

REPORT ON WILDLIFE SURVEY AND RESEARCH IN WELLS GRAY PARK 1951
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I wish to emphasize here several of the more important of the findings presented in this report.

1. Moose, deer, caribou, black bears, and perhaps beaver have increased.
2. Uncontrolled fire can be disastrous to wildlife in this area.
3. The Battle Mountain area is described in detail.
4. There should be an "any sex" moose and deer season in this park.
5. Fire can wipe out caribou there, as could logging.
6. We need a grizzly study to ensure preservation of an unique animal.
7. There should be a black bear season.
8. Lack of a good map is holding up research.
9. There should be special grouse regulations in the park, enabling heavier cropping.
10. We must keep guides and trappers informed of our work, and notified well in advance of changing regulations.
11. We must increase hunter dispersion. We need trails, if not new ones, improved old ones. There is no sense in managing wildlife if it cannot be harvested.
12. The Battle Mountain area is essential to our wildlife programme.

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ABSTRACT

A study of the wildlife of Wells Gray Provincial Park was carried out during the months of May to September of 1951. This was a continuation of studies initiated in the summer of 1950. The work was directed by Mr. R.Y. Edwards, newly appointed Research Assistant in the Parks and Recreation Division.

Investigation of the moose winter ranges should a statistically significant increase in utilization of the Hemp Creek - Green Mountain area. This is the most important winter range in the park. All other wintering areas showed no significant changes in the extent of use as determined by pellet group counts.

The health and reproductive success of both deer and moose populations was judged to be very good. An increase in the number of caribou and of bear was noted. The increase of bear apparently was due to a good winter survival after a heavy berry season. The reason for the increase in caribou numbers is not known.

The predators of the park are at a low level of abundance and killed few game animals during the past winter.

The Aldous method of browse analysis was found to be inadequate and new methods of study were tried. Research on willow regeneration were initiated; the results of this research are reported elsewhere.

Beaver have moved into an area which was barren of these animals during the summer of 1950. Live trapping of marten and mink was attempted. The marten trapping was unsuccessful. Several mink were trapped, tagged, and released. The trapper returns were too incomplete to analyze the productivity of the trap lines.

A reconnaissance was carried out to determine a southern boundary of a proposed extension to the park. This boundary would include a large amount of caribou and moose range which is at present outside the park.

The park has suffered a number of bad fires during the past year. The fires cannot be considered beneficial to the wildlife of the park.

I INTRODUCTION

The initial wildlife survey of Wells Gray Park was carried out in the summer of 1950. Studies of the wildlife resources of the park were continued during the past summer. The object of the investigations were: to complete reconnaissance of the southern areas of the park and vicinity; to continue studies begun in the previous year; and to initiate new studies of wildlife and of factors affecting it in the park.

Field work was carried out by Mr. R.Y. Edwards, Mr. R.J. Davies, a third-year student at the University of British Columbia, and myself. The studies were directed and aided by Mr. Edwards, newly appointed Research Assistant in the Parks and Recreation Division of the B.C. Forest Service. Ranger Les Cook and Patrolman Jack Norman were again very helpful in our work, as were other members of the Forest Service personnel of Wells Gray Park. Our thanks are due also to the residents of Hemp Creek who always were ready to be of assistance, and who made our stay in the region most enjoyable.

We arrived in the park on May 5th and immediately commenced to study moose winter ranges in the southern part of the park. We carried out Aldous method studies and pellet group counts at Deer Creek on May 9th to May 11th, in the Green Mountain - Hemp Creek area from May 13th to 17th, and in the Stillwater region from May 18th to 25th. During this time we also observed the condition of the moose as they moved north towards their summer range. One two-day reconnaissance was taken to Murtle Lake in search of caribou. On May 30th the party moved to Clearwater Lake and spent ten days in this region doing browse studies and pellet group counts. We spent one day on goat and caribou winter range to the east of the lake on the Azure Mountain range. Our movement on the lake were hampered when we did not receive an outboard for our canoe. On June 13th Mr. Edwards met the party at Hemp Creek and brought forward suggestions as to how we should devote our time during the remainder of the summer. We spent the rest of June experimenting with means of doing browse surveys which would be more accurate than the Aldous method.

From July 1st to 18th we made a reconnaissance of Battle, Trophy, and Table Mountains and of the Stevens Lakes country to assess the wildlife values of these areas. This was to determine what part of parts of these areas should be included in a southern extension of the park boundaries. The report of last year had recommended that the boundaries include a greater portion of the caribou and moose range than is involved at present.

A ten day live-trapping expedition for marten and mink was undertaken in early August in the vicinity of Stillwater on the Murtle River. From then until our departure in September we carried out browse measurement studies and constructed experimental plots for the study of willow.

The party located one fire and helped to fight two in the course of the summer. Mr. Davies spent a week fire-fighting on the hillside to the north of Azure Lake.

Field work was terminated on September 14th and the party left Hemp Creek with a feeling that there was much work still to be done.

The present report avoids repetition of data and recommendations made by Mr. Martin in his report of 1950. A re-reading of the latter report will be an aid to understanding references made to it in this report.

II FIRE PROBLEMS

The summer of 1951 was an extremely bad fire season. The members of the party were called upon to fight fires on two occasions. One of the fires, north of Azure Lake, necessitated a week's work by Mr. Davies. The other fire only took one man-day's work.

Fires in the park now are rarely beneficial to wildlife. The majority of lowland valleys suitable for winter range of moose or for beaver habitat are clothed in deciduous growth. This rarely catches fire as a result of lightning strikes. Some re-burning of windfall areas and of dense conifer regeneration may be beneficial. Such fires have occurred to the west of Clearwater Lake and in the Flourmill Creek region, where several fires burned over a considerable area in the past year.

However, the main areas to catch fire are sub-alpine slopes clothed with conifers and stands of mature timber on flats which so far have escaped fire. These areas do not benefit by fire. They create an abundant summer food supply for animals summering here, but summer food is generally more than sufficient in the sub-alpine forest. In the winter, snow forces the moose and deer from here. The marten, the fisher, and the caribou suffer as a result of the burns. They require climax forest for optimum habitat.

In short, uncontrolled fire in the park, aside from its destruction of other resources, is not beneficial to wildlife.

Fresh burns offer an opportunity for study. Careful records should be kept of regeneration. In this way we may find whether burning of certain areas is advisable to use as a management practice.

III RECONNAISSANCE

The following is a report of a reconnaissance of Battle, Trophy, and Table Mountains, and of the country in the region of the Stevens Lakes. This reconnaissance was made to determine the

location of a boundary which would include all valuable caribou range of these regions. The boundary extension was recommended in the report of 1950.

Battle Mountain

Access at present is by one trail to Battle Mountain. This is a guiding and trapping trail which is kept free of windfall at irregular intervals by residents who have occasion to take horses into the country during the hunting season. This trail starts at the east edge of Lot 2893, and follows a direct but steep course to the alpine plateau at the south slopes of Battle. Regrading and maintenance of this trail would not be costly. For the most part it is made through a dry burn and the place where it enters unburnt alpine terrain is the only part where the removal of windfall would be necessary. Another trail, an old Forest Service route, leads into the plateau about two miles to the north but this is choked with windfall. It is poorly located and goes through boggy and wet ground.

The ascent by foot into alpine country took less than five hours by the first mentioned route. On reaching the upper end of the trail at Fight Creek, one may walk or ride at will over several miles of open alpine meadows and semi-wooded areas. By mid July, the open hillsides are massed with flowering alpine plants. The following quotations from the report of A.C. Pollard B.C.L.S. (Pollard, A.A. - Triangulation Survey, Clearwater Lake Area 1950. Report to Surveyor General) are of interest:

“Between Battle and Trophy lies a high alpine country beautifully dotted with large open meadows, clear blue lakes and ponds, and veined with sparkling streams, stretching to the east of Battle round to Stevens Lakes. This was the only area we saw where it was possible to take horses at will across country, and our trips to Battle were the most pleasant of the season. At present, Battle and Trophy Mountains are more accessible to the public than any alpine areas within the park boundaries.”

As mentioned elsewhere, the alpine country on the slopes of Battle Mountain supports a summering band of caribou of about twenty animals. It is quite likely that this caribou band ranges into the park during the winter, frequenting the dense conifer forest to the south of Murtle Lake and the open swamps in the vicinity of Murtle River.

Other large animals which summer in the Battle area are grizzlies, wolves, coyotes, moose, and deer. The open country here offers an excellent opportunity for photography and study of these animals. At one time this was a favoured hunting spot and each meadow has at least one place for tethering horses and the remains of a camping site. In the past few years the meadows have not been visited by hunters.

Small mammals include a rather large population of marmots and pikas in the rocky slides.

Alpine birds, including horned larks, rosy finches, and white tailed ptarmigan are fairly abundant. Barrow's golden eyes bring off their broods near the alpine tarns and a mallard was found nesting beside a creek in one of the alpine meadows.

Table Mountain

Access - from the meadows at the foot of Battle, it is necessary to descend into the sub-alpine to reach Table Mountain. Table can also be approached by a trail leading eastward from the back of the community hall of Upper Clearwater. This trail was not explored by the survey.

Game trails are abundant on the slopes of Table and the caribou seem to travel freely between this mountain and Battle. Deer are abundant on the grassy slopes during the summer months and this was once a favoured hunting spot for deer and caribou. Since the closing of the caribou season, the area has not been hunted very often.

The most conspicuous of the smaller mammals are the hoary marmots. On the east slopes of the mountain, they are more abundant than in any other alpine area which I have had occasion to visit. Here the habitat for these animals is excellent, broken rocky slides descending into slopes of lush vegetation consisting of forbs and grasses.

Trophy Mountain

Access is by well-opened cattle trail leading from the Upper Clearwater Road in the vicinity of the Second Canyon bridge. In places, the trail is not easily followed by this part is in an open burn and walking is not difficult.

The slopes of Trophy rival, and perhaps surpass, those of Battle in respect to variety and abundance of wild flowers. Grazing has modified the flora however, and a certain amount of its naturalness has been destroyed.

In July, the slopes of
Battle are massed with
flowering alpine plants.

July 29, 1951

Trophy Mountain from
Battle Mountain.
Fight Lake and Philip's
meadow in foreground.

July 29, 1951

Philip's meadow, looking
eastward. Battle Mountain.

July 29, 1951

Moose and deer summer range
in Indian Valley. South plateau

in background.
July 29, 1951

Trophy is a favoured summer range for deer and they are more abundant on the slopes of this mountain than on the two previously mentioned. Wintering range for the deer is found on the lower slopes of the mountains, toward the canyons above the Clearwater River. Deer hunting on Trophy is quite popular and is probably better than any deer hunting areas within the park boundaries.

No fresh caribou sign was seen when we visited Trophy in July but C. W. Shook reported that he had seen fresh sign when he was there in June. Residents report that caribou never were as abundant here as in the alpine country to the north. It appears that caribou bands do not usually frequent this alpine country. Perhaps the deep canyon between Table and Trophy prevents the animals from traveling freely between the two mountains.

No fresh grizzly sign was noted although the bears do visit the mountain as evidenced by old diggings. Perhaps the accessibility of the mountain to hunters is a reason why grizzlies are not abundant in this alpine area.

Stevens Lakes

The Stevens Lakes country, which lies to the east of Battle Mountain, is reached by a poorly marked and windfall-choked trapping trail leading eastward from Fight Lake.

The forest cover to the north and east of the lakes has been largely removed by fire, and regeneration in these areas is slow. Conifers are growing near seed sources, the dominant species being Engelmann spruce and lodgepole pine. Throughout the remainder of the burn, fireweed and scattered willows are found.

Where the forest has survived recent fires, a sub-climax of lodgepole pine and Engelmann spruce occurs. This forest is open and broken by many meadows which contain a variety of sedges and coarse grasses. A small population of moose spend the summer in these meadows. No fresh caribou sign was seen in this forest type on our July visit. There was evidence of their former presence and this open country may be favoured by the caribou at certain seasons of the year.

Deer are seen throughout the burn country during the summer. There is little evidence of either deer or moose wintering at this elevation (4,500' plus). It is unlikely that deer or moose could survive the winter if they remained here.

The Stevens Lakes themselves are shallow and have low sloping shore lines. A flock of about fifty Canada geese were seen on the lakes in mid-July. These were apparently a flock of non-breeders which were spending the summer in the vicinity. Golden eyes nest in abundance in the snags which surround the lakes.

Beaver inhabit the creek which appears to drain in the upper end of the lakes, although the habitat appears to be marginal due to the high altitude.

Raft River Range

A cattle trail leads into this country from Birch Island. It can be reached also from Battle Mountain by following the broken alpine and sub-alpine ridges eastward from the meadows at the foot of Battle.

The divide between the drainage systems of the Murtle and Raft Rivers occurs south of the Stevens Lakes. This divide consists of a burnt-off sub-alpine range extending to an elevation of about 6,000'. The range here is largely made up of alpine herbs with a few interspersed grasses. Small meadows occur around creek which drain southward into the Raft and northward to the Stevens Lakes and the Murtle. Some of the timber has survived the fire and patches of Engelmann spruce and alpine fir supply seed sources from which the burn is regenerating.

This summer, a herd of about two hundred cattle was ranged near the headwaters of Ritchie Creek, a tributary of Raft River. This cattle range is separated from the meadows of Battle by about three miles of broken alpine burn and it is not likely that the cattle would visit the Battle country unless driven there by herders.

Moose summer on this range, and deer are also common in the same locality. These animals probably winter in the burnt-off valleys of the Raft and its tributaries. Possibly some individuals make their way westward to the winter ranges of the Clearwater Valley.

Caribou sign was seen here in small patches of timber that escaped the fires. Mr. Helset says that caribou from the Stevens Lakes country once ranged over this divide.

South Plateau

The south plateau is reached by a poor trail leading southward from the Murtle Lake - Hemp Creek Trail about three miles above Stillwater. It is a small bit of broken alpine country lying between Indian Valley and Murtle River, and bounded on the east by the Stevens Lakes country.

Deer summer on the open meadows of the south plateau, and excellent deer hunting is to be had here in the fall. When caribou were plentiful in the thirties, this was a favourite hunting ground for these animals. Sign of wintering caribou was noted in this district when we visited the area in July.

The regenerating burn in Indian Valley is excellent moose and deer summer habitat. Forbes are plentiful and the numerous small meadows are bordered with alpine willow. Cover is provided by timber strips which have escaped the burn. This region is rarely hunted because of its inaccessibility.

IV RECOMMENDATIONS

It is recommended that Battle and Table Mountains and the area surrounding the Stevens Lakes be included in the park. These areas support larger bands of caribou during the summer than any regions within the park. It is also likely that the caribou migrate between these areas and the caribou habitat within the park. Trophy Mountain does not appear to be used extensively by caribou. It is a valuable deer range and for scenic attraction but inasmuch as its inclusion into the park would create additional administration problems it is recommended that it be left out. The area should be closed completely to hunting until further study of the grizzly and caribou is made.

The trail to Battle Mountain should be improved in the interests of fire protection.

If hunting pressure warrants it, a trail should be constructed into Indian Valley some time in the future. This trail would not lead hunters into the caribou country but would open up a large area for early moose and deer hunting.

V BROWSE STUDIES

a) Aldous Method

For purposes of comparison with last year's work, Aldous plots were taken on most of the same sample areas excepting the southwest slopes of Green Mountain and the Azure Lake burn. A description of the Aldous technique is given in the report of 1950. Since willow is the key browse genus in all areas, I have included only this genus in the analysis of this year's Aldous studies. The complete record as given in the report of 1950 is available in the field notes. Data on willow is given in Table 1.

Graphs I, II, and III show the inadequacies of the Aldous method when used by different workers in the same area. Part of the failure was due to the inability to sample the exact areas of last year. The location of the plots was not marked and it was difficult to return to exactly the same areas from a mere description of the terrain. Marking and blazing is time-consuming and could not be carried out if the rest of the summer's work was to be completed. However, as seen in Graph I, the occurrence of willow in all areas was very nearly the same in all areas in both years. This indicates that the sampling errors were not exceptionally great.

The percentage density of willow in the two years, as determined by visual estimates of different observers in both years, shows much wider variation. Graph II shows that in nearly all areas the density was much greater in 1951 than in the previous year. The observed difference was probably due to differences in judgement of the two observers.

The browse intensity (Graph III) shows the widest variation in the two years. This would be expected to vary somewhat over the two years but in the Archer Creek burn, where pellet group counts indicated a slightly higher winter utilization, the browse intensity was much less.

From the foregoing, it is seen that the Aldous method does not lend itself to accurate analysis if the observer varies from year to year. Even with the same observer, judgement is liable to vary if not backed by actual measurements.

Some of the discussion of the condition of the winter ranges is based on the Aldous work. The data is used with reservation, and usually the statements on utilization are based on pellet group counts.

Explanation of Table I, to be found on following page

Occurrence: percent of plots in which willow occurred. Thus 91 means willow was in 91% of the plots and so was widely distributed.

Density: percentage the willow covered on the plots. Thus willow "shaded at noon" 12% of the ground on all Green Mountain - Hemp Creek plots.

Browse Intensity: percentage of available browse eaten, but the method of obtaining this figure is not very accurate, as noted in the report.

Regeneration: a poor term for the degree to which bushes are producing new twigs. This term will be dropped in future for one less confusing with another meaning.

TABLE I
Comparison of browse on willow in Aldous plot studies, 1950 and 1951

Area	Number of Plots		Occurrence		Density		Browse Intensity		Regeneration					
	50	51	50	51	50	51	50	51	Poor		Fair		Good	
	50	51	50	51	50	51	50	51	50	51	50	51	50	51
Green Mt.- Hemp Creek	72	100	83	91	12	12	45	54	18	11	36	43	46	46
Stillwater	40	30	100	100	27	51	6	4	-	-	-	-	100	100
Lava Beds- Falls Creek	10	20	80	90	6.5	12	70	65	25	33	75	55	-	11
Hillside above Lava Beds	10	20	80	75	6.5	9	52	58	50	53	50	27	-	20
North of Ivor Creek	15	20	90	80	10	12	25	21	-	-	9	8	91	92
Archer Cr. burn	45	60	82	93	4	11	48	31	4	3	23	33	74	63
Deer Creek ft of Kilpil	20	50	95	95	8	16	70	30	-	5	30	21	70	74
base Pyramid SW side	10	10	100	100	5	8	66	12	10	-	30	33	60	67
Pyramid S slope	10	10	80	80	7	4	65	11	-	25	75	37	25	38

b) Sampling and Measuring Twigs

After completion of the Aldous analysis, an attempt was made to devise a more suitable method of browse survey. It was thought that the total amount of food eaten could be determined by actual measurement of a sample of last year's twigs. The total length of all twigs, browsed and unbrowsed, would give the amount of food still available at the end of the winter. The average length of the unbrowsed twigs, minus the length of the browsed twigs, would show, on the average, how much of each twig was eaten. From this the percentage of total available food consumed by the moose could be determined for any sample, by measuring and tallying all the twigs in the sample. This method fell down because it is based on the assumption that moose browse completely at random. The following data shows that the browsing was selective and that the longer shoots were preferred by the animals. The average length of the browsed twigs was actually greater than that of the unbrowsed twigs.

TABLE II

Measurement of Willow Browse on Sample Areas
from the Pyramid to the Upper Clearwater Valley

BROWSED TWIGS

Length	Number	Average Length	% of Live Twigs
2,856"	529	5.4"	33%

UNBROWSED TWIGS

Length	Number	Average Length	% of Live Twigs
3,760"	1,071	3.5"	67%

DEAD TWIGS

Number	% of all twigs tallied
2,423	60%

TOTAL TWIGS TALLIED: 4,023

The sampling also showed that a great proportion (60%) of all the twigs in the sample were dead. This is not too alarming, for the dead twigs remain on the branches for several years and thus can be considered a measure of the browsing intensity over a period of time. It is also possible that the sampling techniques, as described below, tended to include a greater percentage of the dead twigs in the sample than is typical over the whole of the bushes sampled. Browsed twigs made up to 33% of the total number of live twigs tallied. It was impossible to judge which twigs had died as the result of last year's browsing, so all dead twigs were tallied separately. This means that the actual percentage of last year's twigs browsed was somewhat greater than 33%.

Two sampling methods were tried. The first technique was to throw a hoop made of a coat hanger to it would lodge in the willow. All last years twigs within and distal to the points of contact of the hoop were measured and tallied. Dead twigs of the sample were tallied but not measured. All willows along a given compass bearing were sampled. The second technique was to heave a weighted line 50' in length along a compass bearing. All the twigs lying distal to the points of contact of the line on the willows was measured. Both techniques gave similar results in the ratio of dead; browsed; unbrowsed. The second technique was more suitable in open stands of low growth, and hoop method better in dense thickets. Both methods were tedious and time-consuming.

c) Measurement of Browse on Marked Bushes

After finding that it was impossible to arrive at the percentage of food eaten by the methods just described, another attempt was made to find an exact measurement technique. The entire length of this year's twigs was measure on sample bushes in the Green Mountain area. These bushes were marked and the measurements separately recorded for each bush. When these are remeasure in the spring, the exact amount of the year's growth that is utilized will be known. It will also show the total amount of food consumed by the moose if they eat only the previous year's growth. Individual twigs were also tagged and measured, so the length of twigs preferred by the moose can be determined, and whether or not they eat only this year's growth.

VI WINTER RANGES

A description of the main winter ranges of the park has been given in the report of 1950. A discussion of each of the ranges studied this year is given below. The descriptions of utilization are based on general reconnaissance, Aldous plots (Table I) and on pellet group counts (Tables III and V).

a) Green Mountain - Hemp Creek

This range was again subjected to heavy use. Residents reported that the moose arrived here later than usual in the winter of 1951. The pellet group counts of 64/acre in 1950 and 139/acre in 1951 showed a significant increase in the utilization of the ranges. Browse intensity on willow increased but the regeneration remained about the same with 46% of the samples having good regeneration in both years. Reconnaissance showed that in some areas a few willows had been killed by browsing but this was not general over the winter range. An increase was noted in the number of trees that had their bark stripped by the moose. This is an indication that the browse species are tending to escape above the reach of the moose.

b) Stillwater

The same situation prevailed in this area during the two years. A plentiful food supply was hardly browsed by moose. The snow depth in this region is apparently sufficiently great to prevent the animals from using it. The pellet group counts dropped from 16 to 7 per acre, but the sample size was too small to show a significant difference between the two years.

c) Deer Creek and base of Kilpil Mountain

This is the most important early winter and spring range of the park. A large proportion of the moose from the mountains to the north concentrate here in the fall before moving southward to the winter ranges of Hemp Creek, Green Mountain, and the Upper Clearwater valley.

The browse intensity, as indicated by Aldous plots, dropped from 70% to 30%. This decrease is difficult to explain. Probably some of the decrease is due to sampling and judgement error. However, it was at once apparent on entering the area in 1951 that moose had not used it as much as in the previous years. The food supply here is rivaled only by that of Stillwater. Perhaps early snow forced the animals to abandon the region before the usual date.

Pellet group counts showed that the population was relatively high there, with 100/acre. No pellet counts were made here in 1950 as dense summer vegetation rendered this impracticable.

d) Clearwater Outlet

As noted in the report of 1950, this area is no longer of importance as a winter range. It was studied only to demonstrate falling productivity as forest succession advances.

It was difficult to find the exact area from which the small Aldous sample of 1950 was taken. Browse intensity dropped somewhat, but not significantly. Regeneration of willow in lava beds and on the hillsides was again unsatisfactory. Pellet group counts in the lava beds dropped from 90 to 56 per acre, and from 60 to 16 per acre on the hillsides. The sample size here was too small to demonstrate a statistically significant decrease.

e) East Shore Clearwater Lake, North of Ivor Creek

There was little change in the browse intensity of regeneration of willow in the sample area during the past year. Regeneration continued to be good with moderate browsing. The carrying capacity

here is apparently greater than on the other shore in the Archer Creek burn. Pellet groups of 24 per acre again indicate a small wintering population. Perhaps this light winter concentration of animals is due to lack of good summer range nearby.

f) Archer Creek Burns

This area to the west of Clearwater Lake is a complex of different aged burns (see report of 1950). To obtain an adequate sample of the whole region would be extremely difficult. Aldous plots and pellet group counts were taken in the same general areas as in 1950. Pellet group counts for both years indicate that wintering moose used the region to a moderate extent in the past two winters. The slight increase in the pellet groups per acre is not significant. Taken as a whole, these burns are not utilized as much by wintering moose as the ranges from Deer Creek south to the Upper Clearwater valley. It is therefore recommended that browse studies and pellet group counts be discontinued in this area. The area is not of sufficient importance to devote time upon it.

g) Pyramid Mountain

Aldous plots taken in this area indicate a marked decrease in browse intensity in the past winter. No pellet groups were taken here in 1950 but field notes say "last winter's droppings are numerous". The pellet group counts of 1951 showed only one group in thirty plots. On this mountain it was possible to take the Aldous samples on nearly exactly the same locations as last year, and the drop in browse intensity was very apparent. The reason why the moose should almost completely abandon this small area for a year is not known.

h) General Notes on Winter Ranges

The foregoing discussions of winter ranges do not cover the browse areas of the higher levels. No pellet group counts or Aldous plots were taken outside of the main wintering areas of the lower valleys and hillsides. Reconnaissance showed alpine willows to be heavily browsed in the South Plateau, Kilpil, and Stevens Lakes regions. Here the willow had been seriously damaged in many isolated areas. This depletion of the food supply at higher elevations may cause hardship to the animals at certain seasons.

The studies of the key winter ranges indicate that the general picture has changed little over the past year. Local variation occurs, but in general these ranges have a large amount of available food with a well-distributed population of moose. Biologists J.H. Hatter and P.W. Martin of the B.C. Game Department expressed the opinion that the carrying capacity for moose of the winter rangers of southern Wells Gray Park exceeds that of any area of equal size in B.C.

The extensive Aldous studies and the limited twig measurement studies in this area show that between 40% and 50% of the available willow twigs are browsed yearly. It is a general belief that continued browsing of more than 50% is liable to decrease the vigor of the browse species and to lower the carrying capacity of the range. At present, study of willow regeneration is being undertaken to see what utilization the willow can tolerate. Until the results of this study are available, it would be wise not to allow the present degree of utilization to be exceeded.

TABLE III
PELLET GROUP COUNTS TAKEN IN 1950 and 1951 BY AREAS

Area	1950		1951		
	No. of Pellet samples	No. of Pellet groups	No. of Pellet samples	No. of Pellet groups	Pellet Gps per acre
Green Mtn					
Hemp Cr	72	46	230	283	139

Stillwater	30	5	16	100	7	7
Lava Beds Clearwater Lk	10	9	90	50	36	72
Hillsides Clearwater Lk	10	6	60	50	8	16
Clearwater Lk east side	15	5	33	50	10	20
Archer Cr Burn	45	26	57	150	95	63
Deer Cr French Meadows				200	200	100
Hillsides Upper Clearwater				69	14	20
Flats Upper Clearwater				50	17	34
Pyramid Mtn				30	1	3

VII MOOSE

a) General

The first moose inventory of the park was carried out in the spring of 1951 by Park Patrolman J.C. Norman. His report, on file elsewhere, states that the animals came through the winter in good health. I do not consider the sex and age ratios obtained from the inventory reliable, but even if they are used with the most extreme caution, one must admit that the survival to yearling age was excellent. The number of moose seen by the summer survey was again small, although it was 60% above that of 1950.

A summary of the sex and age ratios obtained for the park moose to date is given in Table IV.

TABLE IV
OBSERVED SEX AND AGE RATIOS OF MOOSE IN WELLS GRAY PARK 1950-1951

Date	Bulls	Cows	Yearlings	Calves	unidentified as to age & sex	Totals
1950 - summer	17	17	7	10	7	58
1951- spring	93	123	151		108	475
1951- summer	24	22	17	11	20	94

Considering only the data from the two summer surveys, we find that the sex ratio of the adults is approximately 50:50. There are several explanations for this equality in the observed sex ratio: (1) Possibly the cows are more secretive in the summer and harder to find than the bulls. (2) The illegal kill falls chiefly on the females and due to the light hunting pressure there is no resultant unbalance. (3) Another possibility is that the amount of hunting, legal and otherwise, is so small compared to the total population that there is no effect on the sex ratio.

Observations made during the early summer served to substantiate Mr. Norman's spring observations on the general condition of moose. No debilitated animals were seen during the summer's work and all moose beds examined were tick free. The winter was apparently very easy on the herds.

The only pathological condition noted in the moose during the summer was one severe case of fibromatosis on a mature bull. The animal was covered with wart-like growths about the size of a golf ball. This condition causes the moose little inconvenience but may cause wastage if the animal is abandoned by the hunter who fears that the carcass is unfit for consumption.

A serious parasite of the moose in the park is the tapeworm, *Echinococcus granulosus*. Three of ten moose examined by myself and Mr. Helset in the fall hunting season of 1950 were moderately infested with this parasite. The liver of one of these had to be discarded it was so full of cysts. Mr. L. Ludtke reported that a moose taken by one of his hunters in the 1951 hunting season had such a bad case of "tuberculosis" that it had to be abandoned. The symptoms that he described make it reasonably sure that this was a case of a heavy hydatid infestation.

Predation was light, and only two fresh carcasses of moose were seen during the reconnaissance periods. One of these was apparently killed by wolves and the other looked as if it had met with an accident and had fallen through thin ice on a small lake to the west of Clearwater Lake.

b) Pellet Group Counts

Pellet group counts were again taken on the main moose winter ranges. A "t" test was made to determine whether there was a significant difference in the number of pellet groups in the samples taken in the two years. The statistical analysis was made using a correction for Poisson distribution as described by Snedecor (2). Table V shows the differences in means of the samples and of the tabulated and calculated "t". A significant difference is demonstrated when the calculated "t" is greater than the tabulated "t". The "t" was taken at the 1% level.

Only the Hemp Creek - Green Mountain area showed a significantly different number of pellet groups per sample in the two years. Here there was an increase from 1.05 groups per sample (hundredth acre plot) to 1.26 groups per sample in 1951. This is an increase of 20% between the two years.

Pellet groups indicate how many moose days are spent in the area in question. If the moose were in the area during the same length of time in both years, the pellet group counts would indicate a twenty percent increase in the moose population of the area. Residents say that the moose arrived a little later in 1951 than in the winter previous. Therefore we are reasonably sure that the increased number of pellet groups per sample in 1951 is due to an actual increase in population of the Green Mountain - Hemp Creek winter range.

To make the pellet group counts of maximum value, we must know when the moose enter and leave the sampled area, and whether they shift their concentration of the wintering grounds over the years. This essential information can only be gained by field observation during the winter.

With this supplemental data, pellet group counts will offer a valuable aid to determining fluctuations in population size and concentration.

There has been no attempt to calculate population size from the data at hand for two reasons: (1) There is no knowledge of how many defecations a moose makes per day. (2) The sample size is inadequate.

An attempt was made to tag young moose on the calving grounds. After two attacks by the protecting cows, this project was abandoned. It is essential that we continue to try to mark moose for study of their life histories and migrations.

Although Ranger Cook's report was not available at the time of writing, it appeared as if hunter success and hunting pressure was greater in the fall of 1951 than in the previous fall.

c) Recommendations

In the light of the increasing population, as determined by pellet group counts and observations on winter survival, it is recommended that the kill of moose be increased by allowing hunters to take moose of either sex. Due to the lack of trails, and to the fact that the moose do not come down to the hunting areas in large numbers until the end of the hunting season, there is little danger that we could over-harvest, even with the heaviest of hunting pressure. If we want to look for a precedent in the harvest of the female moose, we can turn to Sweden. In that country, they have had a cow season for almost twenty years. In fact, Folke Skuncke (3), the Swedish moose expert, says "the practice of a closed season on cows is most nearly analogous to the handing of firearms to a blind man. This practice has little in common with true moose conservation." He further states that if it is desired that a given population be held constant, it must be taxed at the rate of one quarter of its size (winter population) annually. Of course, a severe winter may cause a drop in the moose population of the park, and a reduction in the kill would be logical. The recommendation for an increased kill is made with the assumption that no disaster will overcome the moose this winter.

All guides and hunters in the park should be given brief instruction on game diseases, pointing out which ones may or may not be transmitted to humans. One of the aims of management should be to prevent waste. This education program would prevent the loss of carcasses which may be abandoned through ignorance.

A large population of wolves or coyotes should not be tolerated in the park, as they are vectors of hydatid disease, which is transmissible to humans as well as to moose.

Snedecor, G.W. - Statistical Methods. Collegiate Press. (1937)

Skuncke, Folke - Moose. (translation from the Swedish) P.A. Norstedt and Sons, Stockholm (1949)

TABLE V
ANALYSIS OF MOOSE PELLETT GROUP COUNTS TAKE 1950 - 1951

Area	1950		1951		Difference between means
	Sample sz. 'n'	Pellet gps. per smp. 'x'	Sample sz. 'n'	Pellet gps. per smp. 'x'	
Stillwater	30	0.79	100	0.74	0.05

Hemp Creek	72	1.05	230	1.26	0.21
Lava Beds Clearwater Lk	10	1.12	50	1.02	0.10
Hillsides above Lava Beds	10	1.02	50	0.78	0.24
Clearwater Lake east	15	0.81	50	0.81	0.00
Archer Creek Burn	45	0.98	150	1.01	0.03

Area	Calculated 't'	Tabled 't'
Stillwater	0.32	2.62
Hemp Creek	3.57	2.59
Lava Beds Clearwater Lake	0.02	2.66
Hillsides above Lava Beds	0.32	2.66
Clearwater Lake east	0.00	2.66
Archer Creek Burn	0.03	2.60

VIII MULE DEER (*Odocoileus hemionus hemionus*)

a) General

From the limited information which the survey was able to obtain on deer, it appears that there has been a considerable increase in the numbers over the last year. Tracks were more abundant in most of the areas revisited this year. The total number of deer seen during the summer of 1951 was one hundred and one, compared with only thirty-five in the summer of 1950. These figures are not strictly comparable as the same areas were not covered in both summers. They do, however, serve to substantiate my general impression that the deer were more abundant over the southern part of the park in 1951 than in 1950.

TABLE VI
OBSERVED SEX AND AGE RATIOS OF MULE DEER IN WELLS GRAY PARK, 1951

Date	Bucks	Does	Yearlings	Fawns	Unidentified as to age and sex
March - April	18	26	38	--	10
May - September	15	29	9	2	43

The above table of observed sex and age ratios contain numbers too small to be very reliable. It does indicate, however, that there is an unbalanced sex ratio in favour of females. This unbalance is quite possibly due to hunting pressure. The survival to yearling age in Mr. Norman's data is very high. Observations made during the summer cannot be expected to yield accurate data on winter survival for, at that time, many of the yearlings cannot be distinguished from the adults. Many of the younger animals are therefore put in the classification of unidentified as to age and the true survival is masked by this classification.

There was no apparent winter die-off and no deer carcasses were seen on our limited observations of the deer winter ranges.

Most of the animals were thin on our arrival in the park in the first week of May, and this condition persisted into June with some individuals. A yearling doe seen on May 31st near Clearwater Lake had not yet started to put on summer flesh and appeared to have suffered from malnutrition on the wintering grounds. On June 15th an adult doe at Hemp Creek appeared quite thin and had only attained about half of its summer pelage. All animals seen after this date were in full summer coat and were not noticeably thin.

Hunter success for deer in the park is relatively poor. Prolonged trips into the alpine country are necessary to ensure a good chance of getting a buck in the early part of the season. Only after heavy snows have driven the animals from the alpine range does hunting in the lower levels become good.

b) Recommendations:

A regulation should be made to allow shooting of deer of either sex during the open season. Wintering ranges in the park are small, the deer at present seem to be rapidly increasing, shooting of the male sex only cannot prevent an increase in the population. A spring inventory should be made of the herd wintering in the southern park of the park, and close examination of their spring condition is probably all we can hope to do in the study of the population. An accurate check of the numbers and age classes taken by hunters is also essential. Management of our deer will depend on close co-operating with the Game Department. The wintering ranges in the park are small and contiguous with larger wintering grounds to the south and lying outside the park boundaries.

IX CARIBOU (*Rangifer arcticus montanus*)

a) General

One of the most striking changes in the game picture in the park during the past year and a half has been the increase in the numbers of caribou seen in the southern part of the park and in the region of Battle Mountain. Whether this increase has been due to an influx of caribou from the north, or whether it has been due to an increase in the numbers of the bands in the southern region of the park is not known.

Habitat requirements of the mountain caribou are not known, but it is generally thought that they require mature conifer forests with their accompanying lichens during certain times of the year. If such is the case, our habitat in the park has been markedly restricted by fire during the past twenty years and we can never again hope to support the numbers which once ranged throughout the area. An increase in numbers may well cause damage to the caribou habitat which is now available, and our caribou might move on to other regions if this should happen.

A map of available caribou information for the park and vicinity has been prepared and it is hoped that from it we will be able to come to some conclusions regarding habitat requirements as we gain more information. This map is necessarily inadequate because of lack of an accurate base map, but it will lay the foundation for a new map as soon as a good base is available.

As in last year's investigation, we made a trip to Murtle Lake after hearing of caribou being seen about the lake outlet. On May 20th of this year, we counted twenty-one piles of caribou droppings on the trail between Stillwater and Murtle Lake. Last year, on May 24th, there were five piles of droppings. Tracks were also noted but these were not recent and were sometimes obliterated by moose which had been moving northward over the trail. On arrival at the lake, we looked over the meadows at File Creek but found only old tracks and little sign of caribou having been in the area for the past few days. The snow was practically gone from the meadows, and it appeared as if the caribou had moved northward.

Our second trip into caribou country was on June 8th when we climbed the Azure Mountain range behind the Forest Service lookout. Here we found abundant evidence of wintering animals. Most of it appeared to have been made by goats, but a considerable portion of the sign was that of caribou. This wintering range is rather restricted, covering a few square miles of alpine fir and heather, and lying above a burn which extends from Clearwater Lake to an elevation of about 6,000'. Above timberline there are large, windswept rocky faces which are probably blown clear for much of the winter. The vegetation on these slopes is sparse, consisting of scattered grasses, sedges, heather, and lichens. We spent only a day in the region, for the sign indicated that the caribou had moved elsewhere and only goats remained.

On July 1st, the party started an extensive reconnaissance of Battle Mountain and vicinity. We had the good fortune to see three caribou on the meadow to the west of Fight Lake before reaching our camping site. This small band was made up of two mature bulls and one cow. Messrs. Helset and Davies said that the cow appeared to be heavy with calf. During our stay of two weeks in the high country about Battle, we saw caribou on four separate occasions. Sign was abundant on most of the alpine and sub-alpine habitat that we visited. Caribou trails led along the small rills coming down from the north side of Table Mountain. These had been used recently. Three sets of tracks only a few hours old were seen in the snow at timberline on this mountain. Caribou crossed the meadow above and below our camp on Fight Lake on at least three different occasions during the time we were camped there. Sign on the South Plateau above Murtle Lake and Murtle River was noted but it was quite old and was probably left by animals in the early spring. At the meadows near the head of Stevens Lakes there was a lick that had been used by a single caribou shortly before we visited it. From the sign on Battle Mountain, it appeared as if there were at least twenty caribou in the region during the first week of July.

On July 29th we saw a band of eleven caribou on the southern slopes of Battle. Three of the band appeared to be calves. Later, on the same day, two single bulls were seen resting on snow patches on the eastern slope.

Caribou summer on the slopes
of Battle. Little snow remains
in late July.
July 29, 1951

Western slopes of Battle in
July. Note the burnt-off
sub-alpine slopes to the north.
July 29, 1951

Mature conifer forest on the South
Plateau trail. Caribou spend part
of the winter on this forest.
August 1, 1951

The slopes of the Kilpil on the other
side of the Murtle River Valley have
been denuded by fire. This once had
same forest cover as that in the picture
to the left.
August 8, 1951

In the fall of 1951, all of the following trappers saw caribou or fresh caribou sign on their traplines: Messrs. Helset, Hogue, Ludtke, and Shook. Mr. Shook saw a band of twenty-seven in the vicinity of Stillwater. He estimated that fifty had crossed the trail, moving north between Stillwater and Murtle Lake.

b) Recommendations:

1. The closed season on caribou now in effect to be continued.
2. A complete closure of the Battle Mountain area to hunting to be enforced if this area is included in the park. This closure should cause little hardship to the local guides as the area is not usually hunted. The closure would remain in effect until more is learned of the status of the grizzly and the caribou in the region.
3. A least two caribou reconnaissance trips to be made yearly, one after the calves have been dropped in the spring and one while the animals are still on their winter range.
4. Food habit and habitat study to be initiated.
5. Fire protection of caribou habitat to be given greater priority, if possible.

X MOUNTAIN GOAT (*Oreamnos americanus*)

a) General

The survey had little opportunity to investigate goat conditions in the park this year. Only two trips into goat country were made. On June 8th, we spent a day on the range above the Azure Mountain Lookout. Here abundant evidence of wintering goats was seen. The rapidly melting snow made it difficult to estimate numbers but fresh tracks of four animals were seen and a fifth was noticed feeding on a slide just above timberline. This animal was an old female and she appeared to be pregnant. Mr. Davies saw seven goats in the Buchanan-Huntley Range when he had an opportunity to see this part of the country after a fire-fighting expedition which took him to the north shores of Azure Lake.

From all sources of local information, it appears that the bands of goats in the park are small and that they rarely consist of more than twelve animals. This has been substantiated by the limited investigations carried out by the surveys of the past two summers.

b) Recommendations

1. In light of the fact that few large bands of goats exist in the park, it would be wise to restrict the number of goats that could be taken in any one area during the hunting season. I would suggest three as the maximum number to be taken from each range. The ranges accessible to hunting are shown on the Goat Range Map.
2. Study of the goats should be given low priority as these are not as important as other game or fur animals in the park.

XI GRIZZLY BEAR (*Ursus Horribilis*)

a) General

The survey saw no grizzlies during the summer's reconnaissance and sign was not especially abundant in the alpine habitat which we visited. Tracks of two animals were noted at Murtle Lake in late May and fresh tracks were seen at Stillwater in early July.

Trappers reported grizzlies as occurring on their lines during the fall and spring trapping seasons of 1950-51. Mr. A. MacAndrews, holder of a trapline at the headwaters of the Azure River, had his entire catch of marten destroyed by a grizzly in the fall trapping season.

Five grizzlies were taken during the fall hunting season of 1951. Three of these were from Mica Mountain, which lies only partly within the boundaries of the park. The party on this hunt was guided by Mr. McNeil of Mahood Lake, who reports that twenty-seven separate grizzlies were seen during the hunt. Two were taken in the alpine range behind the Azure Mountain Lookout.

b) Recommendations

1. Study of grizzly to be given high priority and to be carried out in connection with caribou studies as much as possible. We have comparatively little data on the actual numbers of grizzlies within the park boundaries, but this data might be obtained by early spring censusing. The counting of tracks on the open slides may offer an index to grizzly abundance. Aircraft reconnaissance offers another possibility.
2. Perhaps our sole management of grizzly in the immediate future will be that of restraint and of distributing the hunting pressure on these animals. From reconnaissance of the past two years, grizzly habitat has been found to be plentiful and well distributed throughout the park. Their conservation and management will depend upon cooperation between the guides and trappers under the guidance of the Parks and Recreation Division.

XII BLACK BEAR (*Euarctos americanus*)

a) General

Black bears were plentiful throughout the park during the summer. The residents reported that cubs accompanied many of the adults. The survey saw eleven bears during the summer, four of which were cubs. The berry crop of 1949 was excellent and this is believed to be a factor in the survival of wintering bears and in the success of reproduction (see report of 1950). The berry crop

was relatively light this year and the huckleberry crop was practically a failure. The main food of bears in the berry season was the fruit of the buffalo berry (*Sheperdia canadensis*). Indications are that cubs will be scarce in the next summer as they were in the summer of 1950 following the poor berry year of 1949.

Ranger Cook reports that ten black bears were shot by his fire crews in the region of Murtle Lake. This makes a total of fourteen reported taken in the park and near vicinity during the year of 1951. Six of the blacks were reported to have been shot by one Patrolman.

The only damage reported from black bears within the park occurred when a bear entered a cabin belonging to H. Hogue. Considerable damage was done to his food cache as well as to the cabin itself.

Field examination of sixty-six scats revealed no instance of any other animal food eaten except insects which were found in two scats. Vegetable food consisted largely of fibrous vegetable matter, which was found in thirty-five scats; thirty-one contained fruits and leaves of berry bushes. Two bears were taken and examined for pathological conditions. Both appeared to be in excellent health at the time of shooting. One had a very light infestation of tapeworms tentatively identified as *Taenia* sp.

b) Recommendations

1. A closed season should be placed on black bears during the summer months and the black bear season should run concurrently with the grizzly season in the spring and with the deer season in the fall. This should protect bears from unnecessary slaughter when they are of little value to hunters. The hides are practically worthless during the summer months, and the value of the bear is much greater to cameramen than to gunners during this season.
2. Killing of bears in the park by local residents to be allowed by permit during the summer months. The few bears that residents take for their fat does not appear to harm the bear population.
3. Park personnel should be instructed to leave bears unmolested where they are doing no harm.

Beaver lodge in marginal
habitat. Stillwater
August 4, 1951

Overbrowsed willow is
killed out in many
sub-alpine meadows.
Kilpil
August 7, 1951

Construction of live traps
Stillwater
July 31, 1951

Black bears offer an opportunity
for photography in summer.
Stillwater
August 2, 1951

XIII FUR BEARERS

a) Trapping Returns

At the time of writing, the complete fur returns for the park were not available. The returns which the trappers of the area send into the Game Department are entirely inadequate in assessing the productivity of their lines. Some returns are blank, where the trapper has been known to have spent a considerable length of time on his line. Other returns have been filed where the trapper has filed only a small part of his catch. The following returns available at the Game Department Office in Vancouver, and are believed to be accurate. They serve to bring out some of the highlights of the 1950-51 trapping season.

TABLE VII
FUR RETURNS OF SOUTHERN WELLS GRAY PARK 1950 - 51

	Hogue Bros.	Helset-Shook	R. Miller	Total
Beaver	3	27	10	40
Fisher	3	5	3	11
Marten	2	13	45	60

Mink	4	9	6	19
Muskrat	--	1	1	2
Skunk	--	--	1	1
Squirrel	20	7	150	177
Weasel	8	19	100	127

b) Marten (*Martes americana*)

Marten appear to be at a high level of abundance in the park. The thirteen animals taken by the Helset-Shook partnership resulted from short lines set near the shores of Murtle Lake. The forty-five marten trapped by Mr. Miller were taken from an area to the south and east of Murtle Lake. These catches indicate a productive marten country in this territory.

As a first step in an investigation of the weasel family in the park, the party attempted to live-trap marten for tagging purposes. The trapping operations were carried out during the first week in August. Two areas were trapped, one in the mature timber on the Murtle Lake trail above Stillwater; the other, a small area on the south of the Kilpil. Our efforts were not as successful as those of the park trappers and no marten were taken from any of our sets. One mink was taken in a set on the river bank.

Two types of traps were used in our live trapping. Five collapsable wire squirrel traps were borrowed from the BC Game Commission. The party constructed nine wooden box traps under the direction of Mr. Helset. This trap was a simple oblong box about twenty-six inches in length. The walls were constructed of one-inch cedar boards. One end was boarded in; the other was filled with a dropping door of galvanized metal. The door was held in place by a wire running through a staple, and dropped when the bait attached to the end of the wire was disturbed. No mink or marten were caught in the hand-made traps but two ground squirrels and two *Peromyscus* were taken, thus proving their efficiency. These traps are too bulky to be of much value in marten trapping in the high country. They might be used to advantage when trapping is done from a boat or canoe along water courses.

Fish oil prepared from rotting Kamloops trout was used as a scent. Baits were squirrel, trout, *peromyscus*, and grouse heads.

In future trapping operations, more care will be taken in selecting the location of the traplines. This, along with a better scent, may improve our chances for success.

c) Fisher (*Martes Pennanti*)

The total of eight fisher taken by the Hagues and the Helset-Shook partnership in the past season is greater than the catch on these lines in any single year since they have been registered. This is the more remarkable because Mr. Helset did not trap during the past season, and Mr. Shook did not attempt to trap over a large area. He took his five fisher from the shores of Murtle Lake.

d) Short-Tailed Weasel (*Mustela erminea*)

The short-tailed weasel was locally abundant around Hemp Creek during the summer months. One was observed about our cabin on several occasions. Some were killed by residents who feared that they might cause damage to poultry.

LIVE TRAPPING OF MINK - August 22, 1951

Trapped

Tagging

Ready for release

e) Long-Tailed Weasel (*Mustela frenata*)

One long-tailed weasel was caught in a live trap set on the trail to Placid Lake. Bait used was half a squirrel. The animal was an adult male and it now bears tag #492.

f) Wolverine (*Gulo luscus*)

No wolverine were taken on park traplines during the past trapping season, but Mr. Miller reports that there were seven on his trapline during his trapping operations.

Mr. Davies say a wolverine on the upper slopes of the south Kilpil on August 4th, and he obtained motion pictures of the animal.

Wolverine in the part are an interesting part of the fauna of the mountainous regions. They are a relatively rare animal and should be preserved. There is little that we can do to conserve the animals except to encourage the trappers to leave them unmolested. Special sets are not usually made for the wolverine unless it is causing damage on the line. The damage can be prevented to a great extent if the lines are run frequently. It is thought that legislation against the trapping of the wolverine in the park would do little to protect. The trapper always has the defense that the animal entered his traps by accident. Asking the cooperation of the trappers in the preservation of the wolverine is the only measure of protection that we can give it, short of closing the whole area to trapping.

g) Mink (*Mustela vison*)

During the summer, a number of mink were trapped and tagged in order to learn some facts concerning their life histories and movements in Wells Gray Park.

One mink was taken at Stillwater during our marten trapping expedition. Five were taken at Hemp Creek and on the Murtle River. These sets were made during our moose browse work and no special effort was involved. Intensified trapping along the water courses in late summer should prove very productive and divulge much information when trapper returns come in.

The most effective bait used was fresh fish, although hen heads also caught mink.

A record of the tagged mink is given below. One mink was killed by rough handling and is now preserved in the Museum of the University of British Columbia.

RECORD OF MINK TAGGED IN WELLS GRAY PARK -- SUMMER 1951				
Place of Capture	Date	Sex	Age	Tag Number
Murtle River - Stillwater	Aug. 1	Male	Adult	476
Hemp Creek	Aug. 23	Male	?	482
Hemp Creek	Aug. 23	Male	Adult	452
Hemp Creek	Aug. 28	Female	?	486
Murtle River - Pyramid	Sept. 6	Male	Immature	480

h) Beaver (*Castor canadensis*)

In early June, the party made a visit to the beaver territory west of Clearwater Lake to determine whether this area was still barren of beaver (see report of 1950). It was gratifying to note beaver sign on three small lakes in this area. No food caches were seen, and possibly the beavers were not yet established in the region.

The Murtle River drainage was again productive, with over twenty beaver being taken during the trapping season. This area is so well-stocked that active colonies are to be found in marginal habitat such as creeks in spruce-cedar swamps where there is little deciduous foodstuff to be had.

At present, our knowledge of the park beaver is sketchy to say the least. The first requirement is the knowledge of the location of all active colonies. The mapping of the colonies will have to wait completion of an accurate base map.

It is recommended that, if at all possible, the holders of the trapline to the west of Clearwater Lake be prevented from taking beaver from this region until the area is fully stocked (see report of 1950).

XIV PREDATORS

a) Timber Wolf (*Canis lupus*)

Timber wolves were not abundant in the park during the winter of 1950-51. A sizable pack was supposed to be ranging in the vicinity of Smith Lake in early November. From then until spring,

wolves and wolf sign were seen intermittently but there were no further reports of large packs. A horse short on the Murtle River in lake November was cleaned up before mid-December. This was apparently accomplished by both wolves and coyotes.

Four wolves were taken by residents during the winter and early spring. Two were taken on Placid Lake by the Hogue brothers. Mr. F. Ludtke shot two wolves near his homestead. One of these animals was a female with five foetal pups which were almost fully developed.

In late February, J. Hogue could not find a single wolf track in the vicinity of the Clearwater Lake outlet.

Three wolves were seen by the survey during the summer. These were on the meadows about Battle Mountain in early July. It is in this area that the caribou drop their calves.

No evidence of wolf predation on caribou was noted.

b) Coyote (*Canis latrans*)

Coyotes were heard howling in the vicinity of Hemp Creek throughout the summer months. During the month of August, their 'music' was heard at regular intervals both in the morning and late at night.

Four coyotes were seen during the summer by the party, and all of these were in the alpine country except for one on the Upper Clearwater road.

A collection of wolf and coyote scats was made during the summer. These have not been analyzed as yet.

XV SMALL MAMMALS

The following small mammals were noticeably more abundant in 1951 than in the previous year: snowshoe hare (*Lepus americanus*), meadow mouse (*Microtus pennsylvanicus*), and porcupine (*Erithizon dorsatum*). There is no quantitative data on how great the increase has been.

So far, little attention has been paid to the small mammals with more pressing matters at hand. As soon as possible, a program of small mammal trapping to determine population trends should be established. It is imperative to study the food supply of the carnivorous fur bearers if we are to institute a management program for them.

Three new records of small mammals were recorded for the park during the summer:

Dusky Shrew (*Sorex obscurus obscurus*)

A specimen was taken on Battle Mountain near timberline on July 13th. This shrew probably occurs at all levels throughout the park. Several were taken by Miss Mary Jackson in the vicinity of Hemp Creek.

Alaskan Little Brown Bat (*Myotis lucifragus alascensis*)

Little California Bat (*Myotis californicus californicus*)

Bats occur commonly along Hemp Creek and specimens of the above species were taken in August and September. Some larger varieties occur and will probably be taken if more intensive collecting is undertaken.

XVI BIRDS

Since the summer report of 1950, thirteen new species have been recorded making a total of 128 species listed for the district. The new species are noted below. It should be borne in mind that this is by no means a complete list of the birds for Wells Gray Park, and it is to be expected that new species will be recorded yearly.

Herring Gull (*Larus argentatus*)

A single herring gull was seen near Stillwater on the Murtle River on August 6, 1951. Local residents report gulls on the Clearwater River during the salmon run during late summer. These are possibly herring gulls also.

Pygmy Owl (*Gluacidium gnoma*)

A specimen was taken by Roy Helset in December 1950. He also found a nest with downy young on the trail to Grouse Lake in July 1951.

Sandhill Crane (*Grus canadensis*)

A large flock of cranes was heard in mid-October 1950 when they passed through the Hemp Creek valley at night. Local residents say that it is not unusual for cranes to pass through the region in the fall.

Coot (*Fulica americana*)

A single coot was seen on the Stevens Lakes, July 12, 1951. This is the only record of coot for the summer.

Black Swift (*Nephoecetes niger*)

First positively identified at the Murtle River below the Pyramid on June 20, 1951. Seen regularly in this locality throughout the summer. Thought to nest in the canyons below Helmcken Falls.

Magpie (*Pica pica*)

Observed feeding on carrion at the Pyramid in mid-October 1950. Residents report it as being fairly common in late autumn and early winter at lower elevations in the park.

Hudsonian Chickadee (*Penthestes hudsonicus*)

Seen on the Kilpil at timberline (elevation approx. 6,000) on August 7th and 8th, 1951. This is the only record for the park, although it undoubtedly is more common than this information indicates.

Brown Creeper (*Certhia familiaris*)

Seen in the mature cedar-spruce forest on the trail to Murtle Lake on August 5th, 1951. This bird is not common in the park for it was not observed at all in the summer of 1950, although we spent some time traveling in the mature forest where the creeper breeds.

Willow Thrush (*Hylocichia fuscescens*)

Many of the thrushes believed to be Swainson thrush by the 1950 survey were actually this species. Mr. Edwards identified it when he first came into the park in early June 1951. It is found along all watercourses at lower elevations in the park, and is particularly abundant about Hemp Creek, where it was seen or heard daily throughout the summer.

Bohemian Waxwing (*Bombycilla garrula*)

First identified at Stillwater on August 5th, 1951. For several days they were seen frequently with cedar waxwings in small flocks by the Murtle River.

Rusty Blackbird (*Euphagus carolinus*)

First positively identified at Stillwater on August 5th, 1951 when a specimen was taken. It was common about the Murtle River at this place, but there is no other record of it for the park.

Says Phoebe (*Sayornis saya*)

This flycatcher was seen in the meadows at Hemp Creek on August 29th, 1951, and a specimen was taken on August 30th. Others were seen intermittently until the party left the park in mid-September. It probably occurs as a migrant only.

Western Kingbird (*Tyrannus verticalis*)

Western kingbirds were seen on the Murtle River in late May 1951. They were also seen in the Hemp Creek area at this time, and were not observed again during the summer.

Blue Grouse (*Dendagrappus obscurus*)

Blue grouse were seen in the vicinity of Hemp Creek several times. Their appearance in this region was first noted by the survey this summer. It is thought that the failure of the berry crop at higher altitudes may have forced the grouse to localities where there was an abundance of soopolallies.

Three broods of blues were counted during the summer with an average of four to the brood.

Franklin's Grouse (*Canachites franklini*)

Franklin's grouse were encountered very infrequently during the summer months. Ranger Cook reported them to be very scarce along the park road to the Clearwater River. In his trips up this road in the year previous, he encountered Franklin's grouse daily.

Three broods were seen during the summer, with only two chicks in each.

The reason for this decrease in Franklin's grouse is not known. It is very puzzling, because the other two species remained at a high level during the same period.

Willow Grouse (*Bonasa umbellus*)

The willow grouse of the park seem to be near their peak of abundance. Residents reported this grouse to be more abundant than usual during the fall months. On one weekend spent in the park in mid-October, I found the birds to be much more plentiful than they were at any time during 1950.

We saw five broods during the summer, which averaged 3.6 birds per brood. However, the great abundance of birds in the fall suggested that our small sample was not representative of the brood success as a whole.

Recommendations:

1. Grouse season should run concurrently with the open season on deer and goose, and the bag limit should be much more liberal than that now in force. Grouse are distributed widely throughout the park, but there are few areas where they are exceptionally abundant. Most grouse hunting will be done by big game hunters who are interested in getting some grouse for eating purposes. There is no reason for restricting the kill of these birds during part of the time

that the big game hunters are afield. The number of birds that could be killed by them would have little effect on the population. It is poor policy to let these birds go unharvested. All studies to date show that grouse have periods of abundance and of scarcity. Hunting rarely has an effect on the numbers of these birds.

2. Studies of game birds in the park should be left until the more pressing problems of game and fur have been investigated.

XVII GENERAL REMARKS

a) General

Recommendations for management of resources of the park made by a wildlife biologist will necessarily tend to emphasize the importance of wildlife. The biologist has neither the time or the training to study all park values equally. His duty therefore is to report his findings on wildlife to the head office, where they can be assigned their priority in the scheme of things. The recommendations made here and throughout the report are present with this fully in mind.

b) Hunting

The status of, and proposed recommendations for, each game species in the park has already been discussed. The following generalizations on management apply to all of these species.

Present management will have to be based on a small amount of data from observations of our animals and from principles learned elsewhere by other game managers. It is foolhardy to follow blindly in the path of others, but it is equally unwise to fail to try methods which others have found to be successful. For instance, in the management of the moose only the European countries have tried shooting both sexes. They find this to be the most cost productive method of maintaining a sustained yield of this animal. Are we to ignore their findings and continue to hunt only bulls? Similar remarks could be made about the hunting of deer, where we take only bucks, while most findings show this to be poor policy.

As shown in Table III, the take of game species in the park is very light. These figures are, admittedly, incomplete, but they do show a general picture of the magnitude of the take.

TABLE VIII
TOTAL HEAD OF GAME SPECIES TAKEN IN WELLS GRAY PARK 1950 - 1951

Species	1950	1951
Moose	30	--
Mule Deer	15	--
Black Bear	2	14
Grizzly Bear	2	5
Mountain Goat	3	5

If we cannot increase the take by a considerable amount, intensive management of game in the park for hunting purposes is not economically justified. Under the present system of trails and

regulations we cannot hope to make any appreciable increase in the take of game animals. Whether we like it or not, our present game management and that of the near future will have to be hunter management. Changing the regulations to suit the conditions that prevail yearly is a necessity. Distributing hunting pressure is another method of management. At a later date, we may be able to practice habitat manipulation and ultimately that is the only method by which we can produce more wildlife. Until that time, however, we must utilize that which we have to the fullest extent.

c) Trapping

We have learned few facts on the fur bearers of the park during the past year. Studies of life histories will have to be made before we can do much in the way of management. We know practically nothing of the distances carnivorous fur bearers travel. More accurate records of fur returns in the park will have to be made. It is useless to duplicate the efforts of the Game Commission, so it is recommended that the park biologist make an effort to see that the returns filed by the trappers are accurate and complete.

d) Guiding

Most hunting in the park will require the services of a guide or a packer. These men can be a valuable aid to the management of our wildlife. They are interested in its welfare because that is the source of a good proportion of their livelihood. During the fall of 1950, when guiding in the park in the employ of Mr. Helset, I noted that a great majority of the hunters respected the instructions of their guide. The hunters are often ignorant of regulations and look to the guide to tell them what they can and cannot do. The success or failure of park regulations will rest on the cooperation of the guides.

To promote better understanding, it is recommended that we convey our findings and our proposed regulations to these men at regular intervals. Much of their business is contracted for in advance, and sudden changes in park regulations would seriously inconvenience them.

Possibly an annual meeting of park guides, trappers, and Forest Service personnel could be arranged. This meeting would help iron out any difficulties or misunderstandings which may arise.

e) Fishing

The completion of the park road to the Clearwater River in the vicinity of the Horseshoe made more fishing available to the public, and many people fished this stretch of water at the road's end during the past summer. Otherwise, the fishing situation has not changed since the report of 1950.

The only records of the fishermen's take are at present being kept at Clearwater Lake by Patrolman J. C. Norman. An effort should be made to keep complete and accurate records where possible, so we can readily observe changes in the productivity of our fishing waters.

f) Roads and Trails

Little has been done on road or trail improvements in the past year. I am in complete agreement with the recommendations made in the 1950 report. I would reiterate Mr. Martin's remarks with a few additional suggestions.

The construction of a new trail to Murtle Lake should be undertaken as soon as possible. A practical route along the north shore of the Murtle River exists as pointed out in the report of the recreation survey in 1949. This trail would open up new fishing and hunting areas to the north of

the Murtle. If constructed, a trail to Ray farm through Deer Creek could be improved, and another excellent moose hunting area would be served. If funds are not available for the construction of a new trail, the old trail to Murtle should be improved at once.

A trail from the outlet of Clearwater Lake to the outlet of Murtle Lake, by way of the Kostal Lake flats, would open a large area of early fall moose hunting and allow guides to take parties to hunt the goat and deer country of the Goat Peaks and the Kilpil Mountains. This trail would be of value for fire protection, passing through the finest stands of timber remaining in the park. Its construction would not materially increase fire hazard for the trail would seldom be used in summer. Greatest use would be in the fall hunting season, after the fire hazard has moderated.

The improvement of the trail to Battle Mountain has been recommended elsewhere. This should take precedence over the construction of the Kostal Lake trail.

Some signs have been erected, showing the location of park trails, in the past year. The location of most trails is still a mystery to most visitors however. Marking of those routes would be of great value to people who wish to use the park 'on their own'.

g) Park Extension

In accordance with a recommendation made in the report of 1950, an extensive reconnaissance was made to determine suitable boundaries which would include the caribou range of the Battle Mountain area in a southern extension of the park. The reconnaissance showed that it would be most desirable to include Battle and Table Mountains in the park, as well as to include the area in the vicinity of Stevens Lakes. These areas would be valuable for alpine hiking and horse back riding, as well as placing the caribou range under park control. The inclusion of the deer winter range of the Clearwater canyons and of Trophy Mountain is not recommended. The value of these areas would not compensate for the additional administration problems that this would involve.

The boundary as described below would include most of the moose wintering range of the Upper Clearwater Valley and practically all of the most valuable caribou range between the Clearwater and Raft Rivers. It would also provide a "buffer zone" between the cattle ranges of the Raft and Trophy, and the caribou range of Battle and Stevens Lakes.

Proposed boundary: extending due south from the present south-east corner to the height of land between the drainage systems of the Raft and Murtle Rivers; then following this height of land southward and westward to the headwaters of Grouse Creek; then following this creek eastward until it joins the Clearwater River; then the east bank of this river followed north until it meets the present southern park boundary. All settled homesteads lying north of this boundary should be left out of the park, but all unoccupied pre-emptions within the new boundaries should be included. Refer to appended map.

h) Research and Management

During the summer, the first research work of the park was initiated under the direction of Mr. Edwards. Experiments were undertaken to determine the ability of willow to produce new growth when subjected to varying degrees of mutilation. It is hoped that the findings from these experiments will show just how much browsing a willow can stand and what degree of browsing will produce the optimum growth.

Such research is valuable in our understanding of factors affecting our game populations. It is of equal importance to carry out field observations on the condition of the animals, the general condition of their ranges, and on the sex and age distributions of the herds. This data is essential

to proper management. A proper balance will have to be struck between time spend on such routine investigations and upon fundamental research.

XVIII 1951 COLLECTION

A small collection of birds and small mammals was made incidental to the summer's work. This collection was donated to the Museum of Zoology at the University of British Columbia. These specimens, along with a large collection made by Mr. Martin in the summer of 1950, are available for reference at the Museum. A list of the specimens collected in 1951 is given below:

Canada Jay (*Perisoreus canadensis*)

Pine siskin (*Spinus pinus*)

Chipping sparrow (*Spezille passerina*)

Golden crowned kinglet (*Regulus satrapa*)

Jumping mouse (*Zapus* sp.)

Bog limming (*Synaptomys borealis chapmani*)

Sandpiper

Horned lark (*Otocoris alpestris*)

Red backed vole (*Clethrionomya gapperi saturatus*) (2)

Phenacomys intermedius intermedius

Shrew (*Sorex obscurus obscurus*)

Cowbird (*Molothrus ater*) (2)

Eastern kingbird (*Tyrannus tyrannus*)

Macgillivray's warbler (*Oporornis tolmiei*)

Drummond vole (*Microtus pennsylvanicus drummondii*) (3)

Alaskan little brown bat (*Myotis lucifugus alascensis*) (2)

Steller's jay (*Cyanocitta stelleri*)

Rusty blackbird (*Euphagus carolinus*)

Mink (*Mustela vison*)

Say's phoebe (*Sayornis saya*)

Little California bat (*Myotis californicus californicus*)

