

(*MARTIN, P.W. 1950. Report on wildlife survey of Wells > Gray Park 1950. Unpublished Report, B.C., Forest Service, Victoria. 67 > pages".*)

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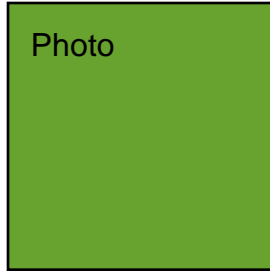
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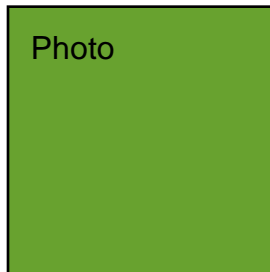
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Photo

Clearwater Lake from the
Huntley and Buchanan Peak in



Photo

Archer Creek Burn with Mt.
the background.

Willow: note “witches broom” effect caused by repeated heavy browsing by moose.

REPORT ON WILDLIFE SURVEY OF WELLS GRAY PARK 1950
by: Patrick W. Martin

INTRODUCTION

The survey was commissioned by the Parks and Recreation Division of the B.C. Forest Service to conduct an investigation into the wildlife resources of Wells Gray Provincial Park. The object of this was to assess the population of animals within the park preparatory to initiating a management program designed to put them on a sustained yield basis. The party consisted of myself and Mr. Ralph W. Ritcey, B.A., a graduate in Zoology of the University of British Columbia. I would like to acknowledge, with thanks, the splendid co-operation afforded us by the Kamloops division of the British Columbia Forest Service in supplying and transporting us by air whenever required. I would also like to acknowledge the assistance afforded us by Ranger Les Cook and patrolman I.C. Norman and R. Miller, who were at all times extremely helpful. Mr. Ted Helset gave us much valuable information both with regards to animals and terrain, which was of great assistance in furthering our work. My thanks also go to Dr. Ian McTaggart-Cowan of the University of British Columbia. His advice in drawing up a plan of operations before the commencement of the survey; and his criticism of the rough draft of this report have been of great value and are much appreciated.

The period of actual field work extended from May 9th to September 15th, 1950. We arrived at Hemp Creek on May 10th and worked in this area till May 22nd. Most of this period was spent in assessing the range conditions of the area and in general reconnaissance. On May 22nd we moved to the "Stillwater" on Murtle River and worked in that area until June 1st with the exception of a three-day interval at Murtle Lake from May 24th-27th. On June 5th we moved to Clearwater Lake outlet and worked in that vicinity until June 11th. Most of the work again was range assessing and moose tallying. We attempted to visit all the small lakes and swamps and thereby cover most of the calving areas of the moose. We followed water courses where practical, and so gained some idea of the beaver situation. On June 11th we moved to Azure Lake, making a base camp at a cabin on a small bay about three miles from the outlet and on the south shore. From this camp we made two trips up Mt. Huntley and also a trip to the east end of the lake where we spent four days. On June 22nd we moved base camp to Clearwater Lake. We situated our camp close to the mouth of Archer Creek so as to be centrally located, and worked from there until July 2nd. During this period the outboard motor developed a defect in the coil which was not repaired for the remainder

of the summer. From July 2nd-6th we continued our work in the vicinity of the Clearwater Lake outlet. From July 6-12th we worked from a base camp on the east shore of Mahood Lake. On July 12 we were moved to Murtle Lake and made camp at the west end. During our work at the west end Mr. Miller was most helpful. He accompanied us on a pack trip into the mountains above Strait Lake and assisted us in our movements with the outboard. On July 22nd we moved to the west end of the lake and worked the area about File and Anderson Creeks and the outlet of the lake itself. We returned to Hemp Creek on July 31st and spent the remainder of the month working out of this base camp. During this period several short pack trips were undertaken to the base of the Kilpil Mountain, to Deer Creek and to Blackwater Creek. Green Mountain and the Whitehorse Bluffs were visited several times. The first two weeks of September were spent in the high country above Kostal Lake in the Coat Peak group of mountains. Field work was terminated on September 15th, 1950.

GAME RANGES

Before going on to consider the wildlife itself, it is pertinent to examine more or less critically the area in which it lives. The lowland areas of Wells Gary Park lie in a transition zone between the Columbia Forest Biotic area and the Cariboo Parklands Biotic area (Munro and Cowan 1947). The stands of mature coniferous forest are largely composed of Western red cedar (*Thuja occidentalis*) and western hemlock (*Tsuga heterophylla*) with an intermingling of varying amounts of Engelmann spruce (*Picea Engelmannii*). On the drier ridges and better drained areas Douglas fir (*Pseudotsuga taxifolia*) is quite abundant. Where fire has destroyed the climax forest the plant succession is initiated by an abundant growth of willows (*Salix spp.*), aspens (*Populus tremuloides*) and birches (*Betula papyrifera*), which in turn give way to coniferous stands; this will be more fully dealt with later.

At an elevation of approximately 4500 feet the lowlands merge into the Sub-alpine Biotic Area. Here the vegetation is dominated by Engelmann spruce (*Picea Engelmannii*) and alpine fir (*Abies lasiocarpa*) with a dense understory of vacciniums and rhododendron. In damper areas the underbrush, not so dense and more plants persist, false hellebore being conspicuous and widespread. The continuity of the Sub-alpine forest is frequently broken by meadows of considerable size. These meadows have an understory of sphagnum moss, sedges and grasses, and in addition, frequently contain large thickets of willow.

The sub-alpine forest merges with the Alpine Biotic Area at approximately 7500 feet, varying of course, with aspect and soil conditions. The flora of the alpine area is dominated by alpine fir (*Abies lasiocarpa*), heaths, mosses and alders. Where drainage conditions and aspect are favourable large alpine meadows occur; they contain a great variety of grasses, sedges, flowering plants and willows.

A great deal of the country has been swept by fires, which have been largely caused by lightning strikes and so must be considered a natural sequence in the order of nature. In many cases the fires have run up the mountain sides well into the sub-alpine zone,

occasionally even into alpine country. These high fires appear to have longer lasting effects than those at lower altitudes the growing season is shorter and the vegetation is correspondingly slower. The pioneer species is usually willow, and it is eventually replaced by alpine firs and spruce, but the process is a very slow one.

In the lowland areas the pioneer species is again willow. Here willow gives way to aspen, birch or coniferous stands, depending upon the proximity of seed sources. Where large areas have been burned over, there is little regeneration of conifers for long periods of time and the willow is succeeded by stands of aspen and birch. Along the edges of the burns and where seed trees remain, dense stands of conifers replace the willow.

Here, as in all mountainous game range at this latitude, the winter range is more restricted than the summer feeding grounds. At the same time it is subject to heaviest use during the dormant period, the longest part of the year. It follows that the winter range limits the carrying capacity of the entire region and must be given first consideration in the development of management plans.

The moose in western Canada has been shown to be a species of the pioneer forest stage. It is in the burned-over areas in the deciduous community stage of regeneration that moose reach their greatest numbers. Except for isolated animals and small groups wintering here and there as conditions permit the entire population congregates in the winter on the burns at low altitudes and has a tendency to favour those with a south or south-western exposure unless the snow on those exposures is heavily crusted. During winters of heavy crust the animals seek areas of least crust, often north-facing slopes and the margins of timber.

The winter ranges are not difficult to detect and special effort was given to determining them and appraising the degree of use to which they have been subjected. The most important winter ranges for moose in the part area:

GREEN MOUNTAIN-HEMP CREEK (Table I refers)

The largest winter moose range is that of the Green Mountain-Hemp Creek area. It is a continuation of the burned-over areas of the Clearwater Valley which includes all the settled area above the canyon. Prior to 1926 this whole valley was clothed in a mature stand of timber. In that year a fire was started in the lower Clearwater canyon by a lightning strike and swept up the valley. It swept over Green Mountain, up the Blackwater, across the Murtle and along the base of the Kilpil Mountain to Deer Creek. Another tongue of the fire swept over McLeod Hills, up Indian Valley even to the Stevens Lakes. This tremendous area grew up into a mixed association of willow, aspen and birch. Apart from Green Mountain and the area west of the Murtle River, little of this wintering range is within the park boundaries. Table I is a condensation of the information obtained from seventy-two sample plots from the Green Mountain-Hemp Creek area.

It will be apparent from the tables that the cover is still moderately open. In places both *Pachystima* and *Shepherdia* form dense, low thickets, and there is then an abundance of litter on the forest floor. The table lists the three dominant deciduous species and three dominant coniferous species. That deciduous trees are now giving way to coniferous ones is indicated by the total percentage density of conifers of 21% as compared to 18% for deciduous species. This is further substantiated by the fact that the regeneration of willow is fair to poor in 54% of the plots. This decline in the vigor of the willow is due to intensive browsing and increasing shade by the conifers and taller aspens. This range has reached its most productive stage in plant succession, and as the years pass it will inevitably support less and less moose.

STILLWATER AREA-EAST BANK OF MURTLE RIVER (Table II refers)

The Stillwater area cannot be classed as a wintering area proper, for, in the past, it has not been so utilized by moose. There is, however, abundant winter feed in the district and if snow conditions or other controlling factors permit, the animals to use the area, it could undoubtedly winter a large number of animals. I have included all the lowland flat area between McLeod Hill and the Murtle River in this range. When riding the trail from Hemp Creek to Stillwater abundant evidences of wintering moose persist until McLeod Hills are reached. There a marked reduction in breakage, browsing and shed antlers becomes apparent. After the summit is crossed evidences of winter usage become negligible. The fire that swept through the Stillwater area must have been intensely hot for there is comparatively little deadfall in the area and only large snags remain. There are very few coniferous seed trees remaining and the area is mainly clothed in willow. Browse intensity is low and regeneration is excellent. The intrusion of conifers is slow and this area has many years of potential winter feed production ahead of it.

DEER CREEK AND BASE OF KILPRIL MOUNTAINS (Table VIII refers)

The burn at the base of the Kilpil Mountains to Deer Creek on the west side of the Murtle River is part of the original Clearwater burn of 1926. The second growth is not as far advanced in this area, however, and possibly parts of it have been re-burned since 1926. Upon leaving the Murtle River one finds a dense growth of willows, seven to nine feet in height with considerable evidence of winter usage by moose. Upon reaching the Deer Creek district an increase in conifers is quite apparent. The whole area from the Stillwater to Deer Creek, along the base of the Kilpil Mountains and down the Murtle River to the edge of the green timber is bountifully supplied with water. There are several creeks flowing off the Kilpil Mountains and many larger meadows in the area. Table VIII is an analysis of twenty plots taken along the base of the Kilpil Mountains, in the vicinity of Deer Creek. It will be apparent that the condition of this range is satisfactory; the regeneration of willow is good and conifers, as yet, are widely scattered and small. Six of the largest willows were cut six inches above ground level and they ranged from six to fourteen growth rings with an average of eight. Considering the present lack of competition these willows should be productive for many years to come.

CLEARWATER OUTLET (Tables III and XIV refer)

IN the year 1895 a fire burned off a large part of the Clearwater Valley. This fire swept through the valley and burned a strip along the east bank of the Clearwater River and lake from the "horseshoe" almost to Ivor Creek, varying in width from three to four miles. This area now supports mixed stands of aspen, birch and conifers. On the whole, it is past the stage of good moose winter range. There is abundant evidence of heavy usage by moose up to several winters ago. In many instances willows two and a half and three inches in diameter have been broken down by feeding moose. Most of these broken trees have died. A great majority of the birch and aspens are now too mature to provide moose food, because the lower branches are beyond the reach of the animals. Table III illustrates the state of winter range in the lava beds up Falls Creek. While this area is not representative of the valley as a whole, it is included in order to illustrate how a small area of fairly good browse may soon be reduced to the same state of productivity as the surrounding area by intensive browsing.

Table IV illustrates a condition judged to be reasonably typical of the mixed forest that now covers the rolling country. The regeneration of willow is again unsatisfactory, this condition is caused mainly by the shading of the canopies of the taller aspen and birch coupled with high browsing. Red osier dogwood (*Cornus stolonifera*) is coming into the damper areas, and, although an excellent browse species, it will never reach a density sufficient to replace the outgoing willow. The carrying capacity of this area is rapidly decreasing and will continue to do so as the plant succession progresses.

AZURE LAKE BURN AT EAST END OF AZURE LAKE (Table V refers)

The Azure Lake burn is comparatively small, being only about a mile and a half square. It is situated remote from any other burn and probably is important as winter range for the moose of the Azure and Ovis Creek valleys. A dropping count of twenty-six to the acre indicates considerable usage by moose during the past winter. No accurate figures on the age of this burn are available. Plant succession is well advanced; birches, aspens and Douglas fir frequently have a breast height diameter of six to eight inches. Several willows with a diameter in excess of four inches were observed. The forest floor supports a dense understory of dogwood (*pigeon berry*), bracken, pachystima and vacciniums. There is abundant evidence that the area has passed its greatest productive stage and barring further burns the carrying capacity will now decline.

EAST SHORE CLEARWATER LAKE, NORTH OF IVOR CREEK (Table VI refers)

The east shore of Clearwater Lake is generally steep; this slope is broken by small flats. These hillsides and flats were burned at an unknown date prior to 1940. This fire ran up the mountainsides to alpine country. Although the plots analyzed were all taken within four hundred feet of lake level willow regeneration is satisfactory at all altitudes.

This range shows evidence of fairly heavy usage at some time of year. Moose tracks are abundant (June) and browsing is extensive, if moderate, throughout the sample area. The soil and moss is of a type in which tracks persist for considerable periods, despite heavy rains, and the slope is probably used in the spring. Many of the ridges have abundant droppings upon them, which indicates the probability that they are blown clear of snow and are extensively used in winter.

The condition of this range is good; regeneration of willow and birch is excellent. The encroachment of conifers on browse species is moderate, and apparently the greatest carrying capacity of the area is yet to be realized.

ARCHER CREEK BURNS (Table VII)

The Archer Creek burn consists of an extensive area on the west shore of Clearwater Lake. It extends from the vicinity of Huckleberry Bay up to the mouth of Archer Creek and then westward over the flat to the base of the hills. Another tongue runs up the Archer Creek Valley for ten or twelve miles and has burned both sides of the valley up to sub-alpine timber at least. The general picture of the Archer Creek burn is complicated due to the fact that it is a combination of a series of burns. The initial burn in the area occurred prior to 1920 (Forest Service Cover Map) and subsequently the area has been swept by a series of fires. From all appearances the initial burns were not very hot, the resultant tangle of deadfall and scattering of snags resulted in conditions conducive to fires from lightning strikes. The latest fire occurred in 1948 and burned clear a considerable area of deadfall. The forty-five plots of Table VII were taken about the small lakes close to Archer Creek and on the intervening flats. Although they do not, in any way, present a complete picture of the range conditions of the burn, they constitute reasonably accurate assessment of those areas that are currently used by wintering moose. It must be borne in mind, however, that there are areas in the burn, both younger and older than the part assessed, some of which have yet to reach a productive stage and others which are past their most productive stage of browse production. The plots that are analyzed in Table VII were mainly taken on the flat areas, the soil is light and gravelly and the regeneration is not as lush as in the damper areas in draws and along the lake margins. In general, the regeneration of willow, 74% good, is satisfactory for the trees of the ages concerned. Aspens and birches average about thirty-five feet in height but as yet are not dense enough to cause serious shading of the willows. Conifers likewise are well scattered and although the flora of the area is relatively old, from a browse range point of view, it still has many productive years ahead of it. In the moister situations of the same age the conifers are choking out the willows to a large extent, however, these shelter belts are probably of value in that they enable a wider distribution of animals.

PYRAMID MOUNTAIN (Tables IX and X)

Tables IX and X are condensations of twenty assessment plots taken on the mountain and along the south west flat at its base. From all reports and evidences this small area is heavily used by both moose and deer in the late autumn and winter. The Pyramid is

very dry and growth upon it is sparse. Such relatively xerophytic plants as *Ceanothus* and *Mahonia* are widespread and abundant. *Ceanothus* is very heavily browsed and is definitely "losing ground". It is difficult to judge just what causes this concentration of animals on the mountain; it may be the elevation, the slight difference in flora, or merely that it is almost the most southern portion of the burn west of the Murtle River, or a combination of such factors.

SOUTH WEST SLOPES OF GREEN MOUNTAIN (Table XI)

The plots analyzed in Table XI were taken at one hundred pace intervals from the crest of the southern slope of Green Mountain in a south westerly direction. Thus they covered approximately a mile of the mountain side. This area of grass does not exceed an extent of two and a half miles in a northerly direction from the base of the mountain at the confluence of Hemp Creek and Clearwater River. It is then replaced by a dense aspen forest with a thick understory of *Shepherdia*. This area, with its south west aspect and light sandy soil, enjoys a high rate of evaporation. There are no evidences of ground water so the plants have to get along on precipitation alone. Regeneration is relatively less in all species utilized than in any other area. The plots were taken in August so the assessment of winter utilization was impossible to determine. Local residents state that the area is an important winter and early spring range for deer as well as moose. It is the first area to "open up" in the spring.

The method of browse survey which was used in assessing range conditions was an adaption of the method described by Shaler E. Aldous (1). One hundredth-acre plots were taken at random throughout the area under consideration. In each plot each species was described with respect to density, to the degree of browsing, to which it had been subjected and to the degree of regeneration since last browsed. This information was then averaged and entered opposite the species in question in the appropriate column in the table. The number of plots taken in the area in question is entered in the first column. The percentage occurrence in these plots is entered in the second column under "% occurrence". The average density of the species under consideration is entered under the "density" column; density is assessed by an estimate of the percentage of the area of the plot that is shaded by a vertical sun. Browse intensity is a measure of the percent of the twigs or branches that have been browsed, it is an average of the browse intensity of all the plots under consideration. The "utilization factor" is arrived at by multiplying the average browse intensity by the average density of the browse species. The "percentage food eaten" is calculated by dividing each utilization factor by the sum of the utilization factors for the area.

Regeneration was judged to be "good" if more than 50% of the browsed branches were shooting or suckering vigorously; "fair" if from 20% to 50% of the browsed and broken branches were shooting vigorously and "poor" if less than 20% of the browse showed signs of vigorous growth. In all cases where less than 50% of the plots were judged fair the species in question appeared to be dying out.

In the original, records of all woody and some herbaceous plants were kept, however, only those of most importance as browse and forest species are included in the appended tables. These I consider quite sufficient to illustrate the condition of the range from a browse point of view and also indicate the trend in plant succession that is taking place.

(1) Shaler E. Aldous "A Deer Browse Survey Method." Journal of Mammalogy. Volume 25. No.2.

Table I

Range: Hemp Creek-Green Mountain

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	72	83%	12%	45%	540	90.4%	18 %	36%	46%
Aspen	72	36%	4%	9%	36	6%		10%	90%
Birch	72	33%	2%	10%	20	3.3%		10%	10%
Spruce	72	69%	6%						
Douglas Fir	72	72%	11%						
Cedar	72	46%	4%	1%	4	0.3%			

Table II

Range: Stillwater Area on East Bank of Murtle River

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	30	100%	27%	6%	162	94%			100 %
Aspen	30	13%	0.6%	1.5%	9	6%			100 %
Spruce	30	16%	1%						
Cedar	30	6%	0.3%						

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Pachystima	30	66 2/3%	65%						

Table III

Lava Bed up Falls Creek-Clearwater Outlet

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	10	80%	6.5%	70%	475	91%	25 %	75%	
Aspen	10	20%	1%	3%	3	1%			100 %
Birch	10	60%	2.5%	17%	42	8%			100 %
Douglas Fir	10	30%	4%						
Cedar	10	60%	6%						
Spruce	10	30%	1.5%						

Table IV

Hillside Above Lava Beds

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	10	80%	6.5%	52%	336	74%	50 %	50%	

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Aspen	10	30%	9%	3.5%	31.5	7%			100%
Birch	10	10%	0.2%						
Red osier	10	60%	3%	23%	69	19%		8%	62%
Hemlock	10	80%	12%						
Douglas fir	10	30%	4%						

Table V
Azure Lake Burn-East end of Azure Lake

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	30	90%	8%	30%	240	76%	13%	24%	63%
Aspen	30	10%	0.5%	11%	5.5	2%			100%
Birch	30	46%	7%	3%	21	6%			100%
Mtn. Maple	30	36%	3%	17%	51	16%			100%
Douglas Fir	30	60%	5%						

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Hemlock	30	67%	9%						
Cedar	30	60%	2%						
Pachystima	30	93%	7%						

Table VI
Clearwater Lake-North of Ivor Creek on East Shore

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	15	90%	10%	25%	250	57%		9%	91%
Aspen	15	0							
Birch	15	46%	7%	26%	182	43%			100%
Cottonwood	15	46%	2%						
Cedar	15	100%	5%						

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Hemlock	15	70%	8%						
Pachystima	15	86%	4%						

Table VII

Archer Creek Burn

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	45	82%	4%	48%	192	71%	3%	23%	74%
Aspen	45	41%	3%	7%	21	8%		10%	90%
Birch	45	15%	2%	13%	26	9%			100%

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Amelanchier	45	62%	3%	10%	30	12%	9%	30%	61%
Douglas Fir	45	26%	1.5%						
Spruce	45	35%	2%						
Hemlock	45	29%	1%						
Cedar	45	33 1/3%	1%						
Pachystima	45	93%	10%						

Table VIII

Deer Creek-Base of Kilpil Mountain

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	20	95%	8%	70%	560	91%		30%	70%
Aspen	20	35%	2%						100%
Birch									
Cottonwood	20	50%	2.5%	17%	425	9%	10%	8%	82%
Douglas Fir	20	30%	1.5%						
Spruce	20	65%	3%						
Cedar	20	15%	0.7%						
Pachystima	20	90%	7%						

Table IX

Flat at Base of Pyramid-South West Side

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	10	100%	5%+	66%	330	44%	10 %	30%	60%
Aspen	10	60%	3%	20%	60	8%	17 %	20%	83%
Birch	10	30%	1.5%	56%	84	11%			100 %
Cottonwood	10	100%	5%	31%	155	21%			100 %
Ceanothus	10	30%	1.5%	70%	105	16%	100 %		
Douglas fir	10	40%	2%						
Spruce	10	30%	1.5%						
Pachystima	10	100%	5%						
Pine	10	60%	10%						

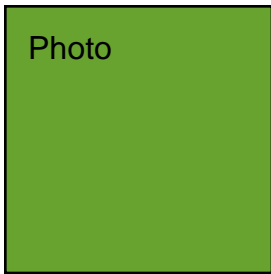
Table X

South Slope of Pyramid

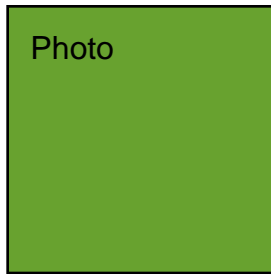
Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	10	80%	4%	65%	240	14%		75%	25%
Cottonwood	10	30%	0.3%	43%	12	2%		35%	65%
Pine	10	30%	0.3%						
Pachystima	10	100%	5%						
Ceanothus	10	100%	48%	70%	1360	84%	100 %		

Table XI

South Mountain

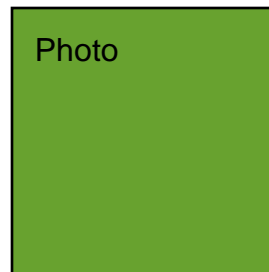
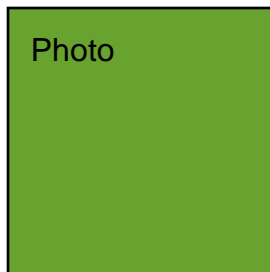


West



Slopes of Green

Species	Number of Plots	% Occurrence	Density	Browse Intensity	Utilization Factor	% Food Eaten	Regeneration		
							Poor	Fair	Good
Willow	20	45%	2%	65%	120	24%	23 %	55%	22%
Aspen	20	85%	7%	35%	245	50%		60%	40%
Birch	20	30%	1.5%	24%	36	8%		66 2/3%	33 1/3%
Maple	20	45%	2%	45%	90	18%	15 %	57%	28%
Shepherdia	20	85%	14%						
Grasses	20	100%	45%		?	?			



1. Heavy winter breakage of willow by moose, Falls Creek area, burned 1895.
2. Unbrowsed willow in Stillwater area. Burned 1926.
3. Regeneration of aspen and conifers in Clearwater Valley, burned 1895.
4. Birch regeneration in lava beds on Falls Creek.
5. Typical winter moose range on Murtle River near Pyramid Mountain, burned over 1926.

MOOSE (*Alces americana*)

Moose are the most important game animal in the park, both with respect to numbers and hunter demand. They are comparatively recent immigrants to the area. Most of the old-timers in the district saw their first moose between the years of 1929 and 1932. The arrival of the animals coincided with the early growth of willows and aspen that followed the big fire of 1926.

Moose are now thoroughly established in the area and have developed regular seasonal movements. Most of the animals winter in areas of old burns. In the spring both sexes forsake their winter ranges and move to their respective summer ranges. This movement is apparently initiated about the time of the first heavy spring thaw, usually in April. The bulls move up into the sub-alpine timber and meadow lands, while the cows seek the vicinity of swamps, meadows and lake margins which constitute their favourite calving grounds. Undoubtedly many of the cows move to the high country later on in the summer.

During the summer they feed largely upon succulent vegetation; after the first killing frosts of autumn, however, they turn to the buds and twigs of willows and other deciduous trees for sustenance. This change of diet and the rutting season coincide with the commencement of the movement of the animals to their wintering grounds. The main movement of moose within the park appears to be of a north-south drift. They leave the wintering grounds of the Murtle and Clearwater Valleys and go up into the plateau country of the Kilpil Mountain, Kestal Lake, Murtle Lake and Stevens Lakes; returning again in the autumn. Apparently a similar movement takes place between the wintering grounds on the Raft Mud River country and the highlands of Stevens and Murtle Lakes.

It is practically impossible to estimate accurately the population of moose from summer observations, however, the following data is indicative of the numbers of moose in the area. Mr. Helset took careful note of the number of moose that he saw during the 1950 trapping season.

Between April 20th, and May 5th, he was one hundred and four separate animals or sets of tracks between the Blackwater and Stillwater, all on the east side of the Murtle River. These observations were made when the moose were moving north to their summer ranges.

When browse assessment plots were taken the number of moose fecal pellet groups were also recorded. In the following table these are reduced to pellet groups per acre and per square mile. These are in turn converted to moose days on the basis of 13.5 pellet groups per moose per day. By dividing the number of moose days by the number of days the moose use the winter range, a rough estimate of the density of the wintering population can be ascertained.

District	Pellet Group per acre	Pellet Group per sq. mile	Moose days	Moose sq. ml.
Hemp Creek-Green Mountain	64	40,960	3034	23.3
Stillwater	16	10,240	751	5.7
Lava beds-Clearwater	90	60,600	4488	34.5
Hillsides-Clearwater	60	38,400	2844	21.8
Azure Lake Burn	26	16,640	1225	9.4
Clearwater Lake-East	33	21,120	1564	12.0
Archer Creek Burn	57	36,480	2702	20.8

While estimates of populations drawn from such data as fecal pellet group counts are not absolutely accurate, they do indicate the relative abundance of animals in the different areas and of the same area for succeeding winters; accordingly the relative value of such information will increase as records accumulate and comparisons are made with actual counts in future. From the above data one can estimate that there were approximately four hundred moose in the Hemp Creek-Green Mountain area, three hundred in the Archer Creek burn and sixty along the east shore of Clearwater Lake during the winter of 1949-50. The Azure Lake burn is small and probably supported only about twenty animals. In the remaining areas samples were not of sufficient size to enable accurate estimation and the ground cover is too varied to enable estimation of areas.

The above figures total seven hundred and eighty head, if one allows a probable error of twenty-five per cent either side of this figure one arrives at an estimate of between six hundred and fifty and a thousand moose for the southern half of the park.

During the course of the summer's investigations a total of fifty-eight moose were seen; they were composed of the following age and sex classes:

Bulls	17
Cows	17
Yearlings	7
Calves	10

Unidentified adults
as to age and sex 7

Total 58

The ratio of calves and yearlings to adults is most satisfactory indicating both a good crop of calves this year and a high rate of survival of last years crop of calves. Guides in the district reported a great predominance of cows during the hunting season of 19??, this was not borne out by our meagre sample and it is quite probable that the bulls were late coming down off the high ranges due to the late autumn, and the predominance of cows was more apparent than real.

As an aid to assessing the age classes of the bulls, records of all shed antlers were kept:

Size rating	Antlers shed previous winter	Shed prior to previous winter
Large	7	21
Medium	4	19
Small	4	9
Total	15	49

In the above table a predominance of large and medium sized antlers prevail. This is due to the fact that they are more easily seen, but also indicates a relatively long life expectancy of the animals and indicates light hunting pressure.

Environmental Pressures

All environmental pressures are intimately associated with, or affected by, weather. Intense cold, in itself, does not have an adverse effect upon moose. As long as the animals are free to forage and the food supply is sufficient, cold appears to effect they very little. When repeated frosts and thaws occur, however, the snow becomes crusted; this crust cuts the legs of the moose and restricts their movement. Under such conditions, if food is not abundant, the animals are unable to move over a large enough area to obtain sufficient forage to sustain them. Their physical condition deteriorates and they become more vulnerable to the ravages of ticks, disease and wolves. The winter of 1949-50 was a good one as far as moose were concerned. The prolonged cold spell prevented the snow from crusting until late in the winter. The moose were able to forage at will and a great majority of the animals came through the winter in good shape. Tick infestations were abnormally light and very few ticks were found in moose beds in the spring.

Wolves undoubtedly take their toll of moose every winter, but the circumstances vary and the subject of predation will be dealt with later. The hunter kill in the park is very light and restricted to males only. It is doubtful whether it has much affect upon population changes.

The health of the herd appeared to be excellent, and the animals put on flesh rapidly in the spring. Only one animal was seen that was in obviously poor condition; it was shot and its main trouble was senility. The molars of both lower jaws were loose, vegetation having become impacted between them, causing deterioration of the surrounding bone and gums; the teeth were worn down until the crowns were smooth, rendering them less efficient as grinders. The lungs and liver were lightly infected with hydatid cysts (*Eccino coccus granuloeus*), and one small tapeworm cyst (probably *Taenia sp*) was found on the mesentery. The animal was a female and the reproductive tract was completely quiescent, indicating that sterility through age had set in.

All evidence points to a well balance, healthy herd of animals; the greatest threat to their well being, at present at least, appears to be impending over-population.

MULE DEER (*Odocoileus hemionus hemionus*)

In the summer, deer range over the whole area from the lowlands into the alpine country. They have definite seasonal movements similar to those of the moose, moving into the lowlands to winter and returning to the burns and highland in summer. The deer seek out the south-facing slopes upon which to winter. Here the action of wind and sun combine to keep the ground almost snow free and permit the animals easy access to forage plants. The main winter ranges are not within the park boundaries. They lie along the shore of the North Thompson and Clearwater Rivers, however, ranges of limited carrying capacity do occur within the park, along the north shores of Mahood Lake and along the east bank of the Clearwater River from the confluence of the Mahood River southward.

Evidence indicates that the latter two areas have, in the past, supported quite large winter populations. During the winter of 1948-49, however, a combination of inclement weather and abundance of wolves decimated the herds. The winter of 1949-50 was easy on the deer and the population appears to be once again on the up grade. It is practically impossible to estimate the number of deer in the park on the basis of summer studies. Tracks were abundant on all the trails and on all the burns. The bucks move into the alpine country for the summer. Four large bucks were seen on Goat Peaks in one day. Occasional does and fawns summer in alpine country also, but the majority appear to prefer the stands of willow, aspen and birch at lower levels.

According to local residents deer are not as abundant as they were in former years. The main factor controlling the size of the deer population is weather. Deep or heavily crusted snows restrict their movements and prevent access to much of their winter food and as a result they loose much strength and either die of malnutrition or become

subject to disease and predation. The peak of the last population high occurred in 1947-48. In 1948-49 severe winter and wolves decimated them. Dr. Naismith, on Mahood Lake, stated that a herd of twenty deer that used to frequent the immediate vicinity of his residence was wiped out by wolves. The pack of wolves responsible for most of these depredations has been eliminated and the deer are again increasing in the district.

The winter of 1949-50, though bitterly cold, was comparatively easy on the deer. The snow crusted but little and allowed the animals freedom of movement. Those animals seen during the early part of the survey, though thin, were in healthy condition, and rapidly gained flesh as the summer progressed.

Three deer were shot and examined for parasites and diseases. All were lightly infected with the encysted stage of the tapeworm (*Cysticercus tenuicollis*).

One harboured the encystid stage of the tapeworm (*Taenia Krabbei*). One had a large hydatid cyst in its lung. One had a single large grub of the nose bot fly on its chonchae (*Genus Cephemyia*). Two had hard greenish lesions on the surface of the lungs which have been tentatively identified as infestations of the lungworm (*Protostrongylus*).

These parasitic conditions are considered to be normal in deep populations and give no reason to suspect that intestinal parasites are playing an important part in deer survival.

CARIBOU (*Rangifer arcticus montanus*)

Caribou were abundant in the whole district prior to about 1935, and herds of thirty and forty were not unusual in the Battle Mountain and Mobley Mountain areas. Between the years 1935 and 1939 a great reduction took place and now only scattered remnants of the once plentiful herds remain.

Soon after our arrival in the park we heard reports that C. Shook had seen evidences of a herd of from twelve to fifteen head in the vicinity of Murtle Lake. Accordingly we made a quick trip to Murtle Lake on the 24th, 25th and 26th of May. There were still considerable snow upon the ground and caribou tracks were seen on the trail through the green timber. A careful check on tracks indicated that approximately twelve animals were using the area. A similar situation existed on the Mile Creek flats on the shores of Murtle Lake. This area had been trampled considerably by caribou and three fresh beds were found with three fecal pellet piles of different sizes close by. The tracks in the area may have been made by three animals intensively using the area or by a greater number of animals passing through. The holder of the Azure Lake trap line stated that caribou are scarce in that district. He saw evidences of only three or four caribou on Mt. Huntley, Hoque Mountain and on Angushorne Creek.

On the 27th June we climbed the range of mountains south of Azure Lake and found fresh tracks in the snow of two adults and one calf caribou. During our stay at Murtle Lake the fresh tracks of a cow and calf were seen on a snow field above Strait Lake,

and recent tracks were seen in the sand, of the beaches of the narrows of Murtle Lake indicating the presence of seven to ten animals.

Mr. J.C. Norman said that he saw evidences of about seven caribou while fighting fire up Azure River in July, 1950. Mr. Pollard and C. Shook reported seeing abundant caribou tracks in the Azure Mountain area, many of which were old, however. From the above reports it is reasonable to assume that caribou are still widely but sparsely distributed throughout the park. The present small population appears to be producing a good proportion of calves, and given complete protection, has a fighting chance of rebuilding the herds to former proportions.

There have been many theories advanced regarding the reasons contributing to the decline in numbers of caribou in this area. I have received reports of a large influx of caribou to the Dome Creek area, to the north of the park, indicating a shift of the population. Trappers report that in the years prior to 1939 the snow used to become crusted earlier in the year and so allow for greater freedom of movement of the animals. Wolves and cougars have been blamed for the destruction of many caribou. Some of the local residents consider that the bull moose drive the caribou out of the country, this may have some factual basis, seeing that the bull moose range into alpine country in the summer. Last, but not least, hunting has been blamed for their decrease. In the days of their greater abundance, the early thirties, many caribou were killed illegally for food. Many people were unemployed and many of them lived on "wild meat". In addition to this, the legal kill was quite extensive; all the local hunters hunted caribou. I was told of one case where a poacher shot over twenty caribou out of one herd, roasted the lg bones over a fire for their marrow and discarded the carcasses. In light of the foregoing, there appears little reason to doubt that man was largely responsible for the declination of the herds. The main objection to this theory is why was the disappearance so sudden? My answer to this is that it wasn't actually so. To the average hunter game is plentiful as long as the hunts are successful. In the case of the caribou which congregate in herds and frequent selected areas year after year, the hunters would not appreciate a reduction in the number of animals until almost the last available animal in the last available herd was gone.

MOUNTAIN GOAT (*Oreamnos Americanus*)

Goats are confined to the rougher areas of alpine and subalpine country. In the summer they seek the rugged and steep mountain sides that are contiguous with alpine meadows. During the winter they descend to the level of alpine fir and appear to subsist upon it and what vegetation they can secure from wind-blown ridges. They return to the slides in the spring, as soon as they open up.

On June 13th-15th we saw eight adult and two kids on Mt. Huntley. The alpine willow on a large slide showed evidences of very heavy browsing and this small flock probably wintered in the area. Goat hair and dropping were seen in alpine country south of Azure Lake on June 27th and again between Murtle and Strait Lakes of July 18th-20th. During the first week of September, fourteen goats were seen in the Goat Peaks district

north of Kostal Lake. This band consisted of eleven adults, one yearling and two kids. Two goats were shot on the Goat Peaks. Both were very old animals, their teeth were much worn, but both were in excellent condition to enter the winter, being very fat indeed.

It is doubtful that man has much affected the goat population in the park. Some are killed for food by trappers, and some killed by hunters, but the total kill is very small. The ratio of kids to adults 4.20 is not encouraging, but on the other hand the age of the two adults shot indicates a long life expectancy, so the kid crop is probably sufficient to maintain the population.

GRIZZLY BEAR (*Ursus horribilis*)

Grizzly bears appear to live at higher altitudes than the black bear. They prefer the alpine and sub-alpine areas where, in spring, they feed extensively upon the vegetation of the open slides. In the late summer and autumn they dug out numerous ground squirrels and evidences of their diggings were seen above timberline wherever we went. Apparently occasional grizzlies descend into the lowlands as reports of grizzlies about the farms are quite frequent; however, any large light coloured bear is usually called a grizzly and many of the reports probably refer to large, brown-phase, black bears.

Grizzlies are not hunted extensively within the park, in the past some of the trappers concentrated on them but of recent years they have been little disturbed. It is reported that a party flew into Angushorne Lake in the spring of 1950 and shot two grizzly, apparently these were the only ones killed this year.

During the course of the summer's investigations three were seen on Mr. Huntly and evidences of at least three more were seen in the district. Large grizzly tracks were seen on File Creek in August. In September Mr. Ritcey reported seeing the evidences of at least six grizzlies on the Kilpil Mountain, south of Kostal Lake, two of which were cubs. The tracks of another animal were seen on the Goat Peaks range.

Old timers and trappers report that there has been little apparent change in the abundance of grizzlies within their memories. The factors limiting the abundance of these fine animals in their natural environment are unknown. We are starting out with what appears to be a population little modified by activities of man in the past. Only by keeping accurate records of their abundance, and of the numbers killed by hunters year by year, can the necessary basic knowledge be ascertained upon which to set up a management plan.

BLACK BEAR (*Euarctos americanus*)

Black bears are relatively abundant throughout the lowlands of park. As soon as they emerge from hibernation they seek out the skunk cabbage swamps and damp meadows. In the early spring their diet appears to consist of herbs, grasses and ants. As soon as the berries ripen the bears turn to them and they form the main item of diet.

According to local residents there is a definite movement of bears to the Clearwater River in autumn, where they feed on spent salmon.

One hundred and seven bear scats were examined; twelve contained ants; fourteen, fibrous vegetable material; and eight-one, berries. Logs and stumps were frequently seen that had been ripped open by bears for the ants and grubs they harboured. No animal material was identified in the scats apart from the aforementioned insects.

The abundance of bears appears to be largely correlated with the abundance of berries. The berry crop of 1949 was a complete failure due to early frosts. Not a single **cat** or cub track was seen during 1950, in all probability this was due to the fact that the bears entered upon the winter in poor condition and failed to produce young. The berry crop of 1948, on the other hand, was normal and local residents reported that cubs were frequently observed in the spring of 1949. The berry crop of 1950 was one of the heaviest in the memory of the local residents, and it will be interesting to see the effects on the cub production in the spring of 1951.

They are not hunted to any extent by visiting sportsmen, but a few are shot incidentally when other species of game are being hunted. The local residents prize them in the late summer for their fat which is widely used for shortening. The kill of bears in the area is not large and probably has little effect upon the population as a whole.

Fur Bearers

The following fur returns represent the catch of fur from the south central portion of the park. This area now consists of the trap line areas of Henry Hogue, the Helset-Shook partnership and Lawrence Ludtke. The fur returns from the remainder of the park are so disjointed that they are of no value in assessing the productivity of the lines in question.

Fur Returns of South Central Wells Gray Park 1929-1940

	1929 1930	1930 1931	1931 1932	1932 1933	1933 1934	1934 1935	1935 1936	1936 1937	1937 1938	1938 1939	1939 1940
Beaver	93	50	43	59	35	51	37	36	33	23	61
Fisher	4	2	7	5	6	2	4	4	2	2	3
Fox	1	1	2	2	2	1	1	1	-	1	-
Lynx	3	2	-	-	-	2	-	-	-	-	1
Martin	57	49	47	69	87	57	20	26	31	20	6
Mink	10	6	3	3	11	9	2	1	4	5	4

	1929 1930	1930 1931	1931 1932	1932 1933	1933 1934	1934 1935	1935 1936	1936 1937	1937 1938	1938 1939	1939 1940
Muskrat	5	7	5	12	14	1	6	8	-	6	-
Skunk	3	-	-	-	-	-	-	-	-	-	-
Weasel	105	91	103	79	89	104	33	61	72	76	65
Wolverine	1	3	1	5	-	1	1	1	-	-	-

Fur Returns of South Central Wells Gray Park 1940-1950

	1940 1941	1941 1942	1942 1943	1943 1944	1944 1945	1945 1946	1946 1947	1947 1948	1948 1949	1949 1950	Yearly Average
Beaver	53	43	56	36	49	29	63	57	28	42	46.5
Fisher	3	6	-	-	-	3	-	6	5	1	3.0
Fox	-	1	-	-	-	-	-	-	-	-	0.6
Lynx	-	-	-	-	-	-	3	-	-	-	0.5
Martin	40	25	18	8	19	12	21	11	6	4	31.0
Mink	6	4	3	3	10	2	-	6	13	4	31.0
Muskrat	3	3	4	2	1	3	10	1	-	-	4.3
Skunk	-	-	-	-	-	-	-	-	-	-	0.1
Weasel	148	168	106	40	91	101	130	77	73	30	87.3
Wolverine	-	-	-	-	-	-	-	-	-	-	0.6
Squirrel	-	-	-	-	-	5	64	-	77	14	32.0
Otter	-	-	-	-	-	2	2	-	-	-	0.2

Before attempting to draw any conclusions from the above figures it might be well to look into the history of this area. Apparently one of the earliest settlers in the district was John Ray, who immigrated by way of Canim and Mahood Lakes. Ray was an excellent woodsman and in his younger days a tireless worker. He has become somewhat of a legendary figure of late and it is stated that during the trapping season of 1917-18 he and a partner took over a hundred beaver and over a hundred marten out of the Clearwater Valley. Unfortunately the fur returns only go back to the 1929-30 season. The three other trappers who were active in this area at that time were Mishel

Majenis and Peter McDougal and Dave Anderson. The lines of Majerus and McDougal are now held by the Helset-Shook partnership, that of Ray by Henry Hogue and that of Anderson by Lawrence Ludtke; all of these transfers have taken place within the last ten years.

In view of the trappers operating in the area I do not think that the figures of fur returns give an accurate indication of the relative abundance of animals from year to year. One must bear in mind that the original holders of the lines were men in the declining years and as a result did not trap as intensely as formerly, similarly those who took over the lines were less acquainted with them and in most cases were less efficient trappers with a resulting smaller catch. Of late years some of the trappers have found guiding so remunerative that they have not needed to trap so extensively, in some cases they have not trapped at all and in others have only skipped either spring or fall season.

I certainly would not go as far as to say that the animals have not suffered a reduction in numbers, but I do doubt if the reduction is as serious as a casual inspection of the above data would indicate. I consider this data of value only in as much as it is a record of what the area has produced in the past, and as such it can be used as an indication of what it can produce in the future. Given the incentive to trap, in the form of good prices, and the guidance of consolidated planning and management, I can see no reason why the trappers should not again enjoy harvests equal or exceeding those of the early thirties.

Each species of fur bearer will now be taken up individually in a short discussion pertaining to their present status in the park.

RED FOX (*Vulpes fulva*)

Foxes are not common in the park. None were seen during the summer and very few tracks were observed. Trappers take the occasional fox but since the decline in the price of long-haired furs they have not been sought to any extent.

MARTEN (*Martes americana*)

Marten constitute one of the most important fur resources of the park. They are characteristically an animal of the mature coniferous, sub-alpine, and alpine areas. The extensive fires of the last fifty years have eliminated much of the marten range at lower altitudes, this and heavy trapping pressure have removed a large part of the earlier populations of the area. Undoubtedly in the past, many lines have been too intensively trapped; however, since the advent of the present system of registered trap lines, most of the lines have fallen into the hands of men who are vitally interested in the future years' crops. As a result the trappers are generally conservation minded and in many instances leave whole areas, untouched for several seasons in succession. The general consensus of opinion among the trapper in the southern end of the park is that marten are slowly increasing. Very little is known of the density of the population or its productivity. Each trapper traps according to his own ideas, many of which are without

factual foundations, so there is little doubt that in many cases this resource is not being fully utilized.

FISHER (*Martes pennanti*)

Fisher are the most prized of all North American fur bearers. Taking into consideration the fact that they are always sparsely distributed, one might well say that they are relatively abundant in the park. Mr. Helset states that he has noticed a marked increase in the number of fisher in the Upper Clearwater Valley in the last few years. Mr. Miller, on the east end of Murtle Lake, states that he can see little change in the numbers on his line. He says that when the hares become abundant the fisher move into the district, but over a period of years there has been little change in their numbers.

Apparently fisher are not as demanding as marten with regards to habitat requirements. They move into the burned-over areas quite freely in search of hares. Very little appears to be known of the biology of fisher, population, density or productivity, and the presence of a stable and relatively large population constitutes somewhat of a challenge to the research biologist.

SHORT-TAILED WEASEL (*Mustela erminea*)

LONG-TAILED WEASEL (*Mustela frenata*)

These two weasels constitute the ermine of the trappers. They are widespread throughout the park. The short-tailed weasel is mainly an animal of the lowlands. It is relatively common about farms and in the burned-over areas. The long-tailed weasel is an animal of the heavy timber and sub-alpine forests. Weasels are trapped extensively by all trappers, many being caught in sets designed to catch the more valuable marten and fisher.

WOLVERINE (*Gulo luscus*)

The wolverine is the large weasel, characteristic of the alpine and sub-alpine country. Three were seen in the course of the work; one on the slopes of Mount Huntly on June 12th; two on the mountains between Strait and Murtle Lake on July 18th, 1950. We heard a report that a wolverine was shot by a party of grizzly hunters on Angushore Lake in June of 1950.

All the trappers report that wolverines cause considerable trouble on their marten lines, destroying traps and fur. Mr. L. Ludtke considers the wolverines to be predator on caribou, certainly a wolverine would be more than a match for a caribou hampered by soft snow. Nevertheless, unless serious economic damage is being done by this animal, it, as the rarest of North American fur bearers, deserves some measure of protection in park areas.

OTTER (*Lutra canadensis*)

Otter are confined to the larger rivers and lakes of the park. They are not sought after to any extent by trappers because they require large, heavy traps, their pelts are not very valuable and they are had to skin. Mr. Helset saw an otter while beaver trapping on the Murtle River in the spring 1950. The Hogue brothers report having seen otter on Azure Lake in years past. Apparently there is little drain on, or change in, the otter population from year to year.

MINK (*Mustela vison*)

Mink are not uncommon to the larger waterways of the park. They are much sought after by the trappers when they frequent the rivers in the autumn. Later in the winter the mink move into the swamps and beaver meadows in search of mice and muskrats. There they live in the spaces along the water courses beneath the snow. Both Mr. Helset and Mr. Miller consider them the main factor controlling the muskrat population.

STRIPED SKUNK (*Mephitis mephitis*)

Skunks are uncommon in the park. Mr. Helset had a family of them take possession of his File Creek cabin one fall and had considerable difficulty evicting them. One was seen along the banks of Hemp Creek on several occasions during the summer of 1950. A record of three having been taken by John Ray during 1929-30 is the only mention of this species in the fur returns.

LYNX (*Lynx canadensis* (Kerr))

The lynx is not an abundant animal in the park. Assistant Ranger John Weinard saw one on the road above the canyon in July, 1950. Reports indicate that lynx were present in fair numbers before the large fire of 1926. Other reports indicate that the White Horse Bluffs district once supported a sizable population, but that they were cleaned out by "cougar hunters" using dogs. The scarcity of lynx can be ascribed to the lack of suitable habitat as a whole, and to the fact that three areas that are suitable are local and circumscribed. Such small local populations are easily cleaned out by trappers.

Beaver (*Castor canadensis*)

Beaver are widely distributed throughout the southern portion of the park. The history of the beaver somewhat parallels that of moose and deer in that their habitat has been greatly improved by the forest fires. What once was dense coniferous forest has now been reduced to stands of willow and aspen, thereby creating large areas of potential beaver country. The presence and abundance of beaver is largely due to the efforts of Mike Majerus. He apparently was fond of beaver and went to great pains to preserve the beaver on his trap line. As a result the animals thrived and increased. Since Mr. Helset took over Mr. Majerus' line he also has preserved the animals and pursued a sensible policy in trapping them.

Distribution

Beaver are abundant in the Blackwater-Murtle River Valley throughout the burned-over area. Strong colonies also were seen on Deer Creek and on Falls Creek, but the present centre of populations is in the Murtle River Valley. In the vicinity of Murtle Lake beaver are scattered on all the creeks and rivers, but there is not sufficient feed to support a large beaver population.

At Kostal Lake a similar situation prevails. At present there are very few cottonwood left on the lake margin and the willows are heavily cut back, indicating that it could support no more than the present occupants. Water levels were too high to allow accurate assessment of the Azure River population, but recent beaver cuttings were quite abundant. A very different situation prevails west of Clearwater Lake and Clearwater River. Most of the lakes in the Archer Creek burn were visited and no fresh evidences of beaver could be found. Several large "beaver meadows" were seen but with no signs of recent occupancy. No fresh signs could be found in the Mahood Lake area either.

Undoubtedly man constitutes the main factor controlling the beaver population. Mr. Helset estimates that he has between sixty and seventy "live colonies" on his trap line. There is much country west of the Clearwater which could be equally productive if properly managed.

The future of the beaver within the park depends upon wise conservation practices. the beaver is an animal which quickly "eats out" its own home territory if allowed to increase unchecked, on the other hand they are easily extirpated over large areas if trapped too assiduously. Careful and intelligent management is essential if beaver production is to be maintained at maximum possible level. At present restoration measures are needed in those areas west of the Clearwater River and lakes, while those areas east of the Clearwater are well, if not fully, stocked.

MUSKRAT (*Ondatra zibethica*)

Muskrats and muskrat sign were seen throughout the lowland areas of the park. They appear to be especially partial to beaver workings. They are not considered to be of much value by the local trappers because they seldom become abundant enough to warrant trapping. The increase of each breeding season appears to disappear before the spring trapping season of the following year. Both Mr. Helset and Mr. Miller ascribe this drop in muskrat population to the predation of mink. Other investigators working upon the mink-muskrat predation problem have come to the conclusion that the mink had little significant effect upon the population levels of the muskrat; however, their work was conducted in areas where the muskrats lived under optimum habitat conditions. The areas inhabited by muskrats in the park are, on the other hand, marginal at best, and a very different predator prey relationship may well exist. For this reason I am very much inclined to agree with Mr. Helset and Mr. Miller in this case. Certainly the

muskrats are, at present, of greater value as feed for mink than they are as fur, and such being the case mink predation constitutes no immediate loss.

SMALL MAMMALS

Small mammals constitute a fairly large proportion of the mammalian fauna of the park. Most of them are more or less important from both an aesthetic and economic point of view. The small rodents provide a source of food for the valuable carnivorous fur-bearers on one hand, and a source of annoyance and property damage to campers and trappers on the other. In all probability our attitude towards the various small mammals will change considerably when the ecological relationships between them and their habitat is fully realized. The following is an annotated list of the small mammals recorded during the summer.

SHREW (*Sorex spp.*)

These little animals are abundant and widespread throughout the park. They were frequently caught in our small mammal traps. The trappers report that shrews frequently chew at those animals that have died in the traps. They usually attack the lips and ears and the damage done materially reduces the value of the pelts.

WATER SHREW (*Sorex palustris*)

Mr. Ritcey caught one on the creek that flows through the flat to the north of Kostal Lake. This was the only specimen definitely identified although another shrew thought to be of this species was seen on Hemp Creek early in May.

SILVER-HAIRED BAT (*Lasionycteris noctivagans*)

Bats were infrequently seen during the survey. One of the above species was taken on Azure Lake on June 16th. Undoubtedly other varieties occur and will be recorded by future collectors.

PIKA (*Ochotona princeps* (Richardson))

Pika are everywhere abundant where dry rock slides occur above 3500 foot elevation. These interesting little rabbits are active all winter and doubtless form a valuable portion of the diet of the marten and weasels at higher altitudes.

SNOWSHOE HARE (*Lepus americanus* (Erxleben))

Snowshoe hares were not infrequently seen in the burns and deciduous thickets. The abundance of droppings was mute evidence of their presence over a greater part of the park. They form a large part of the diet of most of the hawks, owls and mammalian carnivorous during the winter months when so many of the rodents are in hibernation.

HOARY MARMOT (*Marmota caligata* (Eschscholtz))

Hoary marmots were present above timberline wherever large, dry rockslides existed. Their loud penetrating whistles were always a pleasant and characteristic part of the alplands; the fauna of the park would be infinitely poorer without them, and steps should be taken to ensure that they are not wantonly destroyed merely as targets for riflemen.

GROUND SQUIRREL (*Citellus columbianus* (Ord))

Ground squirrels are abundant throughout the whole park. They prefer open, dry hillsides and immediately gravitate to clearings and pastures. No doubt the burning of the mature forests have increased the habitat of this animal immeasurably. They form an abundant source of food for all carnivores from May to August. At Hemp Creek the ground squirrel had all gone into hibernation by the 20th of August. However, at higher altitudes they were still active during the second week of September in the Goat Peaks area.

GOLDEN-MANTLED GROUND SQUIRREL (*Citellus lateralis* (Hollister))

These beautiful little mammals were only found on the highest crags of the Goat Peaks. They appear to be restricted to the truly alpine zone in the park. Two specimens were secured and several more seen.

COLUMBIAN CHIPMUNK (*Eutamias amoenus* (Allen))

Chipmunks are widespread throughout the whole park. They were more often seen out in the burned-over areas than in the mature timber. One was taken above the timber line on Mt. Huntley.

RED SQUIRREL (*Tamiasciurus hudsonicus* (Exleben))

Red squirrels are abundant in all mature timber and second growth conifers up to the alpine zone. They are utilized as fur by the trappers to a limited extent. A majority of the trappers do not deliberately set for squirrels but skin them when they are taken in weasel and marten sets. In all probability squirrels are of as great a value as marten food as they are as fur themselves. They are active all winter and being arboreal in habit are available to the carnivores such as marten and fisher.

FLYING SQUIRREL (*Glaucomys sabrinus* (Shaw))

Not very abundant in the park, one flying squirrel was taken in the big timber between Hemp Creek and Dawson Falls. Trappers report that they catch "a few" every winter.

DEER MOUSE (*Peromyscus maniculatus* (Wagner))

This is the common mouse about cabins and buildings. They are widespread through the whole park up to the sub-alpine zone at least. *Peromyscus* move above the snow a large extent and are probably used for food by foxes and weasels to a large extent. They are abundant in the mature coniferous forests.

LEMMING MOUSE (*Synaptomys borealis* (Richardson))

These little bog dwellers were found in abundance along the west shore of Murtle Lake. Their runs and winter dropping piles were a characteristic feature of the muskegs of the area.

RED-BACKED VOLE (*Clethrionomys gapperi* (Vigors))

Red-backed voles were found to be the abundant vole in the mature timber on the shores of Clearwater Lake. They were also abundant at the east end of Murtle Lake.

MEADOW MOUSE (*Microtus spp.*)

Meadow mice were not abundant within the park boundaries. An average population was found at Hemp Creek in the hay meadows. None of the grassy meadows at low elevations within the park were trapped, but they undoubtedly occur in equal numbers there. These animals are cyclic in population behaviour and it would appear that they are now passing through a relatively low period of the cycle.

JUMPING MOUSE (*Zapus hudsonicus spp.*)

Jumping mice were found to be quite common in hay lands and alpine meadows throughout the park.

PORCUPINE (*Erethizon dorsatum* (Linnaeus))

No porcupines were seen during the summer. A small amount of porcupine work was noticed on the west shore of Clearwater Lake and on Green Mountain. Mr. Miller says that in former years porcupines were abundant in the Murtle Lake area, now they are seldom seen. Mr. A.D. Flowers, who was employed as the lookout on Azure Mountain saw one on July 22nd, 1950; this is the only recent record for the park.

PREDATORS

The subject of predators is always a most controversial one. Some of our most valuable fur bearers are predacious in habit and were it not for their value as fur, would be classed as vermin. It is my firm conviction that there is a place in the park for a reasonable population of predators that would elsewhere be classed as vermin. The howl of the wolf is in itself the very essence of the wilderness, and as a recreational area the park would be infinitely poorer without them; the same could be said of the coyote only to a lesser degree. It should be the aim of any park management program

to keep the populations of larger predators within reasonable bounds and not to eliminate them.

TIMBER WOLF (*Canis lupus*)

Wolves are the most conspicuous and probably the most destructive predator in the park. they are comparatively recent immigrants, having moved in during the last eight or ten years. This rise in wolf population parallels the increase in moose.

During the winter months the wolves appear to follow a definite beat. One pack ranges from the Pyramids up the Murtle River, cuts across the McLeod Hills over to Battle Mountain. They then swing south to the foot of the Trophies, down the canyon to the foot of Green Mountain, following the Clearwater River to Mahood Lake, and finally swing back to the Pyramid again.

Mr. L. Ludtke states that wolves habitually use the Stevens Lakes area as a pupping ground. The abundance of ground squirrels provides them with a ready source of food. During the summers investigations few fresh wolf signs were apparent. Their howls were heard in the Hemp Creek area several times during May. Fresh wolf tracks were seen on the west shore of Clearwater Lake in June, and on the 27th of July fresh tracks were seen on the Murtle Lake trail, close to the outlet of the lake. On the 17th of August wolves were heard howling in the Blackwater district and several sets of tracks were seen in the vicinity of Hemp Creek in late August. On 13th of September Mr. Ritcey shot a large adult male wolf in the vicinity of Shadow Lake in the Clearwater Valley.

The abundance of wolves fluctuates markedly from year to year. During the winter they congregate in packs and are then most conspicuous. Mr. Helset said the wolf pack was composed of nineteen animals in the winter of 1947-48. They reached their peak during the winter of 1948-49. Mr. Baldus reports having seen a pack of twenty-four at the east end of Mahood Lake. During the winter of 1948-49 several of the local residents obtained permits to poison wolves, and the packs were materially reduced as a result of this method of control. Mr. Helset said that during 1949-50 there were no large packs and that only five or six animals were frequently seen on the Pyramid and their other old haunts. Dr. Naismith, at Mahood Lake, says that not a single wolf was heard during the winter of 1949-50.

Known wolf kill for 1948-50:

	Winter of 1948-49	Winter of 1949-50
Helset	14	2
McNeil	18	0
Baldus	2	0

	Winter of 1948-49	Winter of 1949-50
D. Archibald	0	1
Ritcey (summer of 1950)	0	1
Total per year	34	4
Total-38		

The above table of wolf kills represents wolves known to have been killed in the district. Many of them, mainly those of McNeil and Archibald, were taken outside the park boundary; however, they appeared to have belonged to the band whose circuit included the southern part of the park.

Wolf scats were not especially common on the trails, probably due to their habit of following the rivers on their winter circuits. The few scats that were found were all composed of moose remains. All except one were winter scats, the exception was one found near Clearwater Lake and contained the hoof of a calf moose.

I would hesitate to estimate the number of wolves now frequenting the park, but in view of the widespread sign observed during the summer, I would venture to express the opinion that they are again increasing. Wolves are easily controlled by poisoning, however, and there is no excuse for allowing the packs to build up into unwarranted proportions.

COYOTE (*Canis latrans* (Say))

Coyotes are widely distributed throughout the park. Coyote tracks were seen throughout the Clearwater and Murtle River valleys at scattered intervals during the summer. Fresh tracks were observed in alpine country of the Goat Peaks in early September.

Coyotes were quiet and unobtrusive during the summer. They were heard yelping in early May and again in late August. The commencement of autumn howling coincided with the disappearance of the ground squirrels into hibernation, and the sudden loss of this ready food source may have had some connection with their howling activities.

The local residents state that coyotes frequently kill deer during the winter months. However, the population appears to be relatively small. They are shot, snared and trapped extensively by the farmers and trappers and there seems to be little evidence to indicate that their numbers will increase beyond reasonable bands.

Twenty-three scats were collected that were attributed to this animal; nine of them contained remains of deer; twelve, of rabbit; two of ground squirrel; three of mouse; and

one, of marmot. After the berries became ripe small scats were frequently seen along the trails almost wholly composed of berries. These could have been dropped either by fox or coyote or both; probably the majority of them were attributed to coyote.

COUGAR (*Felis concolor* (Kerr))

Cougars are scarce in the park. From the reports of local residents it would appear that they were once moderately plentiful along the Clearwater River in the vicinity of White Horse Bluffs, but were cleaned out by cougar hunters using dogs.

One small cougar track was seen on the shore of Murtle Lake on 28th May, 1950. Mr. L. Ludtke reports having seen at least three sets of cougar tracks on his trap line on the north arm of Murtle Lake during the winter of 1949-50. He found evidences of cougar having killed some beaver on his line.

It is quite possible that cougars may be a serious factor in the control of caribou, but both are so scarce that an intelligent appraisal of this situation is now impossible.

BIRDS

One hundred and fifteen species of birds were noted; only an annotated list of them has been prepared from the necessarily incomplete notes that were made during the more intensive work on the game. This list should not be construed to be a complete list of the birds occurring in the park during the summer months, for undoubtedly when a systematic collection and study of the birds of the area is undertaken, other species will be recorded. The birds have been identified to the specific level only, and there remains for the systematist the task of collecting the material pertinent to the study of the avian sub-species involved.

LOON (*Gavia immer* (Briinnich))

Abundant on the lakes throughout the whole area investigated.

RED-NECKED GREBE (*Colymbus grisigena* (Boddaert))

Occasional on the larger lakes.

HORNED GREBE (*Colymbus auritus* (Linnaeus))

Found nesting on Five-Finger Lake, June 7, 1950.

WESTER GREBE (*Aechmophorus occidentalis* (Lawrence))

Encountered only once, a flock of thirteen on Murtle Lake, July 15, 1950

AMERICAN BITTERN (*Botaurus lentiginosus* (Montague))

Only record for the summer was the wing of a bittern found hanging in the front of a trapper's cabin on Murtle Lake.

CANADA GOOSE (*Branta canadensis* (Linnaeus))

Breeds sparingly in suitable areas in the park. The resident population is small and should be carefully preserved.

LESSER SNOW GOOSE (*Chen hyperborea* (Pallas))

Occasional migrant.

MALLARD (*Anas platyrhynchos* (Linnaeus))

This duck breeds throughout the area covered by the survey in all suitable locations. It is widely distributed but not abundant.

GREEN-WINGED TEAL (*Anas carolinensis* (Gremelin))

An uncommon kind in the spring and summer months, it probably breeds sparingly within the park boundaries.

BALDPATE (*Mareca americana* (Gremelin))

Only one baldpate was seen, at Murtle Lake on May 25, 1950.

WOOD DUCK (*Aix sponsa* (Linnaeus))

Three wood ducks were seen on a beaver pond on Blackwater Creek on August 16, 1950. The habitat was ideal for these ducks and I have little doubt that they bred here.

REDHEAD (*Aythya americana* (Eyton))

Two pairs of redheads were seen on Murtle Lake on May 25, 1950.

RING-NECKED DUCK (*Aythya collaris* (Donovan))

Two "ring-necks" were seen on a small lake east of the outlet of Clearwater Lake.

CANVAS-BACK (*Aythya valisineria* (Wilson))

Several pairs of canvas-back were seen on Murtle Lake on May 25, 1950.

GREATER SCAUP DUCK (*Aythya marila* (Linnaeus))

LESSER SCAUP DUCK (*Aythya affinis* (Eyton))

Scaup ducks were seen at Stillwater and on Murtle Lake during the last week of May. No specimens were taken so no attempt was made to differentiate between the two species.

BARROW'S GOLDEN EYE (*Bucephala islandica* (Gremelin))

Barrow's Golden Eye are the most abundant breeding duck in the southern part of the park. On May 15th, 1950 nine pairs were seen on Placid Lake, this was probably a concentration of migrating birds, but practically all the lakes of this size supported from one to three broods later on in the summer. On July 24, 1950 four broods were seen at the west end of Murtle Lake averaging five birds to the brood. Later on in the summer the average brood consisted of three young. Taking into consideration the number of small lakes and beaver ponds I consider this district of considerable importance as a breeding area of the species.

BUFFLE-HEAD (*Bucephala albeola* (Linnaeus))

Only one brood of Buffle-heads was observed. It was on a small lake in the burn of the west shore of Clearwater Lake on June 30th, 1950, there were six young. A male in the flightless eclipse plumage was seen on several occasions on Mahood Lake, July 8th, 10th and 11th, 1950.

HARLEQUIN DUCK (*Histrionicus histrionicus* (Linnaeus))

These attractive ducks were frequently observed at Hemp Creek and on Murtle River during May and at Clearwater outlet and Azure Lake in June. J.C. Norman reported having seen a female with brood the previous year (1949). We saw two broods on Hemp Creek, one on August 1st, 1950 with two downy young, and subsequently a female with three almost fully grown young were seen near the Forest Service cabin on August 6th, 1950 and several occasions thereafter.

RUDDY DUCK (*Oxyura jamaicensis* (Gremelin))

Seen only once on Murtle Lake, May 25th, 1950.

AMERICAN MERGANSER (*Mergus merganser* (Linnaeus))

American mergansers are common on the larger rivers and lakes in the spring and summer months. They appeared to be most abundant on Mahood lake where three large broods were seen on July 10th. On June 28th several, one of them flightless, were seen on the Clearwater River between Azure and Clearwater Lakes.

HOODED MERGANSER (*Lophodytes cucullatus*)

Two pairs of hooded mergansers were seen on May 30th in a large swamp close to Stillwater on Murtle River. They were seen again on Murtle Lake on July 23, 25th and 26th, on the west end of the lake.

WHITE-WINGED SCOTER (*Melanitta fusca*)

Several pairs of white-winged scoters were seen on Murtle Lake on May 25th, 1950.

GOSHAWK (*Accipiter gentilis* (Linnaeus))

On May 26th an adult male goshawk was collected at the outlet of Murtle Lake. On June 27th another adult goshawk was seen at the same place; they probably nested in the vicinity. A immature goshawk was seen near the Forest Service cabin at the Horseshoe on Clearwater River on August 4th, 1950.

SHARP-SHINNED HAWK (*Accipiter striatus* (Vieillot))

Sharp-shinned hawks were seen intermittently throughout the spring and summer. They probably nest in the park. In the latter part of August there was a migration of this and the following species in the Hemp Creek area and they were seen daily during this period.

COOPER'S HAWK (*Accipiter cooperi* (Bonaparte))

This hawk was not definitely identified until the fall migration commenced in late August, at which time they became quite abundant.

RED-TAILED HAWK (*Buteo jamaicensis* (Omelin))

These attractive birds apparently nest quite regularly in the burned-over areas. One kind was seen several times on June 23rd and 24th in the Archer Creek burn on the west side of Clearwater Lake. On one occasion it acted as if it had a nest close by, wheeling close at hand and squealing constantly. On August 2nd a pair of adults with two fully fledged young was seen on Hemp Creek. The young had only recently left the nest and had not yet learned to fly well. In late August and September a small migration passed through.

GOLDEN EAGLE (*Aquila chrysaetos* (Linnaeus))

These fine birds were seen on the slopes of Mr. Huntley on June 12th, 13th and 14th where they "cruised" the slides. This caused consternation on the part of the marmot population where shrill warning whistles heralded the approach of danger when ever an eagle passed over. Golden eagles were seen again above the Forest Service Lookout on Azure Mountain. Here they shrilly protested our presence and I have little doubt that they had a nest in some cliff close at hand.

BALD EAGLE (*Haliaeetus leucocephalus* (Linnaeus))

Two pairs of bald eagles were encountered, one on Clearwater Lake, and one on Murtle Lake. Those on Clearwater Lake frequented a large snag near the mouth of Archer Creek and probably had a nest close at hand. Those of Murtle Lake had a nest on the "Narrows".

MARSH HAWK (*Circus cyaneus* (Linnaeus))

Seen once in the spring on Hemp Creek, May 18th, it was an adult male. On August 20th and 21st an immature bird was seen on the hay meadow at Hemp Creek on several occasions.

OSPREY (*Pandion haliaetus* (Linnaeus))

These beautiful and interesting raptors are abundant near all large lakes and rivers within the park. They nest on Murtle River near "Majerus ranch" and at the Stillwater. They were frequently observed at Clearwater and Azure Lakes during our stay there. We counted at least eight occupied nests on Murtle Lake and several unoccupied ones. Such abundance of osprey is quite unusual and I think a definite asset to the park. Indiscriminate shooting has seriously reduced the numbers of these birds throughout much of their range and any efforts made to conserve those remaining will be energy well spent.

PIGEON HAWK (*Falco columbarius* (Linnaeus))

Definitely identified only once; at Placid Lake on August 22nd, 1950.

SPARROW HAWK (*Falco sparverius* (Linnaeus))

As abundant breeder throughout the burned-over areas. It was also seen on the alpine meadows on the Goat Peaks in early September.

BLUE GROUSE (*Dendragapus obscurus* (Say))

These grouse are widely distributed throughout the study area. Their natural environment appears to be the sub-alpine slide areas and open fir forests; now they are distributed throughout the more open burns, especially where huckleberries (*Vaccinium*) are abundant.

FRANKLIN'S GROUSE (*Canachites franklinii* (Douglas))

Franklin's grouse are distributed throughout the coniferous forest areas. A female collected on the Murtle River trail on May 17th, 1950 had not started to lay at that time. On July 18th a nest with four eggs was found above the north area of Murtle Lake

(elevation 5000'). First chicks were seen on July 14th at the east end of Murtle Lake; there were four in the brood. Between July 14th and August 3rd five broods were seen averaging four chicks. In September we encountered Franklin's grouse in the timber about Kostal Lake and on the bench between the lake and Goat Peaks.

RUFFLED GROUSE (*Bonasa umbellus* (Linnaeus))

Ruffed grouse are widely distributed throughout the burns within the park. In the vicinity of Hemp Creek the males could be heard drumming almost constantly in May. Only two nests were found and they contained eight and eleven eggs respectively. Six broods were seen and they had an average of five chicks to the brood. Ruffed grouse appeared to be most abundant in the area about Hemp Creek and again about Clearwater Lake outlet. Only one was seen at the east end of Azure Lake and only one in the big Archer Creek burn on Clearwater Lake; while seven were seen in one day close to the outlet of Clearwater Lake.

WHITE-TAILED PTARMIGAN (*Lagopus leucurus* (Richardson))

Ptarmigan are restricted to the mountain tops in the summer. One was seen in the vicinity of Azure lookout on June 27th, 1950. Four were seen on Goat Peak on September 8th, 1950. Mr. Pollard, of the Triangulation Survey said he encountered only scattered singles wherever he went this summer. These birds are probably passing through a period of "cyclic low".

WILSON'S SNIPE (*Capella gallinago* (Linnaeus))

One snipe was heard making its whistling call over a meadow close to Stillwater on May 30th, 1950, another was seen on the Murtle River on August 15th, 1950, above Majerus ranch, these are the only two records for the summer.

SOLITARY SANDPIPER (*Tringa solitaria* (Wilson))

First positively identified when a specimen was taken on the Blackwater Creek on August 16th, 1950; subsequently several were seen on Murtle River and Hemp Creek.

SPOTTED SANDPIPER (*Actitis macularia* (Linnaeus))

This little sandpiper is found wherever there are sandy beaches or gravel bars on lakes of streams. It undoubtedly breeds in the park.

GREATER YELLOW-LEGS (*Totanus melanoleucus* (Gmelin))

Greater yellow-legs were seen on the larger meadows and sphagnum swamp in the vicinity of Stillwater, May 29 and 30th and Clearwater Lake on June 24th, 1950. Upon both occasions the birds acted as though we were invading their nesting territory so I think there is little doubt that they were nesting.

SEMIPALMATED SANDPIPER (*Ereunetes semipalmatus* (Cabanis))

One individual was seen on a sand bar on Hemp Creek in the last week of August, 1950.

SHORT-BILLED GULL (*Larus canus* (Linnaeus))

An occasional migrant on the larger lakes of the park.

BONAPARTE'S GULL (*Larus philadelphia* (Ord))

These gulls were seen at Stillwater, and on the Murtle, Clearwater and contiguous lakes. They were usually in pairs, but no positive evidence of breeding was noted.

BLACK TERN (*Chlidonias nigra* (Linnaeus))

Observed once on Five-Finger Lake, close to Clearwater Lake outlet, on June 8th, 1950.

HORNED OWL (*Bubo virginianus* (Gmelin))

Encountered four times during the summer at Murtle Lake, Mahood Lake, Kostal Lake and Blackwater Creek. Specimen taken at Blackwater was an immature male just out of the nest.

NIGHTHAWK (*Chordeiles minor* (Forster))

Abundant in the dryer, more open parts of the park. It was found breeding at Whitehorse Bluffs with fledgeling young on August 7th, 1950.

VAUX'S SWIFT (*Chaetura vauxi* (Townsend))

Abundant throughout the burned-over area, especially over the small lakes west of Clearwater Lake in late June and about Hemp Creek for the last week of August.

RUFIOUS HUMMINGBIRD (*Selasphorus rufus* (Gmelin))

Abundant spring migrant and some undoubtedly nest in the park.

BELTED KINGFISHER (*Megaceryle alcyon* (Linnaeus))

Occurs along streams and lakes in the vicinity of suitable cut-banks in which they nest.

FLICKER (*Colaptes auratus* (Linnaeus))

Flickers are not abundant but are widely distributed throughout the park. They are most numerous in the old burns and the edges of burns. Seen up to 4500' elevation above Kostal Lake in September.

PILEATED WOODPECKER (*Ceophlaeus pileatus* (Linnaeus))

Not common in the park, restricted to the nature coniferous forests at relatively low elevation, most of which has been burned off.

YELLOW-BELLIED SAPSUCKER (*Sphyrapicus varius* (Linnaeus))

Moderately common in the older second growth and along the margins of the burns and mature coniferous forests.

HAIRY WOODPECKER (*Dryobates villosus* (Linnaeus))

Recorded only twice during the summer; viz. June 12th on Mr. Huntley and July 14th at Murtle Lake.

DOWNY WOODPECKER (*Dryobates pubescens* (Linnaeus))

Seen only once, on August 25th at Hemp Creek.

ARCTIC THREE-TOED WOODPECKER (*Picoides arcticus* (Swainson))

One specimen of this species was taken west of Clearwater Lake on June 24th, 1950.

AMERICAN THREE-TOES WOODPECKER (*Picoides tridactylus* (Linnaeus))

These birds occur sparingly throughout the mature coniferous forest of the park.

EASTERN KINGBIRD (*Tyrannus tyrannus* (Linnaeus))

Abundant throughout the burned-over areas of the lower elevations within the park.

FLYCATCHER (*Empidonax* sp.)

Several species of this group appeared to be present, however, owing to the difficulty of certain identification, I am not going to try to differentiate between species. As a group they are common throughout lower elevations within the park.

WESTERN WOOD PEWEE (*Myiochanes richardsoni* (Swainson))

Seen throughout the burned-over areas but nowhere common.

OLIVE-SIDED FLYCATCHER (*Nuttallornis mesoleucus* (Swainson))

This bird was frequently heard throughout the park.

HORNED LARK (*Otocoris alpestris* (Linnaeus))

Seen only once, on top of the Azure range on June 27th, 1950.

VIOLET-GREEN SWALLOW (*Tachycineta thalassina* (Swainson))

Abundant migrant in early spring, later on the tree swallows outnumber it.

TREE SWALLOW (*Iridoprocne bicolor* (Vieillot))

Abundant throughout the area in suitable habitat.

CLIFF SWALLOW (*Petrochelidon pyrrhonota* (Vieillot))

Abundant breeder at Hemp Creek on the park boundary.

CANADA JAY (*Perisoreus canadensis* (Linnaeus))

Locally abundant throughout mature coniferous forests and in the sub-alpine regions of the park.

STELLER'S JAY (*Cyanocitta stelleri* (Gmelin))

The ranges of Steller's jay and Canada jays overlap, but as a rule the Steller's jay are found at lower altitudes. It is quite abundant between Hemp Creek and Dawson Falls.

RAVEN (*Corvus corax* (Linnaeus))

Ravens do not appear to be abundant in the area, but any carrion soon attracts one or more to the spot.

CROW (*Corvus brachyrhynchos* (Brehm))

Crows are abundant in the vicinity of all small lakes and meadows in the burned-off areas. Several large concentrations were seen in the fall up to fifty birds to the flock. They breed in all suitable locations.

CLARK'S NUTCRACKER (*Nucifraga columbiana* (Wilson))

One seen on Mt. Huntley at timberline on June 20th, 1950.

BLACK-CAPPED CHICKADEE (*Parus atricapillus* (Linnaeus))

Abundant throughout the park, especially so in the area of second growth of considerable size.

MOUNTAIN CHICKADEE (*Parus gambeli* (Ridgway))

Seen and identified for sure only twice; on June 12 on the upper slopes of Mr. Huntley and on June 24th in the coniferous forest on the west shore of Clearwater Lake.

CHESTNUT-BACKED CHICKADEE (*Parus rufescens* (Townsend))

Not uncommon in the mature coniferous and sub-alpine forest of the park.

RED-BREASTED NUTHATCH (*Sitta canadensis* (Linnaeus))

Not abundant but widely distributed, even up the timberline on some occasions.

DIPPER or WATER OUZEL (*Cinclus mexicanus* (Swainson))

A dipper was heard in full song on May 26th on Murtle River. Others were seen on Azure River and on a small creek north of Kostal Lake, elevation 4500'.

WINTER WREN (*Troglodytes troglodytes* (Linnaeus))

Not abundant but present in mature coniferous stands of timber.

CATBIRD (*Dumetella carolinensis* (Linnaeus))

Catbirds are common along Hemp Creek on the park boundary.

AMERICAN ROBIN (*Turdus migratorius* (Linnaeus))

Robins are abundant throughout the burns, especially in the vicinity of meadows. They are also found up on the slides and sub-alpine meadows.

VARIED THRUSH (*Ixoreus naevius* (Gmelin))

Breed throughout the mature coniferous forests of the park.

HERMIT THRUSH (*Hylocichla guttata* (Pallas))

Abundant throughout the mature coniferous, sub-alpine and alpine areas of the park.

SWAINSON THRUSH (*Hylocichla ustulata* (Nuttall))

Present along streams and in the burns of the park.

MOUNTAIN BLUEBIRD (*Sialia currucoides* (Bechstein))

Not very abundant in the park. A young bluebird was seen near Mahood Lake on August 8th, 1950, so they apparently breed in the area.

TOWNSEND'S SOLITAIRE (*Myadestes townsendi* (Audubon))

There was a heavy migration of solitaire through Hemp Creek from May 17th to 20th inclusive. They were encountered in quite large numbers in the vicinity of Azure Lookout on June 27th in the burn and just below the alpine fir country.

GOLDEN-CROWNED KINGLET (*Regulus satrapa* (Lichtenstein))

Uncommon at lower levels in the park. It was observed several times at Murtle Lake in July and at Azure Lake in June, always in mature coniferous forests.

RUBY-CROWNED KINGLET (*Regulus calendula* (Linnaeus))

This attractive songster was abundant and conspicuous throughout the burns in May and early June. They then ceased to sing and became secretive and elusive. Many were seen in late August amongst flocks of warblers and chickadees.

ALPINE PIPIT (*Anthus spinoletta* (Linnaeus))

An abundant migrant for the last two weeks of May in hay meadows and marsh lands. They were seen on all occasions that we climbed to alpine country. Some fall migrants were appearing at Hemp Creek when we departed in the middle of September.

CEDAR WAXWING (*Bombycilla cedrorum* (Vieillot))

A common bird throughout the burned-off areas where there is a good mixture of second growth deciduous and coniferous forests. It ranges up to the elevation of Murtle Lake at least.

RED-EYED VIREO (*Vireo olivaceus* (Linnaeus))

Common bird in the deciduous groves along streams and lake shores and in the more mature aspen groves.

WARBLING VIREO (*Vireo gilvus* (Vieillot))

Small vireos were occasionally seen throughout the spring and summer which I ascribe to this species. Systematic collecting will undoubtedly disclose other species as well.

ORANGE-CROWNED WARBLER (*Vermivora celata* (Say))

Fairly abundant spring migrant. A wave passed through from May 14th to 24th, subsequently they were not observed so frequently.

YELLOW WARBLER (*Dendroica petechia* (Linnaeus))

First observed on May 29th, 1950 on the Stillwater, occasionally seen throughout the summer thereafter; not a common bird.

MAGNOLIA WARBLER (*Dendroica magnolia* (Wilson))

One specimen of this species was collected near the outlet of Clearwater Lake on June 9th, 1950. Three others were seen during the summer.

TOWNSEND'S WARBLER (*Dendroica townsendi* (Townsend))

An abundant warbler throughout the mature coniferous forests.

BLACK-POLL WARBLER (*Dendroica striata* (Forster))

One specimen was taken near Murtle Lake on July 23rd, 1950 and subsequently it was identified on two other occasions.

WATER THRUSH (*Seiurus noveboracensis* (Gmelin))

First observed at Murtle Lake on May 25th, 1950. Their numbers increased thereafter and they later proved to be one of the most abundant songsters along water courses and lake margins where there was a heavy growth of willow.

MACGILLIVRAY'S WARBLER (*Oporornis tolmiei* (Townsend))

Not uncommon throughout the park in bushy areas of the park. One was seen at an elevation in excess of 6000' on Goat Peaks on September 2nd, 1950.

YELLOW-THROAT (*Geothlypis trichas* (Linnaeus))

Abundant near water in willow and alder thickets throughout the lower elevations. First seen on May 25th, 1950 at Murtle Lake.

BLACK-CAPPED WARBLER (*Wilsonia pusilla* (Wilson))

The most conspicuous and most frequently observed warbler in the park. First arrival May 18th at Hemp Creek.

AMERICAN REDSTART (*Setophaga ruticilla* (Linnaeus))

First observed on June 2nd, 1950 at Hemp Creek. They are fairly abundant throughout the second growth aspens in the summer. A large migration passed through Hemp Creek during the last week of August.

YELLOW-HEADED BLACKBIRD (*Xanthocephalus xanthocephalus* (Bonaparte))

None were seen by the survey but on two occasions it was accurately described by local residents. It probably occurs occasionally in the park.

RED-WINGED BLACKBIRD (*Agelaius phoeniceus* (Linnaeus))

Sparingly distributed throughout the park where suitable habitat occurs.

BREWER'S BLACKBIRD (*Euphagus cyanocephalus* (Wagler))

Found nesting in abundance at Hemp Creek in mid-May, elsewhere of casual occurrence. All the nesting population had departed by the time we returned to Hemp Creek on August 10th, 1950.

COWBIRD (*Molothrus ater* (Boddaert))

First seen on June 5th at Ray's farm. During August several were constantly in the horse pastures at Hemp Creek.

WESTERN TANAGER (*Piranga ludoviciana* (Wilson))

First observed on May 15th at Hemp Creek, thereafter they were frequently seen along the edges of mature timber and in the more mature second growth forests. The abundance of these birds in August indicated an unusually successful nesting season this year.

EVENING GROSBEAK (*Hesperiphona vespertina* (Cooper))

First seen at Hemp Creek on June 3rd, 1950. It was abundant, noisy and conspicuous on the slopes of Mt. Huntley at about 4500' elevation on June 12th to 14th and 21st; probably breeding. In August, bands of evening grosbeaks were frequently seen in the vicinity of Hemp Creek.

PINE GROSBEAK (*Pinicola enucleator* (Linnaeus))

Widely scattered throughout the mature coniferous forest at sub-alpine levels down to the altitude of Murtle Lake. Two specimens taken at Murtle Lake on May 24th, were approaching breeding condition. Abundant on the slopes of Mt. Huntley, June 12, 1950.

ROSY FINCH (*Leucosticta tephrocotia* (Swainson))

Rosy finches were encountered on all trips to alpine country. They were abundant on Goat Peaks on the rock slides above timber line where one flock of more than fifty individuals was seen.

PINE SISKIN (*Spinus pinus* (Wilson))

Abundant locally throughout the park in all zones.

CROSSBILL (*Loxia curvirostra* (Linnaeus))

Wandering flocks of crossbills were encountered intermittently throughout the summer up to timberline.

SAVANNAH SPARROW (*Passerculus sandwichensis* (Gmelin))

An abundant spring migrant in the valleys. Possibly these birds breed here but no definite indications were observed.

VESPER SPARROW (*Pooecetes gramineus* (Gmelin))

Observed once in a large meadow close to Five-Finger Lake on June 8th, 1950.

OREGON JUNCO (*Junco oreganus* (Townsend))

Abundant and widely distributed throughout the second growth and burned-over areas. Nests were found on June 7th and 8th near Clearwater Lake outlet and young observed on June 30th on the west bank of Clearwater Lake.

CHIPPING SPARROW (*Spizella Passerina* (Bechstein))

Moderately abundant throughout the park up to timberline. First seen on May 25 at Murtle Lake, subsequently frequently observed in the burns and edges of meadows. A nest was found in a spruce tree on the edge of a sub-alpine meadow at an elevation of about 4500' on July 20th above Murtle Lake.

WHITE-CROWNED SPARROW (*Zonotrichia leucophrys* (Forster))

A fairly heavy migration of "white-crowns" passed through Hemp Creek from May 13th to 18th, 1950. Thereafter they became uncommon. A pair observed in the Archer Creek burn on the west shore of Clearwater Lake on June 28th were obviously nesting birds. They were fairly abundant in the sub-alpine meadows below the Goat Peaks in September, flocks of up to fifteen birds, mainly immatures, were seen.

GOLDEN-CROWNED SPARROWS (*Zonotrichia coronata* (Pallas))

First observed on June 2, 1950 near Hemp Creek. Abundant and conspicuous songsters on Mt. Huntley June 12th to 14th and Azure Mountains June 27th, 1950. They were again seen in the alpine country about Murtle Lake on July 20th, but were not noticeable on Goad Peaks in the first week of September.

FOX SPARROW (*Passerella iliaca* (Merrem))

Apparently not abundant in low lands. Moderately abundant on Mt. Huntley and in the mountains on Murtle Lake at timberline.

LINCOLN'S SPARROW (*Melospiza lincolnii* (Audubon))

First seen at Murtle Lake on May 25, 1950 it was found in meadow lands occasionally thereafter during the summer. An immature bird was taken in a mouse trap at Murtle Lake on July 24th, 1950, so it evidently breeds in that vicinity. It was seen repeatedly during the first two weeks of September on the high meadows north of Kostal Lake.

SONG SPARROW (*Melospiza melodia* (Wilson))

This sparrow was frequently observed in deciduous thickets at lower elevations throughout the park. It undoubtedly breeds abundantly in all suitable locations.

CONCLUSIONS AND RESUME

Moose are plentiful throughout the whole southern half of the park; the health of the herd appears to be good, and the reproductive success satisfactory. At present the greatest potential danger is over-population. Many of the winter ranges are deteriorating due to the inevitable advance in plant succession. I very much doubt that a larger herd than the present one could be safely carried on the winter ranges. Most of the available data at present has been deduced from winter sign and browse intensity. It is therefore recommended that an investigation of the moose be made during the late winter and early spring months before any steps are taken to reduce the herd.

Deer are just recovering from the effects of the losses sustained during the hard winter of 1948-49. Hunting pressure on deer within the park is light, the main wintering grounds are outside the park area so little can be done within the park to improve them. The success of the herds in the park depends largely upon the success of those animals wintering outside it along the canyon of the Clearwater and North Thompson Rivers.

While the present stocks of caribou within the park are low, the calf crop appears to be good, and with adequate management there is an opportunity of restoring the caribou herds of the park area. The successful accomplishment of this offers an excellent opportunity to demonstrate the value of sound management on a regional basis.

The goat population has been little affected by man. Goat ranges are extensive in the park, mainly to the north of those areas under investigation, and much more work must be done on the goats before enough data on them will be available upon which to base a sound management plan.

Black bear are widely and abundantly distributed throughout the park. They are a source of pleasure both to the hunter and to the tourist and vacationist who merely enjoy seeing them. The bear is a characteristic part of our wilderness fauna and, if need be, should be afforded some measure of protection.

Grizzly bears are restricted to the wildest and most remote areas of the park. They are not yet hunted extensively but a careful check should be kept of the kill within the park and restrictions imposed where serious depletion of the population takes place.

The only serious predators within the park are wolves and coyotes. The predator problem is one that varies with locality, time and circumstance. There is no reasonable excuse for eliminating wolves unless they are competing with the requirements of man. Accordingly, if they are eliminated by the administration, the administration must in turn shoulder the responsibility of keeping the game herds culled and within reasonable bounds.

In the past the local residents have managed to control outbreaks of wolves whenever the situation became alarming, but only after serious damage had been done to the deer herds. The ideal arrangement requires a permanent staff of park rangers and biologists to manage all wildlife. Until such an arrangement can be obtained little can be done except to rely on the co-operation of the local residents and the Predatory Animal Control Division of the Game Department.

The population of fur-bearers in the southern section of the park appears to be relatively stable. The trappers in this area are, in the main, established locally and have a keen interest in the welfare of the district as a whole. They are well aware of the importance of the conservation of breeding stock and do not over-trap their lines. The trap lines have been established though many years of wrangling and in some cases open strife. They are now pretty well established and recognized by all concerned and any changes would, in my opinion, be very unwise at the present time. The only exception to the above situation may be the case of Tommy Archer, whose line is situated on the west shore of Clearwater Lake and River. The beaver on his line have been almost completely eliminated and steps should be taken either to persuade Mr. Archer to conserve his fur to a greater extent or to cancel his privilege to trap the area.

FISHING PROBLEMS

There are, in the southern section of the park, in the neighbourhood of twenty small lakes that are unstocked. During the course of the survey over a dozen were visited and a cursory examination made of them. In almost every case a rich fauna of crustaceans and insects were observed indicating that these bodies of water are capable

of providing good fishing, if stocked. Several similar lakes have been stocked naturally from flooding of the Murtle River and have produced fine fishing in the past. They are now deteriorating however, as the fish are becoming smaller and more numerous. In view of the population growth exhibited at these lakes, I do not consider it wise to stock the present "barren lakes" until the demand for more fishing is heavy and until the lakes are made more accessible by the improvement of existing roads and trails.

There appears to be ample fish in the rivers and lakes of the park to most present demands. There has been considerable controversy over the management of the trout in the Clearwater Lake outlet. This stretch of water has been intensively fished for several years and in many cases there has been flagrant disregard of bag limits; but in spite of this heavy drain the stocks of fish appear to be maintaining their numbers. Mr. J.C. Norman reports that fishing was as good as ever this season. In this case, I think the solution to the problem rests in the enforcement of existing regulations rather than the enactment of new ones.

PARK USE

In addition to the usual uses of a park as a recreational area, Wells Gray Park presents somewhat of a challenge to the wildlife manager. After spending a summer engaged in this survey, I left the park with the firm conviction that here was an outdoor laboratory par excellence. There is a great variety of habitats in the park, from parklands to alpine glaciers, from large lakes to mountain tarns, and from open meadows to dense forests. Within the park we now have populations of wolverine and fisher as dense as any on the North American continent. There is almost as great a variety and abundance of game and predatory animals as can be found in any other comparable area within the province. Such an area as this affords ready-made facilities for the studies and experiments in the management of our wildlife resources the fruits of which can be applied to the province as a whole; and so increase the recreational and commercial values of these resources far outside the boundaries of the area under study. In doing so one would be performing a most worthy public service.

RECOMMENDATIONS

In light of the knowledge gained during the wildlife survey in Wells Gray Park during the summer of 1950, it is recommended:

- I. That the work of moose browse study be extended and continued in subsequent years.
- II. That the area west of Clearwater Lake and River and north of Mahood Lake be restocked with beaver.
- III. That the Battle Mountain area be included in the park in order to include the whole of the known caribou range of the district.
- IV. That an investigation be made of the remaining caribou herd over the whole park area.

- V. That as much of the Upper Clearwater Valley as possible be included in the park in order to include the moose winter range.
- VI. That no grazing permits be issued for the purpose of pasturing sheep within the park.
- VII. That park wardens and patrolmen be invested with the authority to enforce the fish and game regulations.
- VIII. That a limnologist be employed to survey the lakes of the park in order that a scientific stocking program may be formulated.
- IX. That the head of the Predatory Animal Control Division of the Provincial Game Department be requested to co-operate in controlling the wolf situation within the park.
- X. In view of the fact that there has been practically no systematic work of a zoological nature done in the area between the Rocky Mountains and the Cariboo Parklands, it is recommended that the Director of the Provincial Museum be invited to conduct such a survey in Wells Gray Park.
- XI. That an intensive study of the biology of the weasel family be instituted.
- XII. That the present park use permit fee for trappers be reduced to a nominal registration fee in view of the fact that the revenue derived thereby is very small and the good will and co-operation of the trappers is essential if a management plan is to be successful.

Appendix

PARK ADMINISTRATION IN RELATION TO GAME MANAGEMENT

I. GENERAL

In this case as in all new ventures I feel sure that many growing pains will be experienced before a thoroughly integrated policy of park administration and game management is arrived at. In the first place, the decision must be made as to which is the most important of the various recreational potentialities of the park and how they are to be developed and exploited to the gull advantage of the public in general. For instance to open up the country by constructing a network of roads and trails would undoubtedly result in a loss of game and the wilderness aspect that now is so attractive, on the other hand it would allow a greater number of people to enjoy that which remained of the wildlife and the scenery. I feel on the other hand that some trails and roads should be constructed and maintained for the use of the public and also for use in case of fire. Fire protection is of prime importance within the park; there is relatively little mature timber in the southern section of the park and more burns will do much more harm than good at present.

II. HUNTING

- a) Moose: At present I feel that the hunting intensity should be increased. I have based my opinion upon the state of the winter range and also the number of large antlers found. The winter ranges can stand little or no heavier browsing than they are now subjected to, and the predominance of large antlers indicates an abundance of mature and old animals, a reflection of very light hunting pressure in the past. I do

not know the present kill in the park, but believe the average kill over the past five years to be less than forty a year.

- b) Deer: The abundance of deer is directly affected by snow conditions on the wintering grounds. The best policy to follow with respect to deer is to crop them when they are abundant and conserve them when they are scarce. If a permanent biologist is appointed to the park staff, he will have to recommend the season take of deer each year before the hunting season. This is easily done by using the degree of successful wintering the previous winter as an index.
- c) Goat: Very little goat country was encountered during the summer but where goats were found the bands appeared to be composed of healthy animals. In the past it has been shown that goats cannot stand extensive hunting. In Wells Gray Park a careful check of the kill each year should be weighed against a survey of the bands and if necessary the killing of goats may have to be restricted and permits to take animals in designated areas instituted. At present they are hunted very little and I doubt if measures to restrict the kill will be necessary in the near future.
- d) Caribou: See section on caribou. Complete protection and possibly the elimination of predators where they are affecting the caribou population could assist in restoration of their numbers.
- e) Birds: Upland game birds in the form of grouse are too widely distributed to form an attraction for visitors. Some will be taken incidental to big game hunting but I doubt if the kill will have any appreciable effect on the grouse populations on the whole. Migratory waterfowl are likewise widely scattered and relatively scarce. Some duck and goose shooting is possible at Murtle Lake, but populations are not large enough to attract wild fowling from other more productive fields in the caribou and elsewhere.

III. TRAPPING

- a) The present arrangement of trap lines appears to be satisfactory. The trap lines have been established by mutual consent and in most cases the boundaries are appreciated and respected by all interested parties. The white trappers appear to be using discretion in their harvesting practices and I do not think their activities detract from the desirability of the park as a recreational area. I would suggest that the case of the Archer trap line be thoroughly investigated before any action is taken. When in possession of the facts the Department of Indian Affairs should be contacted and with their co-operation Mr. Archer could probably be persuaded to trap more intelligently.
- b) In most cases the trapper cabins that we visited furnished shelter from the elements and nothing more. They are not suitable for tourist use and can be considered of value as emergency shelters only. For the trappers, however, they are ideal, they are small and easy to heat, provide a bed, good cache, cooking facilities and a place to dry their pelts.
- c) Beavers: The greatest concentration of beaver is situated along Blackwater Creek and on the small creeks that flow off the Kilpil Mountain west of the Murtle River. At present there are no colonies in close proximity to the roads and few on the main trails, so they are not immediately available as a tourist attraction.

In formulating a re-stocking program west of the Clearwater Lake and River I would suggest that the most suitable sites for introduction would be the small lakes in the Archer Creek burn. I would suggest a minimum of two pairs to a lake. Stock could be obtained locally in co-operation with one of the trappers by live trapping, or could be obtained from outside sources by purchase and flown in to Clearwater Lake. Costs of such operations will depend upon the time involved in the successful trapping and transfer of stock, and so will vary with the skill and measure of success of the operators.

d. Permits: The question of permits, fees, etc. is one that the administrative authority will have to decide. This question is more financial and sociological than biological. My own feelings are that in areas set aside for public use the public should be allowed to pursue its recreational activities as little trammled by red-tape and restrictions as possible. In my opinion any fees charged, whether they be for trapping, fishing or hunting should be nominal and the object of issuance should be the gathering of data that will be of value in deciding future decisions of policy rather than the collection of revenue.

IV. GUIDING

a. At present there seems to be little friction between guides apart from the usual petty and professional jealousies that are inevitable. The guides are very provincial in their outlook and those on the Clearwater Valley consider the Mahood Lake guides are interlopers and vice-versa. There is at present no friction in evidence that could not be easily eliminated by the good offices of a tactful ranger or park superintendent.

Every type of visitor comes to the park from the keen hunter and fisherman to those that use a hunting and fishing trip as an excuse to get out and have a good drunk with "the boys". Services are available to accommodate all types of visitors. The better guides have to turn down applications for reservations for both hunting and fishing parties, but whether or not this potential overflow would go to other guides if they existed is doubtful. Practically all the guides' clients are Americans and the amount of business from residents is negligible.

Aircraft are used to fly fishermen in to the outlet of Clearwater Lake for fishing and for the occasional spring grizzly hunt to Angeshorne and Murtle Lakes. The present control measures instituted by the B.C. Parks and B.C. Game Department appear to be sufficient, at present, to keep the authorities concerned informed as to aircraft movements.

b. Guides: Lawrence Ludtke: A man with many interests, guiding among them. He has an outfit which although shabby and worn is quite efficient. His horses appear to be about average in quality. His knowledge of the country is extensive and he is a good guide and hunter. Guiding appears to be somewhat of a sideline with him and I doubt if he intends to extend or increase his interest in this field to any extent.

John and Henry Hogue: Are efficient and experienced woodsmen. They have no equipment however and cannot cater to big game hunters at present. They are improving their little camp close to the park boundary and may wish to extend their interests in the future. At present they appear to be satisfied to rent cabins, trap, and work with the construction crews for a living.

A.S. Barker: Manages Wells Gray Lodge on Mahood Lake. This lodge is outside the boundaries of the park but takes advantage of the parks recreational facilities. Mr. Barker caters to a wealthy clientele and has interests in the recreational field in British Columbia beside Wells Gray Lodge. My impression of Mr. Barker was that he is far more interested in the monetary gains incurred by his activities than he is of seeing that his clients receive full value for their money.

T. Helset: Has a first class outfit situated at Hemp Creek, on the park boundary. He has cabin accommodation and a good string of pack horses. He is an expert fishing and hunting guide and is definitely interested in the keen sporting type of client rather than the type who wishes to get away from it all and drink. Mr. Helset has worked hard and built up a regular clientele and no doubt wishes to expand his business in the future. He impressed me as being the most efficient guide in the area.

R. Miller: Has the trap line at the eastern end of Murtle Lake. He has catered to at least one grizzly hunt in the past and has hopes of developing his guiding activities in the future. He relies upon aeroplane transport to bring his parties in to the lake and uses boats of hikes about from then on. He has hardly started as yet and will probably wish to expand his operations if he can establish sufficient contacts to ensure a steady flow of customers.

Laine: Is established close to the Trophies Lodge on the road just above the Clearwater Canyon. He caters to fishermen mostly and a few hunters. Most of his hunting is outside the park however. Mr. Laine impressed me as being a man of many words and little action and I am afraid he is not the type who will develop a large clientele of satisfied customers.

McDermott: Runs the Trophies Lodge on the road just above Clearwater Canyon. He caters to fishermen in the main. His activities centre along the Clearwater River from the junction of the Mahood down to the junction of Hemp Creek. He has a good, but small, outfit and appears to provide excellent service to his customers. He has guided hunting parties into some areas in the park, but his main interest rests with the fishing. I am inclined to think that Mr. McDermott's future activities will consist of improving his present facilities rather than extensions further afield.

Baldus: Has a small cabin close to Wells Gray Lodge. He did not engage in guiding this year but may do so in future. He has no equipment and his main interests are in the field of angling.

c. In most cases trappers' cabins are not suitable accommodation for hunting or fishing parties. They are, however, ideal for the purpose they were intended; being small they are easily heated and provide shelter, warmth, and cooking facilities for the trapper on the trail.

In the past there has been some discussion of allowing those trappers who act as guides the privilege of using their trapping cabins as tourist accommodation. In my opinion it would be a far better policy to issue permission to these trapper-guides to build approved dual purpose cabins which could be used as tourist accommodation and trapping cabins. In this manner the quality of these cabins will be improved and better accommodation will be ensured the public, at the same time the trapper will not have to duplicate his buildings. Such dual purpose cabins should be built with adequate head room, adequate window area and a wooden floor as a bare minimum. The number of guests for which the cabin may be approved should be based on the area of the floor space. Such standards could be formulated with the assistance of a staff architect and certain minimum requirements formulated. A rough plan of any projected building could be sent in with an application to erect such a structure with comments by the park superintendent. When completed the building should be inspected by the park superintendent to ensure that all requirements are met and the approval stamped on the permit.

d. The present projected system of permits appear to be adequate at present.

V. FISHING

a. Fishing in the park falls into several well defined areas which are delimited by the mode and relative ease of access.

1) West end of Mahood Lake. Adequate facilities are provided by McNeils at Mahood Lodge; no expansion appears necessary or desirable.

2) East end Mahood Lake and Mahood River. This area is available to the clients of Wells Gray Lodge. It could stand a greater intensity of fishing, but this will probably develop naturally with time.

3) Clearwater River from Murtle River to Hemp Creek. This area is, at present, used by parties guided by Laine and McDermott. It is relatively accessible to those who wish to pack into the area without the services of a guide. Stocks of fish are excellent and the area can probably stand greater fishing intensity than it at present enjoys.

4) Clearwater River in the vicinity of the Horseshoe and Ray Farm. At present this area is very little fished. With the advent of the new road it will undoubtedly receive greater attention. Mr. Ludtke takes parties into this stretch of water in late summer and has good success. At present there are no cabins or shelters in the area available to the general public and some thought to the establishment of camp grounds and shelters should be given to this area in the near future.

5) Outlet of Clearwater Lake. This is the most heavily fished area in the park with the possible exception of the west end of Mahood Lake. Both McNeil and Barker are in the habit of flying day parties into this area from their camps on Mahood Lake. These

people should be obliged to provide adequate facilities in the form of boats when bringing in parties. A plane landing should be established in the vicinity of Hogue's Boathouse in order to eliminate the dangerous passage of planes down the fast water to the present forestry cabin.

6) Stillwater of Murtle River. This area is used by Mr. Ted Helset's parties. Mr. Helset has a camp at the lower end of the Stillwater and should be given permission to erect a cabin or shelter of an approved type for the convenience of his clients.

7) Outlet of Murtle Lake. The Seattle Gun Club cabin is used in many cases as a headquarters for fishermen in this area. Helset and Shook have a large cabin close by which is also suitable for tourist accommodation.

8) East end of Murtle Lake, no facilities for tourists at present.

As the various roads and trails improve and become developed through use there will be more and more incentive for the guides to establish shelters and camps of a semi-permanent or permanent nature. Care should be taken to see that these bases of operation are not located too close to one another, keeping in mind the probability of independent campers also using adjacent areas.

VI. ROADS AND TRAILS

a. Before any increase in the number of people using the park can be expected one must have the road from Clearwater to the park boundary rendered passable. At present it is merely a cowtrail churned into a series of ruts and pot holes with a liberal complement of rocks and boulders of all sizes and shapes. It is strictly a "second gear road" and not suitable for tourists who are seeking recreation.

The road from the boundary of the park to Dawson Falls is narrow but well surfaced and it is being extended to the outlet of Clearwater Lake as a jeep trail. Some doubts have been expressed as to the advisability of opening this latter stretch to the general public. I think that it should be opened as it would open up the fishing along the Clearwater River and tend to spread out much of the effort that is now centered at the outlet of Clearwater Lake. It would also tend to spread out the moose hunting effort and afford those who have not the services of a guide a measure of opportunity to hunt moose and deer.

I would not recommend more roads than those mentioned above until the administration have the opportunity to see what the effects of the road are upon wildlife in general.

b. I think the only new trail that would be advisable would be one to connect up the trail at the Clearwater outlet with the Kostal Lake area. This would open up a large area of early moose hunting.

There are many trails in the park, the existence of which is known by the trappers only. Some of these could be improved to the advantage of the public and the Forest Service as fire protection trails.

There is a trail from File Creek up Moberly Mountain, another from the Murtle Lake trail in the vicinity of McLeod Hills to Mirror Lake and the headwaters of the Blackwater Creek; another up the Murtle River from Majerus homestead to the Blackwater Creek; another from the Murtle River in the vicinity of the Pyramid into the Deer Creek and out over Ray's Lookout to Ray's Farm. Such trails would be of great value in the case of fire. They also afford means of travel for those who wish to take back pack trips "off the beaten track".

I suggest that all trappers and guides be required or requested to register all the trails used by them as trapping and guiding trails. These trails could be improved when desirable and a system of signs erected to enable the camper to find his way about with ease. Doubtless these and many more trails in the park are known to only a few trappers and guides.

VII. PARK ATTRACTIONS

I feel that this park affords great opportunities for mountain climbing and hiking as well as angling and hunting. Mt. Huntley is only three hours walk from the shore of Azure Lake. The range of mountains to the south of Azure Lake is only three and one-half hours walk, via the Azure Lookout trail from Clearwater Lake. Similar opportunities for hiking and exploring are legion about Murtle Lake. The volcanic flows of the Kostal Lake-Goat Peak areas are unique in their geological youth. In most cases trails exist to these areas and there remains only the erection of signs and the improvement of blazing and removal of dead falls to render them available to the general public.

VIII. PARK EXTENSION

The most desirable park extension is the inclusion of the Battle Mountain region. From all accounts it is situated in the circuit used by the caribou. There also exists the probability that it will be used as pasture for domestic sheep. In light of the latter, it would be much easier to have the area incorporated into the park soon, or serious opposition might be experienced once grazing practices have become established there. I have never been in the area and could not recommend definite boundaries. A survey should be made of the area and suitable boundaries established through its findings.

IX. ORGANIZATION OF WILDLIFE MANAGEMENT

- a. The "practical approach" to wildlife management of a wilderness area involves the compilation of data pertinent to population size, annual increment and carrying capacity of the ranges for each and all species present. From this data the annual kill either in the form of sport hunting or culling may be determined.
- b. Personnel, etc.: A permanent resident biologist is essential if regional game management is to be practiced in Wells Gray Park. He should have transport facilities of his own and be independent of other departments in the above respect. He will

require a permanent residence in the area, the size of which will vary as to the size of his family, etc.

A checking station should be maintained during the hunting season on the road to Clearwater in order to ensure complete records of the annual kill.

Park patrolmen could easily assist in routine duties in the summer and in winter census work.

It is essential that the administrative authorities have within their ranks one who is conversant with the problems of the biologist, and who is capable of interpreting his reports and integrating their degree of urgency with current park policy.

c. Adaptability to Park Plans: The new ranger station site appears to be in a suitable location from a wildlife administration point of view. It is within reasonable distance of settlement and is close to some of the most extensive and important winter ranges of moose. The present buildings at Ray's Farm and the Majerus homestead are in suitable locations for semi-permanent bases of operation as both have adequate buildings and horse pastures.

X. MISCELLANEOUS

a. Predators: A resident biologist should be quite capable of controlling outbreaks of wolves within the park area. The newly developed poison 1080 is a potent weapon in the hands of a trained man. Local guides could be employed as assistants when the biologist wishes to make prolonged trips into inaccessible country as it is most inadvisable to travel alone.

b. Co-operation with other agencies: In all probability any biologist who is employed will be well acquainted with the biological staff of the B. C. Game Commission and probably most co-operation will be at this level of authority.