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Elk or wapiti of Riding Mountain National Park

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# THE ELK OR WAPITI OF RIDING MOUNTAIN NATIONAL PARK

BY

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1948

# AN INVESTIGATION OF THE PRESENT STATUS OF THE RIDING MOUNTAIN WAPITI HERD.

## INTRODUCTION

The investigation which formed the basis of this report was carried out in Riding Mountain National Park, Manitoba, during the period May 10th to June 14th, 1947.

The winter of 1946-7 was a severe winter in most of central Canada. In the Riding Mountain area conditions of exceptionally deep snow and low temperatures prevailed during the early winter period. During late winter, there were several thaws followed by cold periods which caused thick crusts to form on the snow. These conditions brought about increased hardships for the ungulate mammals.

During the investigation carried out in January, 1947, these conditions were noted, and in the report presented a winter mortality among the elk or wapiti herd was forecast. The Superintendent's reports for the early spring months reported a large number of wapiti carcasses discovered by the warden service.

The present investigation was instituted on the instructions of the Controller with a view to assessing the mortality among the wapiti, damage to the natural ranges and present wapiti population, and making remedial recommendations.

The study was carried on by foot and vehicle from two base camps. The first was at Clear Lake tower cabin from May 13th to 31st. The second camp was established at Whitewater Lake on June 1st. The study was concluded on June 13th on the instructions of the Controller. Mr. C.F. MacLeod, student assistant, assisted in the field work.

Manitoba Wapiti (Cervus canadensis manitobensis.)

An investigation of the present status of wapiti in Riding Mountain National Park was one of the primary objectives of the 1947 field programme. The history of the Riding Mountain herd is particularly well documented because of the published report of H.U. Green

(1933) and the Departmental reports of J.D. Soper (1941 and 1946) and A.W.F. Banfield (1947). Green gathered many pertinent data on the early status of the wapiti, at the time of the initial settlement of the area and later when Riding Mountain was a Dominion Forest Reserve.

The growth of the present herd may be followed by comparing the figures of the estimates of populations made by the following observers during the years mentioned. The following data were taken from the reports referred to above.

| Year | Wapiti Population | Observer |
|---|---|---|
| 1914 | 500 | Chas. Barber |
| 1925 | 2000 | Fred Smith |
| 1933 | 3500 | H.U. Green |
| 1941 | 5000 - 7000 | O.E. Heaslip |
| 1946 | 12,000 | O.E. Heaslip |

There has not been a steady population growth. In the winters 1935-6 and 1946-7 there were severe losses in population, due to severe winter kills. Coupled with this increase in population there has been an evident increase in range browse utilization.

RANGE Green (1932) states: "Generally speaking, they range throughout the whole Park area, but are most plentiful about the Kennice and Audy plains". The present range is equally well defined by the same description. The wapiti are most abundant on the extensive areas of grassland and wet meadows; they also inhabit the second growth aspen poplar (Populus tremuloides) stands; they are rare or absent in the mature stands of conifers, such as those of white spruce (Picea glauca) or of jack pine (Pinus banksiana).

The forestry cover-type maps of the park have been consulted in mapping the present range of wapiti. The park areas covered by coniferous stands, as well as mixed or hardwood stands of sufficient density to yield 30 cords to the acre, have been arbitrarily omitted from the elk range. This information, considered

along with the observations of wardens and investigators, provides a fair estimate of the present range, which the wapiti inhabit in fair numbers. This range is indicated in figure 1.

It will be noted that, in general, wapiti inhabit the southern half of the park. They are less common in the northern and eastern sections, due to the heavier stands of timber.

The total wapiti range has been divided into two divisions on the basis of observation. The first division consists of the main prairies, parklands and open aspen stands, which harbour the main concentrations of wapiti. These areas, at present population levels, are overstocked and show heavy browse utilization. The second division consists of marginal habitats, consisting of moderately open hardwood stands.

By means of a planimeter the areas of the above ranges have been calculated on the forestry cover maps.

Main rangeland areas.

| | |
|---|---|
| Birdtail valley | 16.8 sq. miles. |
| Pedin ranch | 24.5 " " |
| Whitewater Lake | 23.2 " " |
| Dauphin Road | 7.2 " " |
| Elk Lake | 2.3 " " |
| Audy plains | 74.0 " " |
| Clear Lake | 27.2 " " |
| Whirlpool River | 4.7 " " |
| Total area | 179.9 " " |
| Marginal Range | 399.9 |
| Total utilized wapiti range | 579.8 " " |

MOVEMENTS The Riding Mountain herd does not participate in large scale annual movements, which are such a common characteristic of the Rocky Mountain herds. There are, however, local concentrations of herds or bands on favourable feeding grounds.

After a heavy snowfall in October, 1946, there was a large scale exodus of wapiti from the park to the surrounding farm lands. This exodus has been well documented in the reports of Soper (1946) and Banfield (1947).

POPULATION The estimation of a population of mammals as large as the present herd and distributed over such a large area is an exceedingly difficult task. The most satisfactory means of estimating the population would be by aerial survey during late winter.

The method used in the present investigation was the strip count. Many counts were made in areas of high and low elk populations. The length of the strip and average width of visual field were recorded. When several counts were made along one route, the highest count was used. From these counts, wapiti per square mile were calculated. The summer wapiti counts are listed in table 1.

Table 1.

| Date. | Route | Mileage | Field | Wapiti | Wapiti per Sq. Mi. | Winter Observation. |
|---|---|---|---|---|---|---|
| May 14. | Norgate Rd. | 16.5 | 100 yds. | 25 | 26.8 | 77. |
| May 18. | Clear Lake | 9.0 | 100 " | 28 | 55.0 | 105. |
| May 29. | Dauphin Rd. | 3.5 | 100 " | 6 | 30.1 | 113. |
| May 19. | Audy Rd. - Plains | 12.8 | 300 " | 155 | 71.0 | |
| May 29. | " " Lower | 10.7 | 100 " | 75 | 123. | |
| May 22. | Game Line E. | 3.0 | 100 " | 9 | 53.0 | |
| May 29. | " " W. | 2.0 | 100 " | 3 | 26.4 | |
| June 4. | Whitewater Rd. | 2.0 | 200 " | 17 | 75.0 | |
| June 12. | Fawn Lake | 2.0 | 100 " | 8 | 70.2 | |
| June 11. | Whitewater L. North | 7.0 | 100 " | 23 | 58.2 | |
| June 7 | " " South | 7.0 | 100 " | 29 | 73.5 | |
| Average. | | | | | 60.2 | |

These strip counts give an average of 60.2 wapiti per square mile in the most concentrated range. The decrease from the winter observations is apparent in several areas.

From casual observation, it is estimated that a reasonable estimate would be one quarter of this figure for the marginal range, (15 wapiti per square mile).

On this basis it is possible to give an estimation of the present wapiti population of the park.

| | | | |
|---|---|---|---|
| Main concentrations | 180 x 60 | = | 10,800 |
| Marginal areas | 400 x 15 | = | 6,000 |
| Total wapiti | | | 16,800 |

POPULATION DYNAMICS The total number of wapiti observed are listed in table 2 classified by age, sex and locality.

Table 2

| Locality | Mature Bulls | Mature Cows | Yearlings | Calves |
|---|---|---|---|---|
| Morgate Rd. | 4 | 18 | 3 | |
| Clear Lake. | 2 | 18 | 8 | |
| Dauphin Rd. | 0 | 5 | 1 | |
| Audy Plains | 10 | 133 | 12 | |
| Audy Road | 11 | 60 | 4 | |
| Game Line E. | 1 | 6 | 2 | |
| Game Line W. | | | 3 | |
| Whitewater Rd. | 3 | 12 | 1 | 1 |
| Fawn Lake | | 6 | | 2 |
| Whitewater Lake N. | 3 | 13 | 1 | 6 |
| Whitewater Lake S. | ___ | 24 | ___ | 5 |
| Totals (377) | 34 | 298 | 32 | 13 |
| Percentage to cows. | 11.7% | 100% | 10.7% | 23.7% |
| January percentages (595) | 12.8% | 100% | 34.1% | |

The first calf was observed on May 30, 1947. The 1947 rate of increase was calculated from the percentage of calves to adult cows observed after May 30th. From table 2 it is noted that the rate of increase was 23.7%. This rate is considered to indicate a poor 1947 calf crop. This is shown by comparison with the survival of the 1946 calf crop to January, 1947. This latter age class was then 34.1% of the cows. From these figures it is suggested that the severe winter conditions affected the calf crop by losses due to deaths of pregnant females (several observed), still births (one was found) and re-absorption of embryos.

From figure 2, the heavy winter mortality among the rising yearling age class is indicated. In January, 1947, this class totalled 34.1% of the cows. By May, 1947, it was reduced to 10.7% of the cows. This indicates that 68.5% of 1946 calves which survived until January perished before May, 1947.

Little change is noted in the proportion of bulls to cows from January to May.

Some data were collected on the secondary sex ratio, that is, the sex ratio at birth. A number of new-born calves were caught and ear-tagged. Of the ten calves examined, 8 were females (7 were tagged, Nos. 130, 131, 133, 135, 136, 138, 140). This is only a small sample, but it suggests a high prenatal mortality among the males.

Winter Kill The severe winter conditions of 1946-7 have already been described in the introduction.

These weather conditions caused the available forage to be covered by deep and heavily crusted snow. The wapiti were forced to subsist on a predominantly browse diet.

With the heavy population, this brought about the destructive utilization of browse species of plants and heavy elk population losses.

During the present investigation, 59 carcasses were observed. Many more carcasses were reported by the wardens. During the month of April, 179 carcasses were reported by the wardens.

The same strip counts described previously were used for recording wapiti carcasses. This information is tabulated in table 3.

Table 3.

| Route | Mileage | Width | Carcasses | Carcasses/square mile |
|---|---|---|---|---|
| Morgate Rd. | 16.5 | 100 | 1 | 1.0 |
| Dauphin Rd. | 21.0 | " | 20 | 16.7 |
| Audy Rd. | 23.5 | " | 15 | 11.2 |
| McCreary Trail | 1.5 | " | 2 | 23.5 |
| Game Line E. | 3.0 | " | 1 | 5.9 |
| " " W. | 2.0 | " | 1 | 8.8 |
| Lake 143.5 | 2.0 | " | 2 | 17.6 |
| Creek 137 | 1.5 | " | 1 | 11.7 |
| Gunn Lake Rd. | 3.0 | " | 2 | 11.8 |
| Whitewater Rd. | 6.0 | " | 8 | 23.5 |
| Whitewater Creek | 2.0 | " | 4 | 35.2 |
| Average | | | | 15.2 |

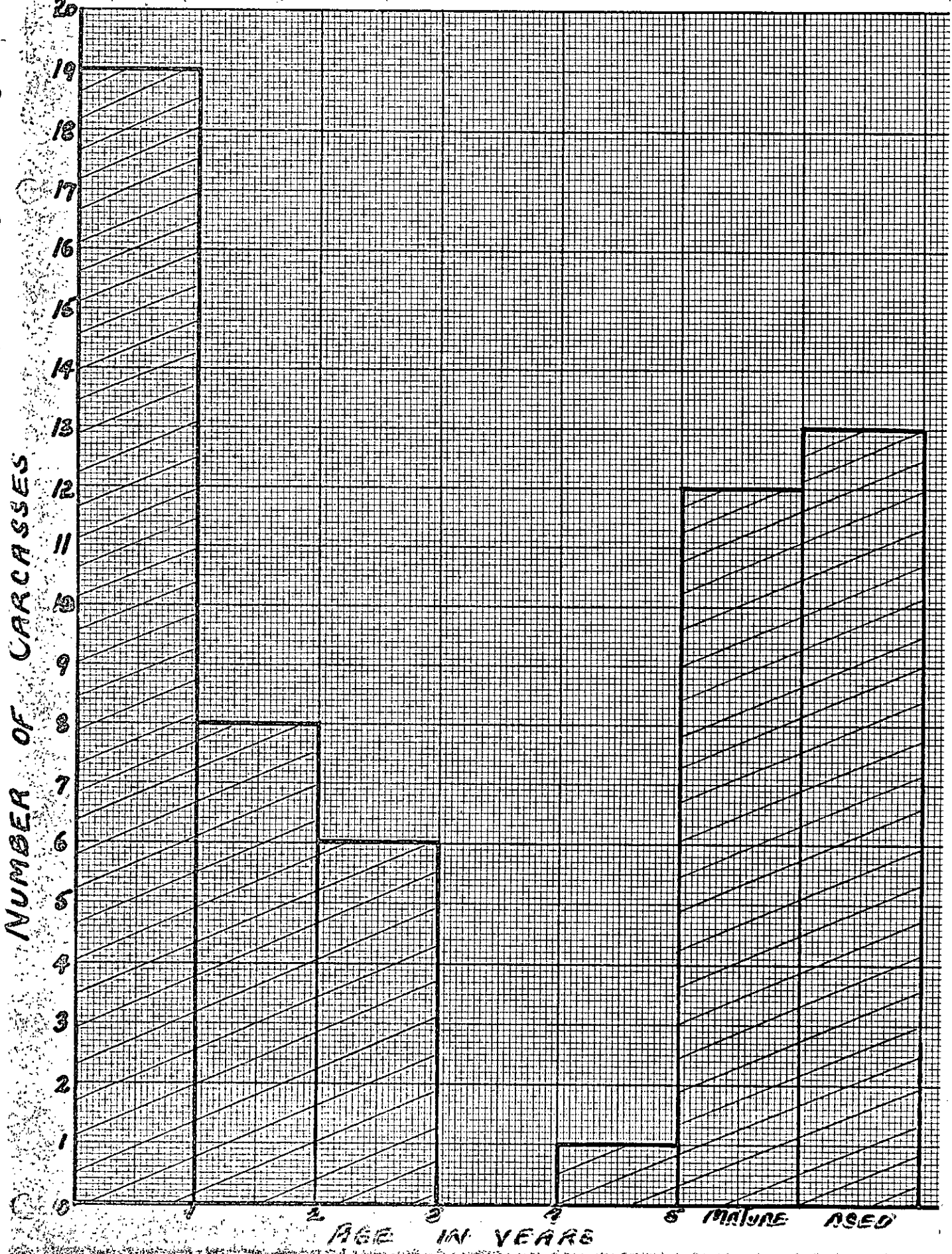
It is noted from table 3 that the strip counts indicate that an average of 15.2 wapiti died per square mile of densely occupied range. Compared with the strip counts of live wapiti which gave an average figure of 60.2 wapiti per square mile, this gives an estimated 20% mortality which occurred during

the winter (15.75). If we compare the elk observations (377) and carcasses observed (59) we find that the mortality was 13.5% of the total, however, it is doubtful if the observations of carcasses and live wapiti are comparable. An average of 16.8 is the best estimate of the mortality among the elk herd due to the severe winter kill of 1946-7.

Assuming the estimated population of 16,800, this would mean that approximately 3,300 wapiti succumbed from starvation due to severe winter conditions during early 1947.

Green (1945) has developed a method of determining age of wapiti by observing the state of irruption of the permanent incisors. The central incisors are irrupted during the second summer and additional incisors each succeeding summer, until the fourth and final pair are irrupted during the fifth summer. All my data support his conclusions and this method has been used to classify the present carcasses by age groups. As the wapiti succumbed during March and April, they may be classified as rising first year, rising second year, up to the fifth year, by the number of permanent incisors. Above these classes, they were classified as mature or aged, depending on condition of teeth, antlers, skulls, etc. If the carcasses showed excessively worn teeth (down to the gums), or broken teeth, accompanied by heavy long skulls, abnormal antlers, poor coat and worn hooves, the carcasses were classified as aged animals.

The age classification of the carcasses found is given in table 4.


NUMBER OF CARCASSES
20
19
18
17
16
15
14
13
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11
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1
2
3
4
5
MATURE
AGED
AGE IN YEARS

Table 4

| Age Group | R1 | | R2 | | R3 | | R4 | | R5 | | Mature | | Aged | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. |
| # | 19 | | 4 | 4 | 2 | 4 | 0 | 0 | 0 | 1 | 1 | 11 | 2 | 11 |
| % | ? | | 100% | 100% | 50% | 100% | 0 | 0 | 0 | 100% | 9% | 100% | 18% | 100% |
| Totals | 19 | | 8 | | 6 | | 0 | | 1 | | 12 | | 13 | |

From this table the high mortality among the early age groups and the senile age class is clearly indicated. This gives factual proof of one of the fundamental tenets of wildlife management. This information is also given in graph form in figure 2.

Differential Sexual Mortality. Due to decomposition and the activities of scavengers, it was impossible to distinguish the sexes in all the calf carcasses examined. It was thought that the majority were females. In order to compare as far as possible, the sex distribution of the carcasses with the sex distribution of surviving animals, the carcasses are classified as percentages of calves, yearlings, cows and bulls in table 5.

Table 5.

| | Carcasses | | Survivors | |
|---|---|---|---|---|
| | # | % | # | % |
| Calves (R1) | 19 | 32.2 | 32 | 8.8 |
| Yearling (R2) Cows | 4 | 6.8 | 12 | 3.3 |
| (R2) Bulls | 4 | 6.8 | 8 | 2.2 |
| Bulls | 5 | 8.5 | 26 | 7.1 |
| Cows | 27 | 45.7 | 286 | 78.5 |

It is shown that there was a slightly heavier mortality among male wapiti in the age classes one year and over, than among females. The heavy mortality among the younger age classes is also indicated.

## PATHOLOGY

External Parasites. The wapiti herd harboured a heavy infestation of winter tick (Dermacentor albipictus). The carcasses examined showed various degrees of infestation. When heavy infestations were encountered, the ground and vegetation for several feet around the carcasses were inhabited by active ticks. On several occasions, both my assistant and I became inhabited while examining carcasses. The tick infestation on the carcasses was classified as light, medium or heavy. The various degrees of infestation on the various age classes are shown in table 6.

Table 6.

| Age Class | R1. | | R2. | | R3 | | R4 | | R5 | | M. | | A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Infestation | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| Nil | 5 | 40 | 2 | 30 | 0 | 0 | | | 0 | 0 | 1 | 12 | 0 | 0 |
| Light | 6 | 50 | 2 | 30 | 1 | 17 | | | 1 | 100 | 4 | 44 | 5 | 41 |
| Medium | 0 | 0 | 0 | 0 | 2 | 33 | | | 0 | 0 | 2 | 22 | 2 | 17 |
| Heavy | 2 | 10 | 3 | 40 | 3 | 50 | | | 0 | 0 | 2 | 22 | 5 | 41 |

From this table it is evident that there is an indication of increasing severity of tick infestion with increasing age.

Heavy tick infestation brings on a condition of debility known as tick poverty. Although the actual primary cause of death in these winter kills was probably starvation, tick poverty was also an important secondary factor.

An adult female wapiti which was shot for pathological examination had a heavy infestation of biting lice (Bovicola sp). Specimens were identified at the Institute of Parasitology, Macdonald College. The specimens strongly resemble the horse biting louse (Bovicola equi); this would constitute an unusual record. The animal showed a thin patchy pelage, with scaly areas of hide. The infestation appeared heaviest on the rump. Many other wapiti observed had the same rough coated appearance, suggesting that the infestation was widespread..

Internal Parasites. Of the two wapiti collected for pathological examination, both contained heavy infestations of hair lung worm (Dictyocaulus viviparous) in the lung bronchioles and bronchi. The lungs exhibited the typical spotted yellowish exterior protrubrances. It is thought that this condition of verminiferous pneumonia is widespread in the Riding Mountain herd.

The diseases caused by parasites, such as verminous pneumonia and tick poverty are density dependent factors influencing the survival of a species. They may assume dominant roles when the population of a species is at a high level. Parasite infestations become widespread in local overpopulations of a species because of the increased facility offered to single lost parasites to complete their complicated life cycles. High parasite infestations are another evil associated with overpopulations of a species.

Predatory Relationship. A complete analysis of the timber wolf and coyote scats collected during the investigation is not possible at this date. Elk remains were, however, the commonest item in the scats. It is probable that the majority of these items represent carrion. This supposition is supported by the finding of one group of 14 coyote scats containing undigested fly larvae along with elk hair and remains.

The positions of the carcasses was also suggestive of natural death. The majority of the carcasses found were intact, with only the viscera and small amounts of meat removed. The majority of the carcasses were lying in positions of rest. Many were found in the shelter of large spruce trees, with the legs folded under the body: others were on their sides with the legs extended.

It is evident that the coyotes and timber wolves found an abundance of food during the winter of 1946-7, without being under the necessity of killing game.

Life History Notes. When observations were commenced in the early part of May, the majority of bulls had already shed their antlers, but the spike horns (rising 2-year-olds) still carried their antlers. The last "spike" was observed on June 11th. On May 14th a young bull was observed still carrying his full spread of antlers. This is considered an unusual observation.

No special study was made of the populations of the other game mammals, such as moose, white-tailed deer or mule deer. From a comparison of the number of wapiti carcasses with the other game carcasses found, an interesting fact is brought to light. The data concerning the moose and deer observations are presented in table 8.

Table 8

Moose (Alces americana)

| Bulls | Cows | Yearlings | Calves | Carcasses # | Carcasses Total | Carcasses Mortality |
|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 1 | 0 | 5 | 0 |

White-tailed deer (Odocoileus virginianus)

| Bucks | Does | Yearlings | Fawns | Carcasses # | Carcasses Total | Carcasses Mortality |
|---|---|---|---|---|---|---|
| 4 | 15 | | 1 | 3 | 23 | 13.1 |

Mule deer (Odocoileus hemionus)

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 2 | | | 0 | 4 | 0 |

| | | | |
|---|---|---|---|
| Wapiti (Cervus canadensis) | 59 | 436 | 13.5 |

It is noted in the above table that the proportionate winter kill, as shown by carcasses found, is approximately the same for wapiti and white-tailed deer. This fact suggests that the severe climatic conditions brought about a similar starvation among the white-tailed deer. This in turn suggests similiarity in diet. There are too few observations on the other species to form an opinion on this matter.

## BROWSE STUDIES

The over-all effect on the vegetation of the park, caused by the destructive utilization of the heavy population of ungulates, is obvious at a casual glance. The areas of wapiti concentration indicated in figure 1, show heavy utilization of shrubs such as hazelnut (Corylus americana) willows (Salix sp.) dwarf birch (Betula

glandulosa) and saskatoon (Amelanchier canadensis). There are also signs of heavy browsing of aspen (Populus tremuloides), as well as bark chawing and stripping.

The period spent in the park was too early in the growing season to undertake an investigation of range utilization and forage yield studies. From casual observations, it appears that the available forage is not being overutilized at present.

A browse survey was made of two park areas which are important winter wapiti ranges. The first area was the McCreary trail, east of Clear Lake, and the second area was east of Whitewater Lake. The method of study consisted of surveying milacre plots, mechanically selected at regular intervals on transects of the range. In each plot the dominant growth form (trees, shrubs, or herbs) was noted, as well as the number, height and condition of the browsed species.

The number of plants is reported as the number per acre. To facilitate comparison of the relative abundance of the species on different areas, the number of occurrences in the sample quadrats is added and the total divided by the total number of plots surveyed. This figure, multiplied by 100, is reported as the percentage occurrence, in table 9. The utilization of the aspen and willow is indicated as percentages of the total number of plants which have had the bark stripped off, or have been girdled, or killed by severe browsing.

In order to establish a basis for the analysis of the relative utilization of the different ranges by wapiti, counts were made of the number of defecations in the sample quadrats. These figures are expressed as defecations per acre.

Table 9. Composition of the browse vegetation on the McCreary trail.

| Species | Height | # per acre | % occurrence | % Utilization |
|---|---|---|---|---|
| Aspen | - 10 ft. | 940 | 52. | Chawed.) - Broken.) - Dead.) 76 |

| Species | Height | # per acre | % Occurrence | % Utilization |
|---|---|---|---|---|
| Aspen | + 10 ft. | 640 | 25. | Chawed. 69.0<br>Broken. 5.5<br>Dead. 7.8 |
| Willow | - 7 " | 670 | 40. | Alive. 94.5<br>Dead. 4.5 |
| Willow | + 7 " | 50 | 5. | Alive 100 |
| Dwarf birch | - 3 " | 520 | 25. | |
| Dwarf birch | + 3 " | 640 | 24. | |
| Hazelnut | - | 150 | 6. | |
| Saskatoon | - | 410 | 21. | - |
| Shrubby Cinquefoil | - | 240 | 16. | - |
| White Spruce | - | 50 | 4. | - |
| Rosa sp. | - | 1210 | 34. | - |
| Wapiti defecations | - | 830 | | |

Table 10. Composition of the browse vegetation on the Whitewater Lake area.

| Species | Height | # per acre | % occurrence | % Utilization |
|---|---|---|---|---|
| Aspen | - 10 | 448 | 22. | Alive. 71.5<br>Dead. 28.5 |
| Aspen | + 10 | 64 | 3. | Alive 100 |
| Willow | - 10 | 96 | 3. | - |
| Hazelnut | - | 128 | 6.3 | - |
| Saskatoon | - | 160 | 9.5 | - |
| Dwarf birch | - 10 | 32 | 3. | - |
| Hawthorn | - | 32 | 3. | - |
| Wapiti defecations | | 512 | | |

Table 11. Comparison of cover types on the two ranges, indicated by percentages of total ground cover.

| | McCreary Trail | Whitewater Lake |
|---|---|---|
| Trees | 9% | 15.6% |
| Shrubs | 26% | 9.4% |
| Grass and herbs. | 65% | 75.% |

An inspection of the data presented in table 9 clearly indicates the destructive utilization of aspen which has taken place. Seventy-six percent of the aspen under 10 feet in height have been killed, while 69 percent of the aspen over 10 feet have been chawed, in the Clear Lake area. In the Whitewater Lake area, 28.5 percent of aspen under 10 feet have been killed. In both areas, those young aspen still alive had been browsed severely.

The different counts for other shrubs in the two areas is not considered important. It may be also noted that the defecation counts indicated a heavier winter population on the McCreary trail range.

In order to study the productivity and utilization of the available browse, standard areas of browse were clipped. The chosen unit of measurement for clipping was the milacre quadrat (a square with sides of 6.6 feet). Four quadrats were clipped within the golf course enclosure at Clear Lake where the wapiti have been excluded by a high wire fence for several years. Three additional quadrats were clipped from the heavily utilized winter range opposite the golf course on ~~the right hand side of~~ the Dauphin highway.

The quadrats were chosen arbitrarily to illustrate average densities of available browse plants, such as aspen, dwarf birch, and hazelnut, in both locations. In each case, the number of stems were counted and the growth of the previous year (1946), was clipped off of each twig. As the leaves had not appeared when these studies were made, this consisted of all the buds and tips of the twigs down to the annular rings indicating the location of the previous years bud scales.

The plants within the golf course enclosure showed the typical growth form of the various shrubs. The plants on the nearby winter game range showed heavy browsing. It was expected that the difference in weight of the 1946 growth in the two locations, would indicate a proportion of browse utilization. The comparison of the average browse productivity at the two sites is given in table 12.

Table 12 Comparison of Browse Productivity.

| Species | Stems | Golf Course Averages. Numbers | Golf Course Averages. Weight | Elk Range Average. Number | Elk Range Average. Weight |
|---|---|---|---|---|---|
| Aspen poplar | Alive | 3 | 11.0 gms. | 3.3 | 13.0 gms |
| Populus tremuloides | Dead | 0 | | 0 | |
| Dwarf birch | Alive | 53 | 92.8 gms. | 92 | 120.9 gms |
| Betula glandulosa | Dead | 20 | | 21 | |
| Hazelnut | Alive | 155 | 195.8 gms. | 118 | 147.0 gms |
| Corylus americana | Dead | 31 | | 27 | |
| Saskatoon | Alive | 5.5 | 16.0 gms. | 2 | 2.3 gms |
| Amelanchier canadensis | Dead | 0.5 | | 0 | |
| Total Annual Growth | | | 157.8 gms | | 144.4 gms. |
| | | Average height of Aspen was 6 feet Shrubs was 4 ft. 6 inches. | | Average height of Aspen was 2 feet Shrubs was 2 feet 6 in. | |

It was found, that despite the visual difference in the form of the shrubs, the proportion of dead to living stems was similiar in the two locations. The amount of annual growth left after severe browsing was found also to be in the same order as the total annual growth in unbrowsed plants of the same species. This means that the browsed plants had a greater annual growth before browsing occurred.

It appears that both the dwarf birch and hazelnut are vigorous shrubs which can stand heavy browsing. The browsing acts like pruning which promotes a vigorous adventitious growth of new buds and twigs, the following growing season.

The heavy utilization of browse, leaves, twigs and bark in the main areas of wapiti concentration has apparently little effect on the total growth of the shrubs. The major damage is done to the aspen trees as previously indicated.

## SUMMARY.

The present wapiti population is estimated to be about 16,800 animals. The severe winter conditions of 1946-7 caused an estimated mortality of 16.5% of the herd. The calves felt the heaviest mortality. It was estimated that 66% of the 1946 crop perished.

The high population of wapiti has caused severe local destruction to the aspen stands. As high as 76 percent of all aspen under 10 feet in height have been killed in certain areas of concentrated winter herds, while as high as 69 percent of the aspen over 10 feet in height have had the bark chawed. The shrubs such as dwarf birch and hazelnut are apparently able to withstand heavy browsing by the stimulated adventitious growth.

The heavy mortality caused by winter kill and the destructive aspen browsing indicate that the park is at present carrying an overpopulation of wapiti. It is recommended that steps be taken to control the wapiti population by means of reduction slaughters similar to those in effect in the Mountain National Parks. It is recommended that an objective of 200 be set for removals during 1948.

A.W.F. Banfield

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