky Mountain Weasel. On August 30, 1947, two weasels were observed hunting pikas (Ochotona princeps) in a rock slide at the lower end of Cameron Lake.

Mustela vison ssp. Mink. According to Mr. Bailey, mink appear regularly about the fish hatchery. During this investigation fresh mink scats were observed on the shores of Cameron Lake.

Gulo luscus luscus. Wolverine. Although no information on the presence of this animal in the park was obtained, Eli Ashman reported taking several annually in his trapline in the Akamina valley of British Columbia. The animal undoubtedly occurs along the eastern slopes of the continental divide in the Park.

Lutra canadensis ssp. Otter. Mr. Bailey reported that an otter had appeared at the fish hatchery several years ago.

Mephitis mephitis hudsonica. Northern Plains Skunk. The skunk is noted regularly about the townsite and nuisance grounds.

Taxidea taxus taxus. American Badger. Considered elsewhere in this paper.

Felis concolor missoulensis. Northern Rocky Mountain Cougar. Treated elsewhere in this paper.

Lynx c. canadensis. Canada Lynx. According to Eli Ashman, lynx tracks are observed but rarely in the continental divide area and the Akamina valley.

Lynx rufus pallescens. Pallid Barred Bobcat. During the winter of 1946-47, Warden B. Pittaway shot, in error, a bobcat in the Belly River Valley. The skeleton was preserved. Pittaway reported that the tracks of these animals were observed regularly in this district last winter.

Ochotona princeps levis. Hollister Pika. This pika is fairly abundant in the Park and individuals seem to inhabit every suitable rockslide irrespective of altitude. Pikas were heard calling from rockslides on the shores of the Upper Waterton Lake at 4,200 feet. Others were observed in the rockslides above Twin Lakes at an altitude of 7,900 feet. Two specimens were collected, one from Mount Crandell on August 4, 1947, and the other from Mount Carthew on August 19, 1947.

Lepus townsendii campanius. White-tailed Jack Rabbit. This typical plains mammal undoubtedly occurs in the Park in the "badlands" area. A dead specimen was observed on the roadside just outside the park gate on August 5, 1947.

Lepus americanus bairdii. Rocky Mountain Snowshoe Rabbit. The snowshoe rabbit seemed to be fairly abundant in the Park during the present summer. It is apparently on the upswing of its population cycle, locally. Numerous animals and their signs



were observed in the Cameron, Sofa Creek, and Bauerman Brook areas.

Marmota caligata nivaria. Montana Hoary Marmot. This mammal occurs in small numbers on the upper slopes and rockslides above the timberline. Marmots were observed in the Rowe Lakes, Carthew Lakes, and Twin Lakes areas. The Superintendent states that they formerly occurred in the rockslide above the townsite at 4,300 feet. This is unusual as they are more characteristic of the alpine slopes above the timberline.

Citellus r. richardsonii. Richardson's Ground Squirrel. This typical plains mammal is reported to occur within the Park boundary on the Cardston Road.

Citellus c. columbianus. Columbian Ground Squirrel. This is the typical ground squirrel of the area. It occurs commonly on the alpine slopes above the timberline where it provides the main source of summer food for such predators as the golden eagle, grizzly bear, coyote, and many lesser carnivores. It is also common in open meadows and rocky sites at lower altitudes such as the townsite, golf course, and Crandell Lake.

The Columbian ground squirrel also occurs commonly in the foothills area of the Park. It seems to be spreading eastward into the prairie region. These squirrels are now regularly observed on the road as far north as Pincher Creek.

Citellus lateralis tescorum. Mantled Ground Squirrel. The mantled ground squirrel is irregularly distributed in the Park, and is much scarcer than the Columbian ground squirrel. They have a wide range of altitude and habitat choice, occurring at Waterton Lakes townsite and also on the slopes of Mount Carthew at 8,000 feet.

They seem to be more common on rocky exposed slopes and sites where the alpine vegetation is sparse. Individuals were observed at Waterton Lake, Mount Crandell, and Sage Pass. A fine large specimen was collected on Mount Carthew at 7,900 feet elevation.

Eutamias minimus oreocetes. Timberline Chipmunk. The timberline chipmunk was first recorded in the Park by W.S. Spreadborough in 1895. Unfortunately the only locality given for the two specimens in the National Museum is Waterton Lakes. It was thought that this species was commonly distributed above the timberline. During the present investigation, although much time was spent above timberline in various sections of the Park, the timberline chipmunk was observed only on the talus slopes above Lost, Twin, and Lone Lakes, and on Sage pass, at an altitude range of 6,500 to 7,500 feet. This chipmunk apparently is restricted to the alpine talus slopes of the continental divide and adjacent ridges.

Eutamias amoenus luteiventris. Buff-bellied Chipmunk. This is the common chipmunk of the lower elevations of the Park. It occurs commonly around Waterton Lakes, Cameron, Blakiston, and Belly River valleys. Three specimens were taken during the investigation, one at 5,300 feet on Mount Crandell.

This chipmunk was originally described from Waterton Lakes, based on specimens taken by Elliott Coues in 1874. The National Museum has 16 specimens taken by Spreadborough in 1895 and Young in 1922 and 1923.

This species inhabits rocky sites, meadows, and open stands of lodgepole pine and is usually terrestrial in habit.

Eutamias r. ruficaudus. Rufous-tailed Chipmunk. The rufous-tailed chipmunk occurs commonly at medium altitudes in the Park. It is a chipmunk of the higher spruce-alpine fir association. (Picea glauca - Abies lasiocarpa). It occurs commonly at timberline in the scrubby growths of alpine fir. This chipmunk is more arboreal in habit and is regularly observed climbing to a considerable height. This chipmunk occurs in an altitude range of 5,800 to 7,000 feet and is well distributed in the Park.

The National Museum contains specimens taken by Spreadborough in 1895, Young in 1922 and Dr. R.M. Anderson in 1938. These specimens

are from Vimy Ridge, Cameron Lake, Summit Lake, and Carthew trail. During the current investigation two specimens were taken from Bertha Lake and Mount Carthew.

Tamiasciurus hudsonicus richardsoni. Red Squirrel. The red squirrel occurs commonly in all the forested areas of the Park. One specimen was taken from the townsite.

Thomomys talpoides ssp. Pocket Gopher. The workings of this mammal are commonly observed at lower elevations in the foothills area of the Park. Its distribution has been considered elsewhere in this report, in connection with the badger.

Castor c. missourieusis. Canada Beaver. Considered elsewhere in this report.

Peromyscus maniculatus artemisiae. Sagebrush White-footed Mouse. This mouse occurs commonly throughout the Park at all elevations below the timberline. It is commonest at low elevations near water courses.

During the present study seven specimens were taken from Boundary cabin and Camp 2. The average measurements were length 164mm, tail 82mm, hind foot 20.5mm, and weight 17.9 grams.

Microtus longicaudus mordax. Idaho Long-tailed Meadow Mouse. One specimen was captured at Boundary cabin, Waterton Lakes, on August 14, 1947. With the limited trapping done during this study, it is impossible to form a clear picture of the distribution of the various species of mice in the Park.

Ondatra zibethica osoyoosensis. Rocky Mountain Muskrat. Muskrats were observed feeding and their lodges noted in several abandoned beaver dams in the Stoney and Crooked Creek systems.

Zapus princeps idahoensis. Idaho Jumping Mouse. An adult specimen was secured from a stream bank at Boundary cabin, Waterton Lake, on August 14, 1947, in a mixed pine-spruce forest.

Cervus canadensis nelsoni. Rocky Mountain Elk. Discussed elsewhere in this report.

Odocoileus hemionus hemionus. Mule Deer. Discussed elsewhere in this report.

Odocoileus virginianus dacotensis. Northern Plains White-tailed Deer. Discussed elsewhere in this report.

Alces americana shirasi. Yellowstone Moose. Discussed elsewhere in this report.

Bison bison bison. Plains Bison. Although the bison has long been extinct in the area, skulls, horns, and bones are regularly found in the foothills area within the Park. In the Blakiston Brook valley above the Pass Creek warden's cabin is a bluff, supposed to have formed a natural trap over which many bison plunged to their deaths. Formerly skulls were abundant at this site and many bones still may be found here.

Ovis c. canadensis. Rocky Mountain Bighorn. Discussed elsewhere in this report.

Oreamnos americanus missoulae. Montana Mountain Goat. Discussed elsewhere in this report.



### Recommendations

1. The reduction slaughter of 200 elk from the Crooked Creek Basin, Belly River, and Indian Springs in co-operation with Provincial authorities.
2. No further beaver removals from the Park but transplantations within the Park.
3. Removal of salt blocks from summer ranges by September 30 annually.
4. Cancellation of grazing permits for domestic stock.
5. Efficient collection and disposal of garbage by means of complete incineration.
6. Killing of predators to be limited to nuisance animals.
7. Discouragement of black bears in the townsite.
8. Placing of salt blocks at upper ends of the winter range in Crooked Creek basin.
9. Construction of 12 foot square enclosure plots at Pass Creek, Indian Springs and Crooked Creek.

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CANADA  
DEPARTMENT OF MINES AND RESOURCES  
NATIONAL PARKS BUREAU  
1947

### MAP OF WATERTON LAKES NATIONAL PARK ALBERTA

SCALE  
Miles 0 1 5 Miles

REFERENCE

Park Boundary	.....	Warden's Cabin	.....
Roads	.....	Cabins or chalets	.....
Trails	.....	Campgrounds	.....

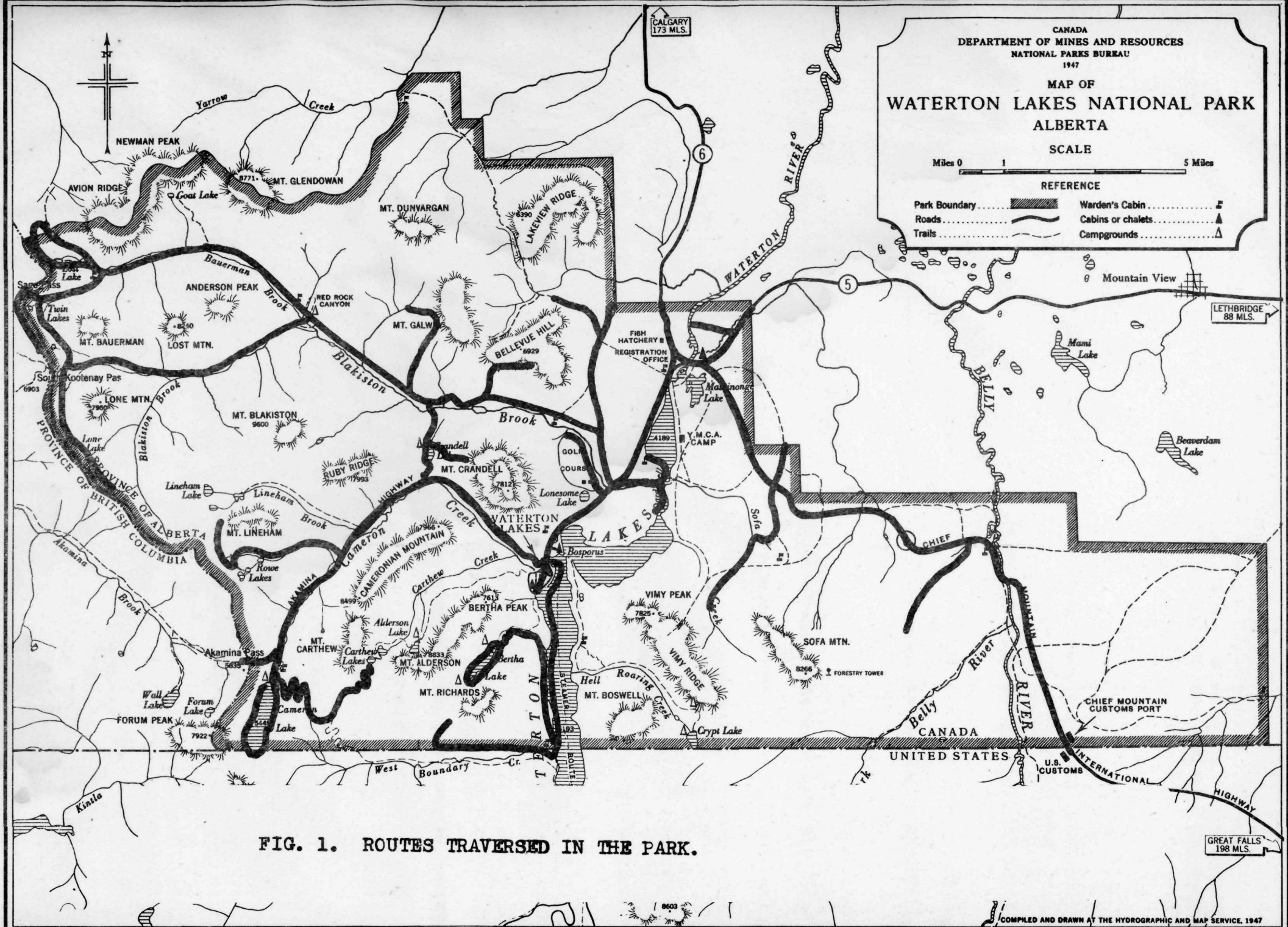


FIG. 1. ROUTES TRAVERSED IN THE PARK.



WATERTON LAKES NATIONAL PARK  
ALBERTA

SCALE

Miles 0 1 5 Miles

REFERENCE

Park Boundary		Warden's Cabin	
Roads		Cabins or chalets	
Trails		Campgrounds	

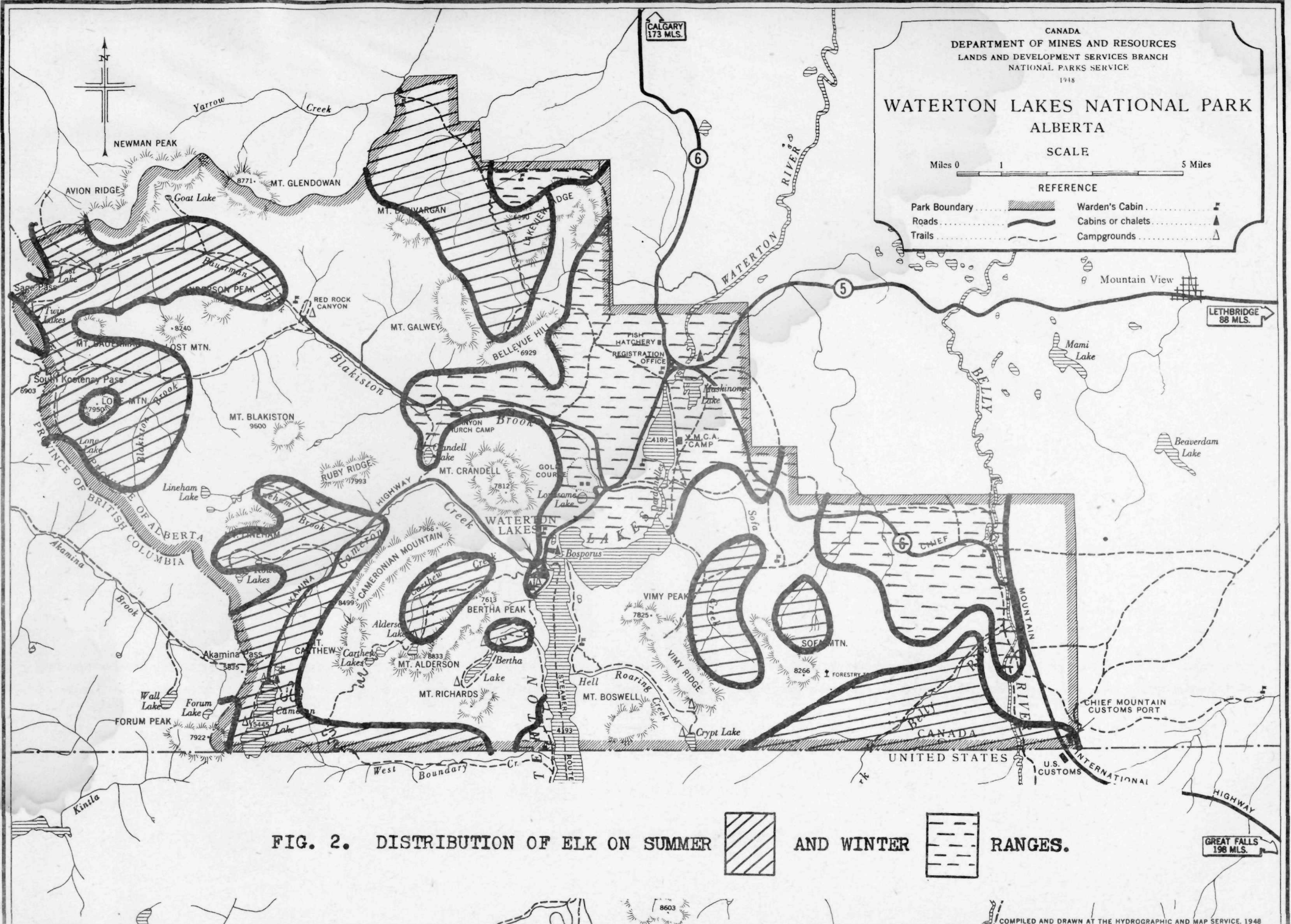
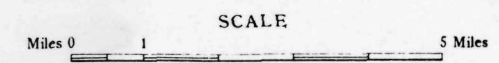


FIG. 2. DISTRIBUTION OF ELK ON SUMMER AND WINTER RANGES.



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 NATIONAL PARKS SERVICE  
 1948

# WATERTON LAKES NATIONAL PARK ALBERTA



REFERENCE

Park Boundary		Warden's Cabin	
Roads		Cabins or chalets	
Trails		Campgrounds	

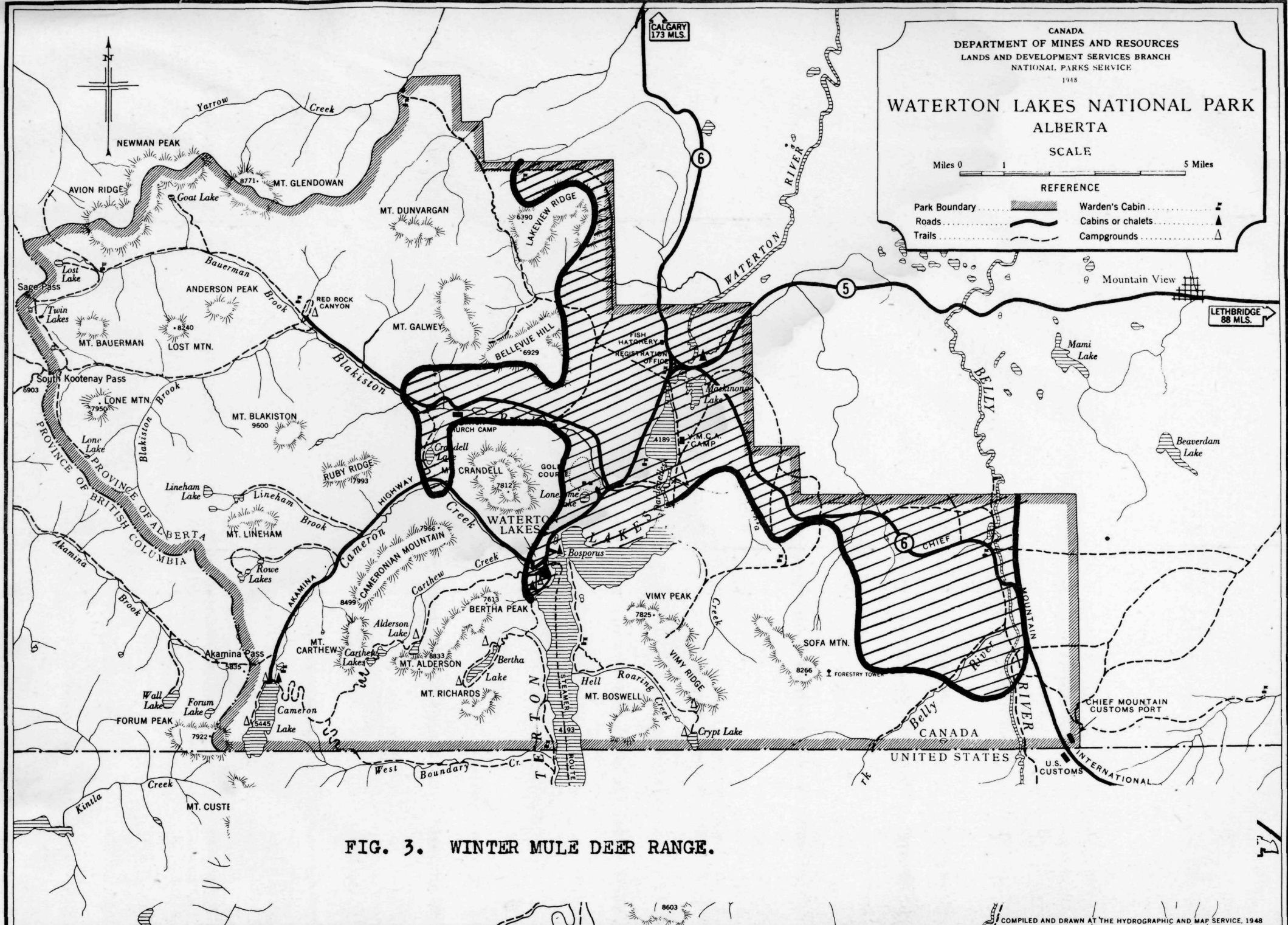


FIG. 3. WINTER MULE DEER RANGE.

WATERTON LAKES NATIONAL PARK  
 ALBERTA

SCALE  
 Miles 0 1 5 Miles

REFERENCE

Park Boundary		Warden's Cabin	
Roads		Cabins or chalets	
Trails		Campgrounds	

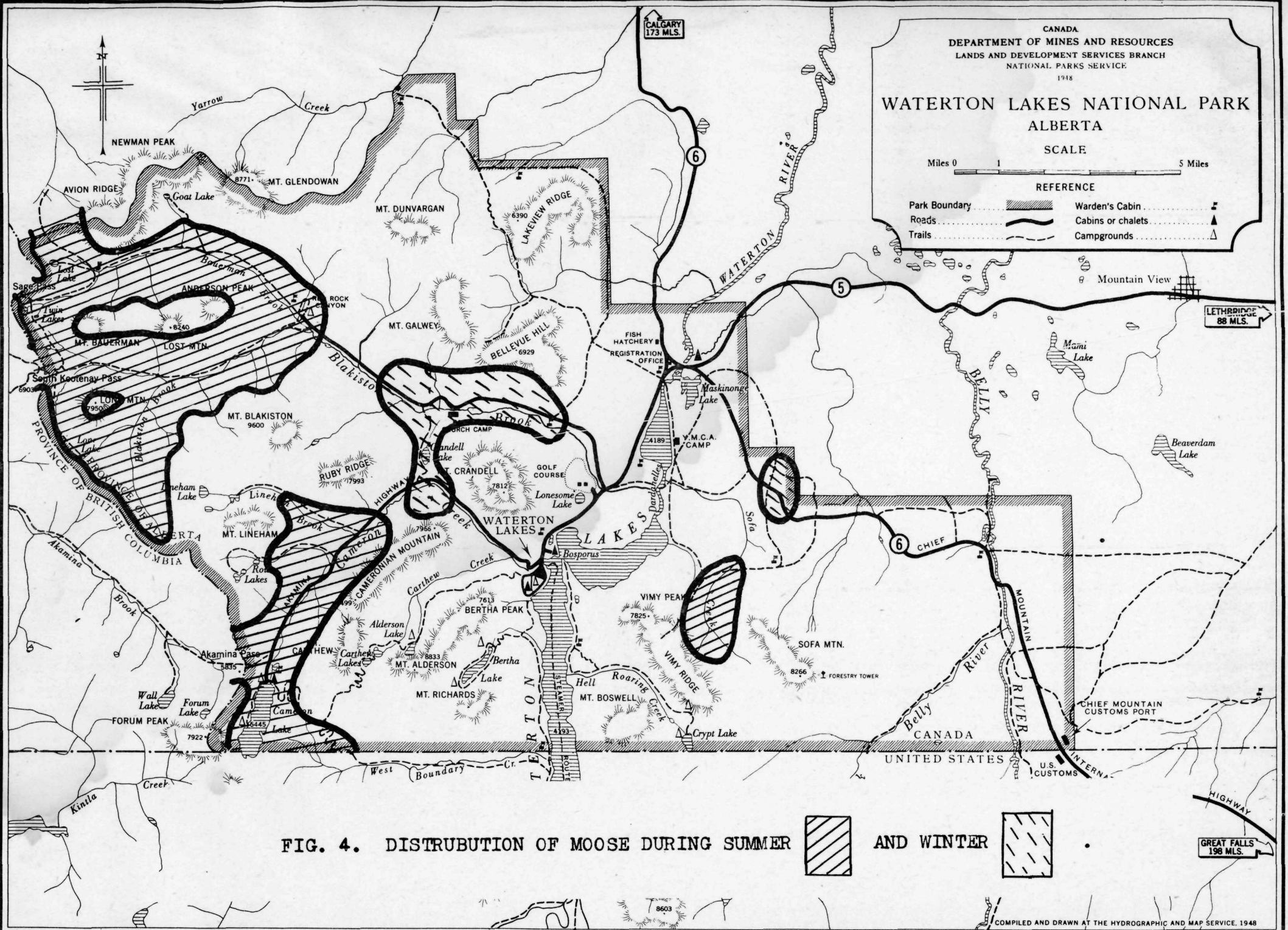


FIG. 4. DISTRIBUTION OF MOOSE DURING SUMMER AND WINTER



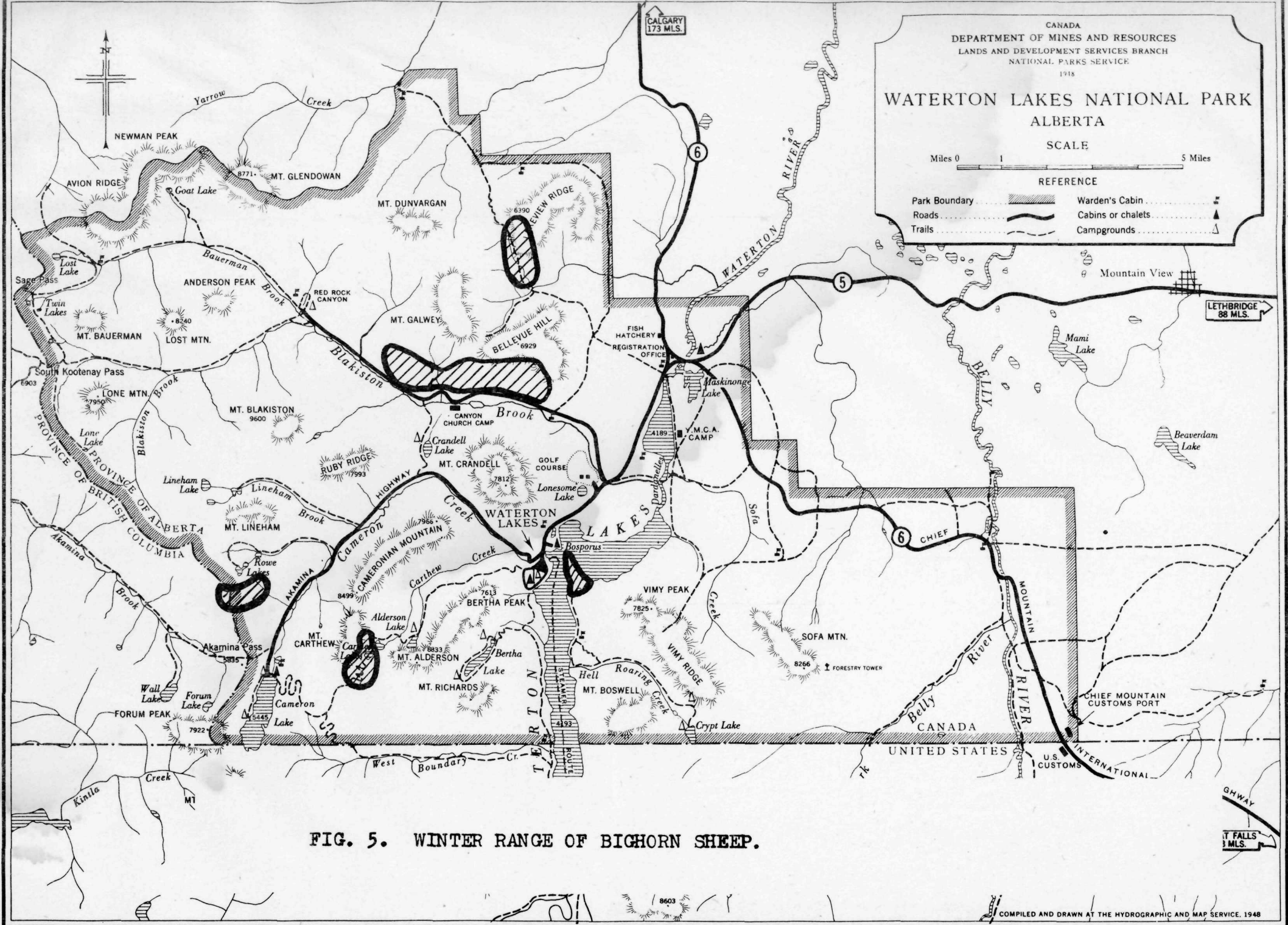
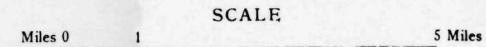


FIG. 5. WINTER RANGE OF BIGHORN SHEEP.

WATERTON LAKES NATIONAL PARK  
 ALBERTA



REFERENCE

Park Boundary		Warden's Cabin	
Roads		Cabins or chalets	
Trails		Campgrounds	

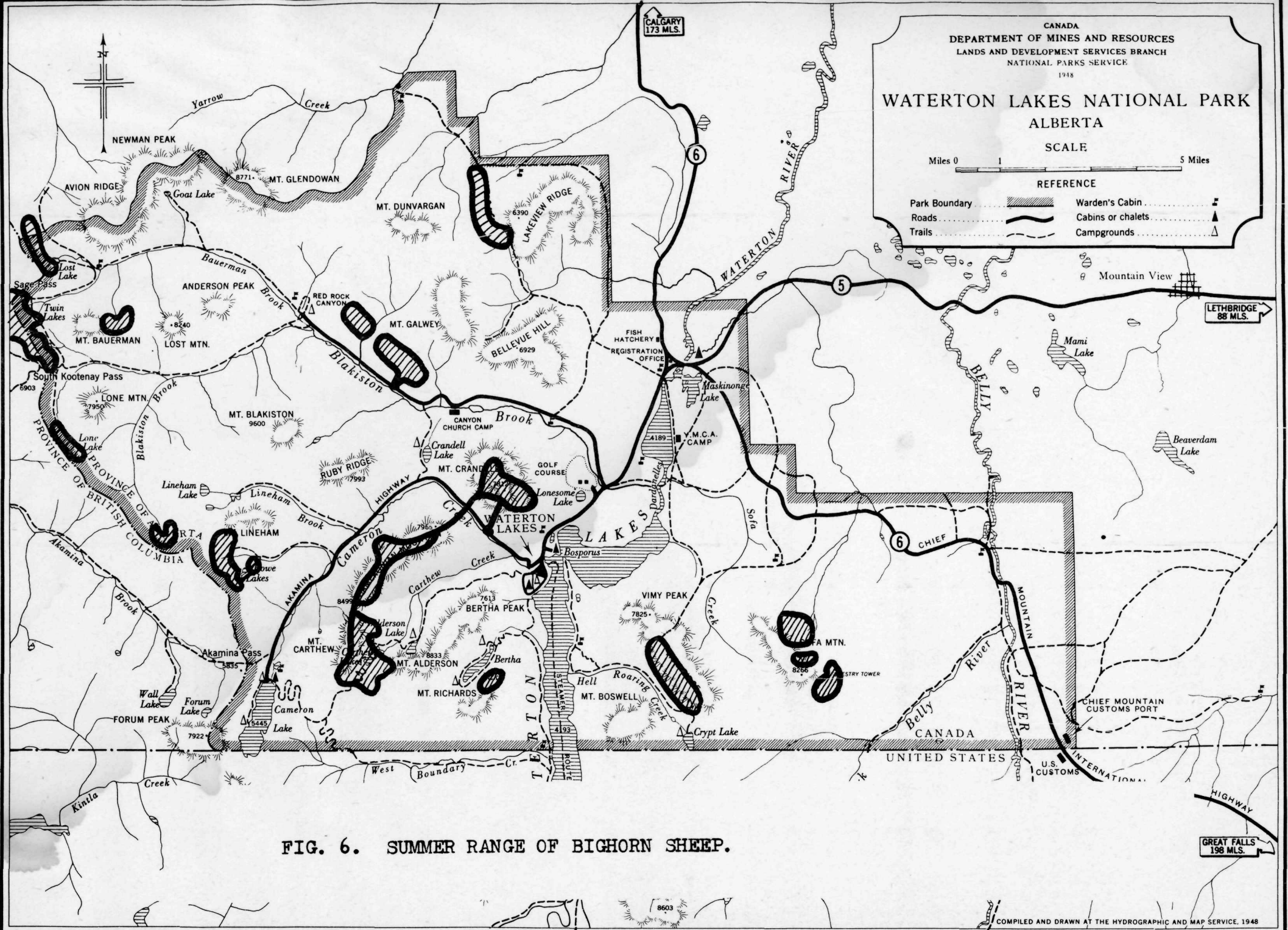


FIG. 6. SUMMER RANGE OF BIGHORN SHEEP.



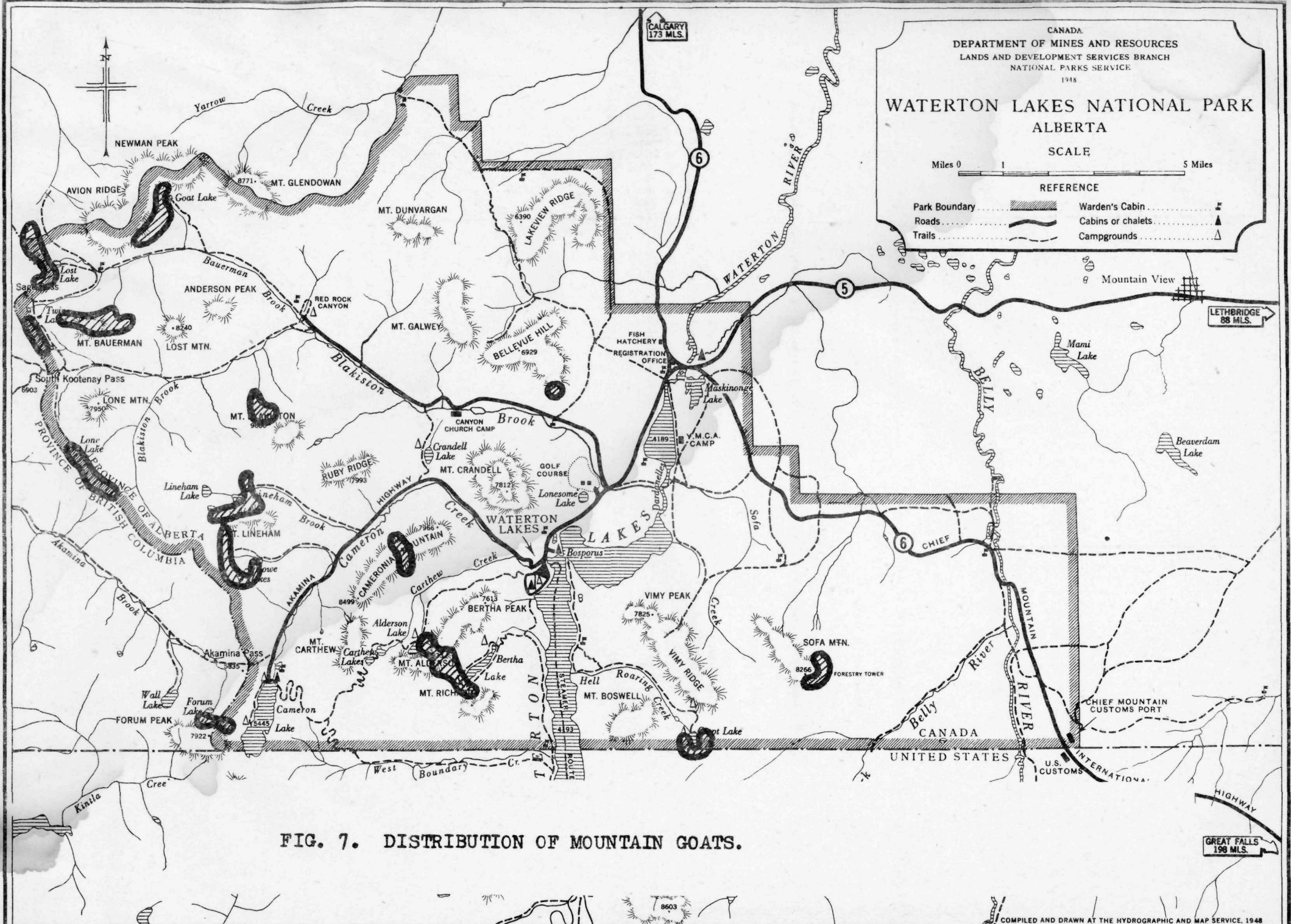


FIG. 7. DISTRIBUTION OF MOUNTAIN GOATS.

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1947

### MAP OF WATERTON LAKES NATIONAL PARK ALBERTA

SCALE  
Miles 0 1 5 Miles

REFERENCE

Park Boundary		Warden's Cabin	
Roads		Cabins or chalets	
Trails		Campgrounds	

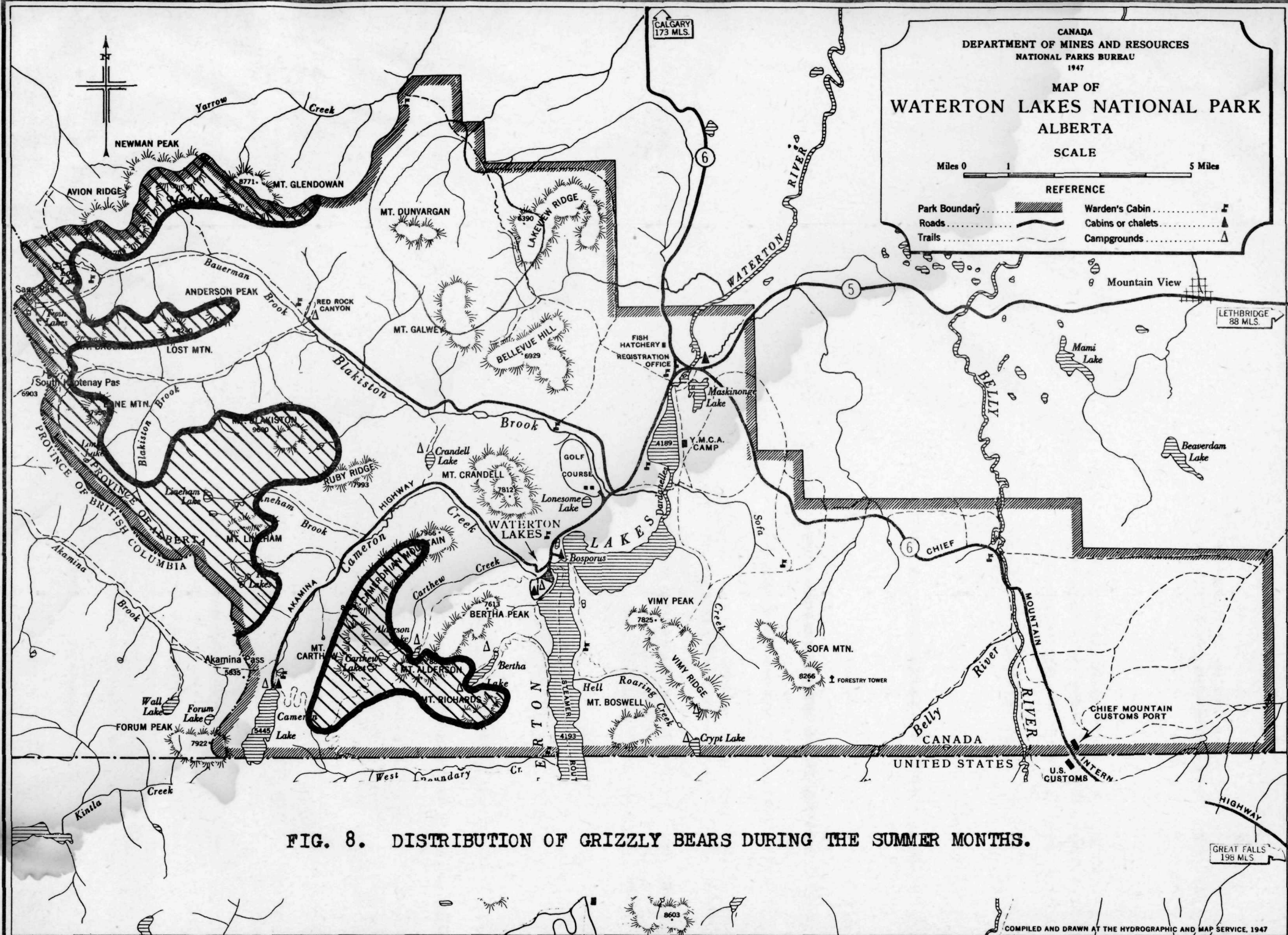


FIG. 8. DISTRIBUTION OF GRIZZLY BEARS DURING THE SUMMER MONTHS.



