ALASKA DEPARTMENT OF FISH & GAME

1960-61 Pittman-Robertson Project Report

DIVISION OF GAME VOLUME II, NO. 3

Caribou Management Investigations

Work Plan C

Juneau, Alaska

Caribou Management Investigations

Photo # 1

Range analysis studies reveal the affect of caribou use and climatic influence on succession, abundance, and distribution of plants. (Photo by Truman Fergin)

Photo # 2

Cladonia alpestris is an important lichen food of the caribou. Thick mats up to 6 inches characterize areas which have had little winter use due to deep snow cover. (Photo by Ron Skoog)

Photo # 3

Caribou are the most heavily utilized big game species in Alaska, with more than 20,000 being taken in 1960. Inhabitants of the Arctic harvested over half of the total number, the remainder being hunted near major population centers such as Anchorage and Fairbanks. (Photo by Herry Merriam)

Contents of Volume II

Reports of Investigations

No. 1 - Sitka Black-Tailed Deer
Work Plan A

No. 2 - Moose
Work Plan B

No. 3 - Caribou
Work Plan C

No. 4 - Elk
Work Plan D

Bison
Work Plan L-2

No. 5 - Sheep and Goat
Work Plan E

No. 6 - Bears
Work Plan F

No. 7 - Fur Mammals
Work Plan G

Snowshoe Hare
Work Plan H

Wildlife Reconnaissance
Work Plan L-1

No. 8 - Game Birds
Work Plan I

No. 9 - Marine Mammals
Work Plan J

No. 10 - Wolves
Work Plan K

No. 11 - Parasites and Diseases
Work Plan M

Volume II, Number 3 1960-1961

ANNUAL REPORT OF PROGRESS, 1960-1961

FEDERAL AID IN WILDLIFE RESTORATION PROJECT W-6-R-2

GAME INVESTIGATIONS OF ALASKA

STATE OF ALASKA

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TABLE OF CONTENTS

Job No.	Title Title	Page No.
C-1	Statewide Caribou Distribution	1
C-2a	Assessment of Herd Status - Nelchina Herd .	13
C-2b	Movements, Distribution and Numbers - Nelchina Herd	20
C-2c	Herd Composition - Nelchina Herd	32
C-2d	Productivity - Nelchina Herd	39
C-2e	Analysis of Range - Nelchina Herd	45
C-2f	Winter Range Utilization - Nelchina Herd . .	56
C-2g	Mortality - Nelchina Herd	66
C-2h	Characteristics of the Hunter Harvest - Nelchina Herd	70
C-3a	Assessment of Herd Status - Steese-Fortymile Herd	86
C-3b	Movements, Distribution and Numbers - Steese-Fortymile Herd	91
C-3c	Herd Composition Surveys - Steese-Fortymile Herd	102
C-3d	Productivity of the Steese-Fortymile Herd .	107
C-3e	Characteristics of the Hunter Harvest - Steese-Fortymile Herd	116
C-4	Status of Caribou and Feral Reindeer on the Seward Peninsula	127

Volume 2 Report No. C-1

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 1 Title: Statewide Caribou Distribution

PERIOD COVERED: May 1, 1960, to December 31, 1960.

ABSTRACT:

The emphasis this year was placed upon the Alaska Peninsula caribou, an aerial survey of that region being made during the period May 10 through June 10, 1960. Two more or less separate groups of caribou are present there--one small group ranging to the south of Port Moller, including Unimak Island, and a large one to the north of Port Moller, a mountain "barrier" at that point restricting free movement. The most intensive work was done in the northern area during May 25 - June 10. Talks with long-time residents of that region served to supplement the field data gathered.

It was estimated that a maximum of 8,000 caribou, calves excluded, were present on the Alaska Peninsula in June, 1960--1,000 to the south and 7,000 to the north. These caribou appear to be in good condition and the population seems to be increasing.

OBJECTIVES:

To determine the distribution and relative abundance of caribou on a statewide basis.

To classify these caribou according to herds and home range and to assess the status of each.

TECHNIQUES:

The emphasis of the reconnaissance surveys this year was placed upon the Alaska Peninsula caribou herd, with miscellaneous information being gathered about other caribou whenever the opportunity arose. The major effort was scheduled for the period May 1 through June 10, 1960, in order to encompass the calving period. At that time it is most feasible to obtain both an estimate of total herd size and also an evaluation of herd status, as reflected by calf and yearling numbers. Game biologists Edward P. Keough and Ronald O. Skoog were assigned the project.

The calving period brings together a distinct segment of a caribou herd and thus provides an appropriate base for estimating total numbers. Most of the parturient cows are present on the calving grounds, plus a highly variable proportion of yearlings, bulls, and nonpregnant cows. Aerial composition counts provide the means for estimating the numbers of parturient cows in the calving area. The remaining portion of the herd then can be estimated using the sex-ratio and fertility data obtained from more intensive studies of other herds, with certain necessary assumptions, of course.

To initiate the survey, reconnaissance flights were made from Dillingham on May 9, 10, and 11 in a Cessna 180 flown by Virgil Crosby, then working for the U. S. Fish and Wildlife Service. The purpose of these flights was to gain familiarity with the country and to ascertain the present caribou distribution. Two of the flights covered the Peninsula from Iliamna Lake southward to Port Moller. The third reconnoitered the Mulchatna River region, which was scheduled for intensive work the following year

(May, 1961), in order to gain prior knowledge of the area. Detailed observations of the vegetation and caribou were made on all flights by means of a portable tape recorder.

Keough and Skoog spent May 12 to May 14 at King Salmon obtaining information about caribou from long-time residents of the area and making arrangements for locating fuel caches. The US FWS extended much help and transported most of the gas purchased, for which the biologists were both appreciative and indebted. The main supply was placed at Port Heiden, with reserves at Mother Goose, Ugashik, and Brooks Lakes. At Port Moller barrel gas was purchased from the cannery. This placement of gasoline enabled us to work the whole Peninsula with the least amount of time spent returning to refueling points and with the best assurance of reaching such a point in case of bad weather.

We returned to the Alaska Peninsula on May 25 in an Alaska Department of Fish and Game "150" Supercub to work the area more intensively. Most of the aerial work was done over the calving grounds, between Ports Heiden and Moller, but the whole Peninsula was surveyed, from Lake Iliamna to Cold Bay. The calving grounds were delineated, calf counts taken, and estimates made of total numbers of parturient cows. The work was completed on June 10.

Information gained during the year concerning other herds has not been included, but will appear later after more complete data have been obtained. The brief historical background presented was obtained from Olaus Murie's Alaska-Yukon Caribou, from various US FWS reports, notably those of J. Hammond, and from observations of various long-time residents of the Peninsula. The data used for this report are filed at the Anchorage P-R office of the Alaska Department of Fish and Game.

FINDINGS:

History of Herd

Large numbers of caribou were present along the Bering Sea coast during the 1860-70's from the Bering Strait to Bristol Bay, and presumably were contiguous with those of

the Alaska Peninsula. There probably was a regular interchange of animals between the mainland and the Peninsula at that time, and as late as 1884 bands of caribou were reported in the mountains north of Mt. Katmai. By 1900, however, the Bering Sea caribou and those adjacent to the Alaska Peninsula had moved "elsewhere", more or less isolating the Peninsula caribou, and there is no existing record of any ingress or egress of animals since then. We did sight many old, vegetation-filled trails between Iliamna and Nonvianuk Lakes, however, indicating a commonly used migration route of the past, but these could be remnant ones from the late 1800's. None of the long-time residents of the King Salmon-Dillingham area with whom we spoke recalled any north-south movements during the 1900's. The present occurrence of Mulchatna caribou commonly along the north shore of Iliamna Lake and occasionally along the Kvichak River seems to be a fairly recent phenomenon. Olaus J. Murie observed in 1925 that the northern boundary of the Alaska Peninsula caribou then was Becharof Lake, with few animals north of Port Heiden and most south of Port Moller. Today the northern boundary seems to be the Naknek Lake and River system, with most of the herd north of Port Moller.

Supposedly this isolation resulted in racial differences sufficient to classify these animals as the Grant's caribou (Rangifer arcticus granti), as opposed to the rest of Alaska's caribou, which are Stone's (R. a. stonei). The type specimen of Grant's is an adult male killed below Port Moller in October, 1901. The supposed differences of smaller body size and paler color seem to be valid, as evidenced by six carcasses examined during this survey. In addition, most of the caribou observed did appear much lighter in color than Interior caribou at that time of year. Since 1901, however, this caribou herd has assimilated hundreds of reindeer which were tended and then abandoned during the late 1930's. It would be difficult to say what genetic change, if any, has resulted from this assimilation. No obvious evidence of reindeer characteristics was noted.

Few detailed studies or surveys have been made of the Alaska Peninsula caribou since the early observations by such people as E. W. Nelson, J. A. Allen, and A. J.

Stone. Prior to 1949 the only significant effort was that in the early 1920's by Murie, who pieced together much of the past and present history (at that time) of these caribou through library research, talks with residents, and extensive observations of his own. In 1949 R. Scott and E. Chatelain of the US FWS made the first organized aerial survey of the herd, and that was followed with occasional censuses during the next few years by US FWS personnel, namely R. Jones and J. Hammond, the last and most intensive being an aerial transect effort in late March, 1956. No further work was done other than casual observations until this survey by the Alaska Department of Fish and Game in May, 1960.

Description of Area

The Alaska Peninsula extends southwestward for some 400 miles, lying approximately between 55 and 59 degrees N. Latitudes, bounded on the northwest by the Bering Sea and on the southeast by the Pacific Ocean, and totaling about 30,000 square miles. A rugged range of mountains parallels the Pacific coast for the entire length of the Peninsula, with peaks reaching to 8,000 feet elevation, many being dormant or semi-active volcanos. The western two-thirds of the Peninsula slopes gradually to the northwest, draining to the Bering Sea. The northeast half contains many lakes, some quite large, and the land adjacent to the Bering Sea is flat and poorly drained; the southwest half generally is better drained and has fewer lakes. At Port Moller the mountains traverse the Peninsula and present somewhat of an obstacle to the movement of caribou by land, but there is no other physical barrier to movement up and down the Peninsula or onto the mainland. The Pacific coast is readily accessible from the Bering Sea side via the many passes present along the entire length of the range. Figure 1 depicts the main geographical features.

The vegetation that typifies the Alaska Peninsula becomes evident below the Naknek River drainage, which seems to be the southern limit of spruce. To the north the spruce becomes increasingly more abundant and merges into the typical "Interior type" vegetation. To the south

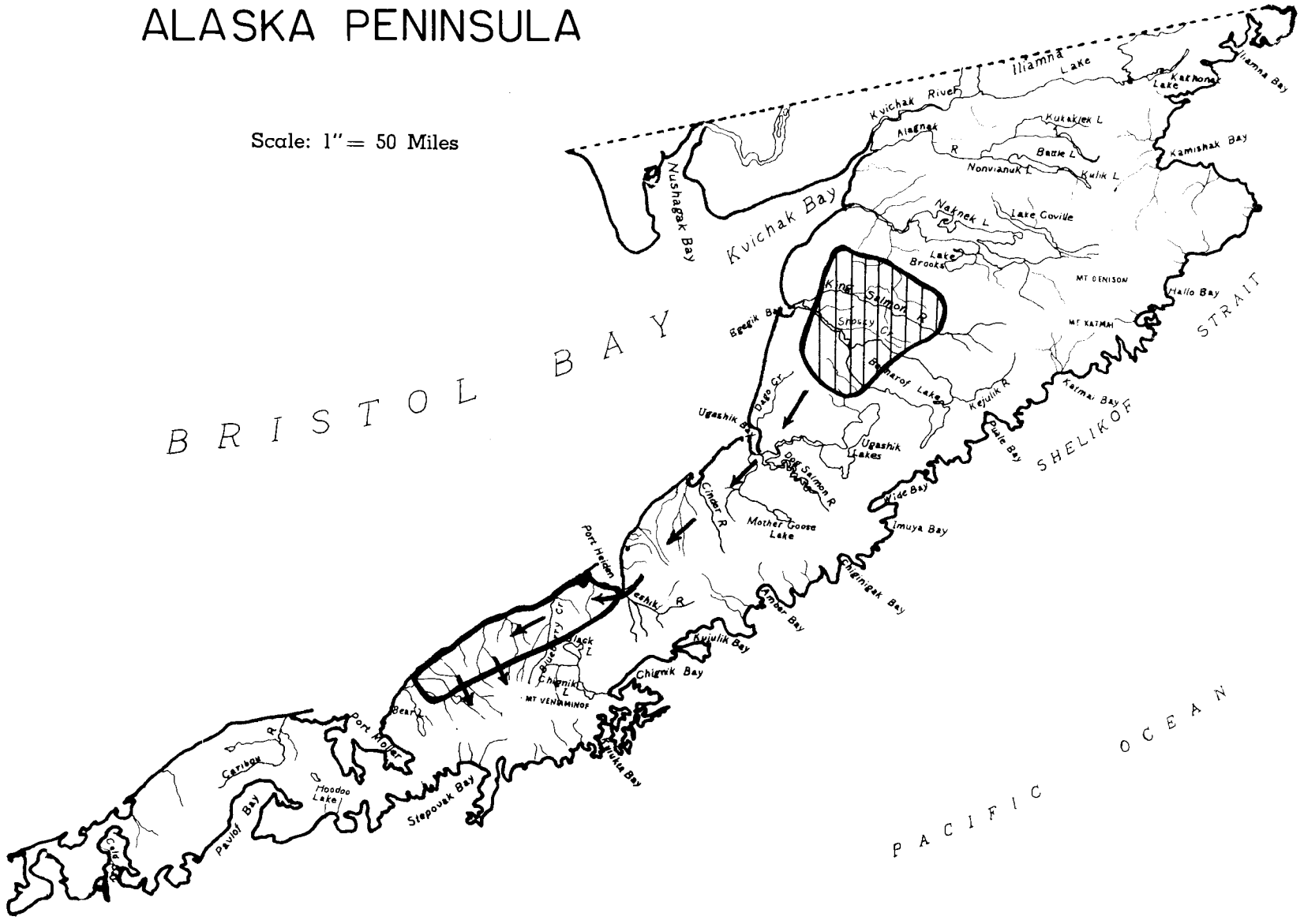

Figure 1. Map showing the main geographical features of the Alaska Peninsula caribou range, plus the main routes of travel from the wintering grounds to the calving area.

the land adjacent to the Bering Sea along the whole length of the Peninsula, except in the Port Moller area, is rather poorly drained and supports a Sedge Meadow vegetation type for the most part, interspersed with Heath on the drier sites and Willow along the drainageways. Heath seems to be the invader. As the land rises to the eastward the Heath becomes more dominant and in many localities a Willow-Grass and/or Alder-Grass community becomes abundant, the latter on dry sites and the former on both dry and wet, but Sedge Meadow remains abundant on the poorly drained areas and Willow along the drainageways. The Willow/Alder/Grass complex extends to about 1,200 feet elevation, after which the Heath takes over. Poplar stands are present in many places, mostly north of Port Heiden, and are quite extensive in the Mother Goose Lake area. Extensive bare "wastelands" caused by volcanic activity occur on the slopes surrounding Aniakchak Crater and Mt. Veniaminof, and to lesser extent on Mt. Pavlof. Bare rocky areas are common in other areas above 2,000 feet elevation. Brief flights on the Pacific side indicated a vegetation similar to that which has been described, although the steep slopes have limited the development of an extensive cover.

The main species comprising the Heath type at the lower elevations are Empetrum nigrum, Vaccinium vitis-idaea, and Loisleuria procumbens; Betula nana (glandulosa?) is common but not abundant, but Vaccinium uliginosum seems to be absent, at least from the Bering Sea drainage north of Port Moller. At the higher elevations I suspect that Dryas, Empetrum, and Cassiope become the dominants. The few lichens present on the Peninsula usually are associated with the Heath type, but nowhere were they observed to be abundant. The most common species is Stereocaulon spp., and this occurs occasionally in pure patches, three to four feet in diameter. Other lichens invading here and there include Cetraria nivalis, C. cucullata, Cladonia sylvatica, Lobaria linita, Nephroma sp., Peltigera spp., and Sphaerophorus globosus, but all are of thin, scattered distribution. It is apparent that lichens are not a mainstay in the diet of the Alaska Peninsula caribou.

Excellent stands of lichens are present north of the Naknek River drainage, however, where at present no caribou occur. Many of these stands seem to consist of climax Cladonia alpestris, which would provide fine winter forage. With caribou now reaching the Naknek River occasionally, it is possible that a large portion of the wintering herd might move into this northern area. Meanwhile these caribou presumably feed upon sedge almost exclusively during the winter.

Caribou Distribution

The mountains at Port Moller form a definite obstacle to the movement of caribou north and south. They are not a complete barrier, however, for the animals are good swimmers and easily could cross the tidal flats at the upper end of Port Moller. In the early 1920's most of the herd, according to Murie, ranged from Moller southward to include Unimak Island. A change has taken place since then, and now the bulk of the herd is to the north with but a small group to the south.

Unfortunately this survey was unable to cover the area scuth of Port Moller to great extent because of bad weather and a shortage of time. Suffice it to say that calving groups of cows, some with calves, were sighted to the Southwest of Caribou River and that probably much less than 1,000 animals are present in that area, including Unimak Island. There is little doubt that caribou can swim readily the short distance separating the Peninsula and Unimak, but with the present caribou population as low as it is such a crossing probably is uncommon. The discussion presented below pertains to the caribou presently ranging from Port Moller northward.

Movements

The information gathered during this survey from field observations, from talks with long-time residents, and from the perusal of past references to the caribou of this area enable the piecing together of the present movement pattern of this main segment of the Alaska Peninsula herd. In winter the main herd seems to locate in the Becharof Lake

region. During April and May the calving segment moves to the principal calving area, which lies along the coast between Ports Heiden and Moller; most of the other animals also move southwestward. Many of the bulls and non-calving animals move up the valleys of the various streams from the Meshik River southward. As calving progresses into June the cows and calves drift southeastward into the hills also, and by the fly-season in late June and July it appears that most of the herd is in the highlands. A dispersal and drifting of animals probably occurs and during late July, August, and early September one might encounter caribou just about anywhere. The animals regroup to a certain extent during the rut in late September and early October, and then move northeastward into the wintering area once again. Needless to say, movements at variance with the above pattern undoubtedly occur, for variety seems the very "spice" of a caribou's life, but the calving area would remain a focal point for any such movements. At present it is assumed by the writer that the caribou north of Port Moller do not intermingle with those to the south because of the relatively low population densities in both areas.

The main wintering grounds during 1959-60 lay in the King Salmon River-Becharof Lake area, with an occasional animal ranging as far north as the Naknek River. A southwest movement to the calving grounds began in April, paralleling the Bering Sea coast some 15-20 miles inland. By May 10 most of the calving groups had passed Port Heiden and moved into the main calving area, but small bands of non-calving animals still were straggling southward from as far north as the Egegik River. By May 25 the calving groups were spread out over the calving grounds--approximately 1,000 square miles of area along the coast between the Meshik and Bear Rivers, extending about 15 miles inland. Few cows calved in the Meshik River valley, but bulls and yearlings were fairly numerous there. In the south, the drainages of Bear River and Sandy Lake also contained fair numbers of bulls and yearlings, plus a few non-pregnant cows. Adult bulls were common on the northern third of the main calving area also, but the animals farther south were primarily parturient cows, plus a variable number of yearlings, young bulls, and non-pregnant

cows. By June 10 most of the calving activity was over and the cows were assembling into large groups (100 to 400 animals) with definite southeast movements to the higher elevations evident. A few animals, including some cows with calves, had reached the Pacific side, as evidenced by observations of caribou along the slopes of Kujulik Bay. Figure 1 shows the approximate locations of the wintering grounds, the calving area, and the movement routes noted.

Total Numbers

After delineating the main calving grounds, the investigators tried to obtain an estimate of the total number of parturient cows in the herd, most of which were present in the main calving area. During the last few days of May a composition count which included animals followed by calves and/or those still retaining hard antlers would provide the necessary data, for such animals constitute the parturient-cow segment. At that late date the only other animals not having shed the previous year's antlers would be a few yearlings or possibly diseased animals. The parturient-cow figure would be somewhat low because some cows would have lost their antlers and their calves both and thus be tallied in the "other" category of adults; a heavy "infant" mortality could distort this figure, but such a mortality should be fairly obvious. To complement the composition count, it is essential to know the approximate number of animals on the calving grounds; and finally, to estimate the total population, sex and age ratios are needed to fill in the missing portion of the herd.

Unfortunately, weather conditions and other problems prevented us from taking the composition counts until June 9-10, and by then most parturient cows were antlerless and many non-calving animals had joined the calving bands. A tally of 2,372 caribou in the main calving area resulted in the following breakdown: 738 calves and 1,634 adults, of which 134 were bulls over two years old. It was estimated that there were approximately 3,500 adults on the calving grounds, of which about 2,000 were parturient cows. Fertility data from the Nelchina Herd productivity studies show that in that herd about 70 per cent of the

cows one year and older during the breeding season actually become pregnant. Such a fertility rate probably can be applied to most caribou herds in lieu of specific data, although some variations undoubtedly occur. Therefore that rate is used to compute the total cows (two years and older as of June 1, 1960) in the Alaska Peninsula Herd, on the basis of the above estimate for parturient cows. If 2,000 represents 70 per cent of the total, then the total cow figure approximates 2,900. The bull/cow (both two years and older) ratio in the Nelchina herd is about 76/100, but that herd has experienced a highly biased hunter kill during the past 10 years (averaging over 70 per cent bulls). The sex ratio for the Peninsula Herd here is assumed to be 100:100, and so indicates a bull population of 2,900. The only unknown segment remaining is the yearling age-class of both sexes, which varies from year to year, depending upon the calf crop the previous year and its survival through the winter. In the Nelchina Herd, with a good calf crop and good survival, the yearlings constitute about 19 per cent of the total herd in early May. The large number of yearlings sighted in this survey suggests a low mortality during the year; a 15 per cent figure is probably conservative. Such a percentage indicates a total of about 1,000 yearlings. An estimated 2,900 cows, 2,900 bulls, and 1,000 yearlings result in a total population figure of 6,800 in June, 1960, calves excluded.

Status

The total estimate for the Alaska Peninsula caribou population thus approximates 8,000 animals--7,000 to the north of Port Moller and 1,000 to the south. Both of these figures are believed to be maximum ones, because all estimates used in the final computation were mostly such. The calf and yearling crops noted on this 1960 survey seemed indicative of a healthy, expanding population, yet there must be some factor limiting the total size. Since the 1920's it is doubtful that the population has ever been a great deal higher than it is now, although exact information is lacking. Periodic adverse weather during calving, causing heavy calf mortality, would act as a population depressant, but the

Peninsula weather is rather mild as compared with that encountered by caribou elsewhere in Alaska. The writer can think of only two major factors peculiar to this area that might individually or together act to suppress the total numbers, and these are icing conditions and scarcity of lichens. Of these I suspect that the former might be the more important, for a thaw accompanied by a freezing rain, not an uncommon phenomenon in this region, could seriously affect the availability of food. This is pure conjecture, however, for as usual the facts are not readily available. Suffice it to say that at present the Alaska Peninsula caribou appear to be in good condition and the population increasing.

RECOMMENDATIONS:

The Alaska Peninsula caribou should be checked periodically to determine the population trend.

A reconnaissance of the area south of Port Moller would be desirable in order to gain better information concerning these caribou.

SUBMITTED BY:

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June 30, 1961

APPROVED BY:

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Volume 2 Report No. C-2a

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-a Title: Assessment of Herd Status--Nelchina Herd

PERIOD COVERED: January 1, 1961, to June 30, 1961

ABSTRACT:

The Nelchina caribou herd continues to increase steadily, as a result of high calf crops and low mortality, and in spite of the highest hunters' kill on record in 1960. At present the animals are in excellent condition and thriving. The range is beginning to show signs of deterioration, and there is some indication that the carrying capacity has been reached. Every effort should be made to increase the harvest in order to stop the continued population expansion. The following herd statistics for the period May 1, 1960, to April 30, 1961, are summarized below:

1) No known egress nor ingress of caribou took place, although once again groups concentrated on the peripheries of the range and extended beyond the artificial boundaries.

2) About 63 per cent of the calves survived their first winter, and an estimated 9,500 yearlings were added to the herd.

3) An estimated 7,500 adults, or 13 per cent of the total, succumbed during the year.

4) Hunters killed an estimated 5,500 animals, including calves.

5) The annual increment was estimated at 3,000 animals.

6) The population size of the herd on May 1, 1961, was estimated at 57,000 animals.

OBJECTIVES:

To compile and analyze all pertinent data resulting from field investigations of the Nelchina caribou herd applicable to determining herd status, in accordance with the needs of management.

TECHNIQUES:

This job attempts to synthesize all the data available concerning the Nelchina caribou into a concise report that will establish the current status of the herd. In essence much of the data is simply a summary of that presented in the reports that follow, but here the information is related directly to such management needs as range condition, carrying capacity, annual increment, herd size, condition of the herd, and the effects of hunting, with recommendations for future management practices.

FINDINGS:

The status of a caribou herd hinges upon a number of factors. Among these are the availability and condition of the food plants, movements on or off the range, the success of reproduction, the extent of mortality, the prevalence of disease and the general condition of the animals, and the population structure. These factors are discussed below under appropriate headings, as related to the past year, commencing May 1, 1960, and ending April 30, 1961.

Range

The Nelchina caribou herd occupies an area of about 18,000 square miles, the approximate boundaries being the Alaska Range on the north, the Alaska Railroad on the west, and the Glenn and Richardson Highways on the south and east, respectively. About two-thirds of the region lies above timberline, with most of the timbered areas being in the southeast quadrant. Range studies have been in progress for three years. The ultimate goal is an evaluation of carrying capacity, but too few data exist as yet for any conclusions on this aspect.

Much of the range has been examined both quantitatively and superficially, and forage plants generally are abundant and in good condition. Good growths of the forage lichens (Cladonia alpestris, C. rangiferina, C. sylvatica, C. uncialis, and others) occur in many portions of the western and northern sections. Sedges, the other major winter food, are abundant throughout. Summer range is practically unlimited.

There is some indication, however, that the winter range is deteriorating steadily, and a few areas show signs of what appears to be excessive use. Excessive use here is considered as being that reflected by the following criteria: scarcity of the main forage lichens; presence of many secondary or early succession species; a lichen mat that is short, compacted, and cracked, with many dead-appearing stalks, interspersed with bare spots; and many, deeply-cut caribou trails. The most noticeable evidence of such use occurs in Range Unit 13 (the Lake Louise Flat), which was the major wintering ground prior to 1956. Many years will be required before that area supports an excellent growth of forage lichens, although the abundant sedge can and does supply much forage for early winter grazing. Less extensive areas of excessive use are evident in Range Units 5 (Deadman Lake), 6 (Tangle Lakes), and 9 (Alphabet Hills), enough, however, to show a downward trend in range condition. Three years of intensive winter use of the upper Talkeetna River portion of Unit 11 has resulted in an estimated nine per cent destruction of the lichen cover, and continued heavy use of that magnitude will result in a steady depletion.

Nevertheless, the range as a whole seems to be in good condition, and extensive stands of near-climax lichens remain in Range Units 1 (Upper Nenana River), 2 (Monahan Flat), 4 (Chulitna Mountains), 6 (Tangle Lakes), 10 (Chunilna Hills), and 11 (Talkeetna River). Abundant winter forage presently is available for the estimated 57,000 animals present, but that number of animals could well represent or even exceed the maximum carrying capacity needed for a sustained yield of forage lichens. Conclusive evidence is not available at present.

Movements

The westward shift in winter range use continued last year, and once again the herd split into several segments, as has become characteristic in recent years. Supposedly the large increase in population size since the early 1950's has been a main factor in this change from the more sedentary behavior of the past. A movement of about 500 animals south of the Tazlina River to the St. Anne Lake area proved to be the first such recorded, the Tazlina River being the usual southern boundary. In the Cantwell area some 5,000 caribou wintered, with bands extending westward up Windy Creek and northward to Yanert Fork. Once again a few bands moved as far eastward as the Chistochina River and Mankomen Lake, and mingled with groups of the Mentasta Pass caribou.

In spite of these excursionsto and beyond the peripheries of the range, the Nelchina herd essentially remained within its territory. Extensive aerial reconnaissances during the year revealed no major egress nor ingress of caribou, although such movements of small groups would not have been detected.

Productivity

The Nelchina caribou continued to maintain the high productivity that has characterized this herd during the past twelve years. In late June, after the early postnatal mortality, the calf crop was estimated at 15,000 animals. An estimated 63 per cent of these survived to April 1, 1961, the high survival being attributable in part

to the mild winter. Thus, the herd received an increment of 9,500 yearlings last spring.

Mortality

The light snowfall, relatively mild weather, and availability of caribou throughout the August 20 - December 31 hunting season combined to permit the highest caribou harvest on record during 1960. The estimated kill of 5,500 animals exceeded the previous highs of 4,000 recorded in 1955 and 1959. The total probably represents a figure close to the maximum possible at the present time, for seldom would the overall conditions for hunting be better than they were last year. About 1,000 or 18 per cent of the harvest were calves; the remaining 4,500 represented about 8 per cent of the total herd estimate of 55,000 on May 1, 1960.

The Nelchina caribou generally seem to be in excellent condition. The mild winter of 1960-61 undoubtedly permitted a high survival, and animals examined in mid-April were found to have great quantities of visceral fat, at a time when normally they would be in their poorest condition. Predation by wolves did not seem extensive, judging from aerial observations, because of the relatively low wolf population and because they seem to utilize moose as much or more than they do caribou. The total adult mortality from causes other than man was estimated at 5 per cent, or about 2,700 animals. The total calf mortality from all causes was estimated at 37 per cent, as computed from calf:adult ratios.

Annual Increment

During the period May 1, 1960 to April 30, 1961, an estimated 9,500 calves survived their first winter to the yearling age. At the same time about 7,500 adults succumbed to hunters and to natural causes. Thus the annual herd increment as of May 1, 1961, was estimated at 2,000 animals.

Herd Size

On May 1, 1960, the Nelchina herd was estimated at 55,000 animals, based upon the census figures of 1955 and

subsequent data on reproduction and mortality. Last year's annual increment was about 2,000, so the present estimate for herd size on May 1, 1961, approximates 57,000 animals.

Herd Composition

Not enough data were gathered during the past year to permit an evaluation of the sex and age composition of the herd. The ratio of 43 bulls:100 cows obtained from ground counts during the rut in early October, 1960, was thought to be non-representative of the entire herd. That ratio, however, together with the 58:100 (very possibly non-representative, also) obtained in 1959, gives some indication that the bulls are becoming less numerous proportionately, for a 76:100 ratio had been obtained in 1956. Such a trend quite possibly is due to the bias in the hunter kill, which has averaged slightly over 70 per cent males for nine years. About the only reliable composition figure available concerns the yearlings, of which some 9,500 were added to the herd last spring. That figure indicates that yearlings comprised about 17 per cent of the herd as of May 1, 1961 (9,500-57,000).

Evaluation of Herd Status

The Nelchina caribou herd continues to increase steadily, as a result of high calf crops and low mortality, and in spite of the highest hunter kill on record in 1960. Diseased and crippled animals are scarce, and the general body condition of most animals is excellent, even in late winter. Five winters of mild weather and comparatively low snowfall undoubtedly have been a major factor in the low mortality, as has the low wolf population. The range is beginning to show signs of deterioration, even though much winter forage remains, and there is some indication that the carrying capacity has been reached or perhaps exceeded. A continued increase in the herd probably will result in continued range deterioration and in a major portion of the herd moving elsewhere. At the present, however, the Nelchina caribou are in excellent condition and are thriving.

RECOMMENDATIONS:

An effort should be made to harvest at least the annual increment, so that the continued expansion of the herd will be stopped. An earlier opening of the season could provide an additional kill, and should be as early as is compatible with current administrative policies. Any other means of removing animals from the herd would be desirable, also, in so far as the future welfare of the herd is concerned.

An intensive census of the herd is needed as soon as possible in order to evaluate the past years' estimates of herd status and to evaluate some of the techniques used.

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Volume 2 Report No. C-2b

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-b Title: Movements, Distribution, and Numbers--Nelchina Herd

PERIOD COVERED: April 1, 1960, to March 31, 1961

ABSTRACT:

The historical calving grounds between Kosina and Tyone Creeks were used once again. The caribou grouped in the lower Kosina Creek area in early May as usual, but from there they did not follow the southeastward route across the mountains typical of former years. Instead the calving groups moved eastward past Clarence Lake along the south bank of the middle Susitna River, then southward to upper Sanona Creek, and finally northwestward into the main calving area. In July the caribou left the normal summer range, extending from the upper Oshetna River to the Coal Creek "plateau", and moved eastward into the Alphabet Hills, south of the Tangle Lakes--a movement not previously recorded for that time of year. During the rut in early October, most of the caribou were on the Lake Louise Flat, with other concentrations in the Eureka, Talkeetna River, and upper Susitna River areas. Extended, continual movements characterized the November-January period, but by late January the herd had settled into four major wintering areas: Cantwell, Nadiwen Lake-Monahan Flat, Talkeetna River, and Lake Louise Flat.

A census was not attempted this year. An approximate 9 per cent annual increment, however, based upon productivity and mortality data was used to estimate the present population size of the Nelchina Herd at about 57,000 animals.

OBJECTIVES:

To determine the seasonal distribution and movements, total numbers, and gains or losses in numbers resulting from ingress or egress of caribou on the Nelchina range.

TECHNIQUES:

Periodic aerial surveys provided the means of tracing the movements and distributions of caribou throughout the year. Additional information was obtained from U. S. Fish and Wildlife Service personnel, from bush pilots, from guides and outfitters, and from residents of the area. All the observations obtained were synthesized into a general description of the herd's movement pattern through the seasons of the past year.

A total census was tentatively planned, but once again it proved infeasible. Wide dispersal of the animals, an insufficient budget, and personnel problems all combined to suppress any serious plans for such a census. The total population figure is estimated by using natality and mortality data, plus population estimates of previous years.

Data used for this report are filed in the Anchorage P-R office of the Alaska Department of Fish and Game.

FINDINGS:

Movements and Distribution

The Nelchina caribou continued to be widely dispersed over the range throughout much of the year, as has been characteristic of this herd in recent years. The western portion of the range again received major emphasis. Deviations from the "normal" movement pattern occurred in spring, summer, and fall, but the areas of concentrated use remained similar to past years. The movements and distribution observed are discussed below chronologically.

Spring

In March, 1960, the bulk of the herd was distributed over the Cantwell-Nadiwen Lake area, the upper Talkeetna River basin, and the eastern portion of the Lake Louise Flat. Movements of the calving segment from these wintering grounds began in late March and early April, being directed more or less toward the Fog Lakes-Clarence Lake area. This phase was typical of the past few years, and the caribou in the Cantwell-Nadiwen Lake region swung generally southward and those on the Talkeetna River, northward. The movement from the Lake Louise Flat passed westward toward the Susitna River along the West Fork of the Gulkana River. In late April and early May those to the west moved eastward past Clarence Lake to the lower portions of Goose Creek and the Oshetna River, much the same as the previous year but at variance with the southeast trek across the mountains characteristic of past years' observations. The main calving groups from the east and west joined along the lower Oshetna, moved southward to the upper portions of Sanona Creek, and in mid-May were swinging to the northwest. The main calving grounds were along Goose Creek, the Black River, and the middle portion of the Oshetna River, with the extremes being Kosina Creek to the northwest and upper Tyone Creek to the southeast. After calving, the animals banded into large groups, as is typical, and drifted to the southeast. Figure 1 depicts the winter concentrations in March, 1960, and the subsequent movements to the calving grounds.

Summer

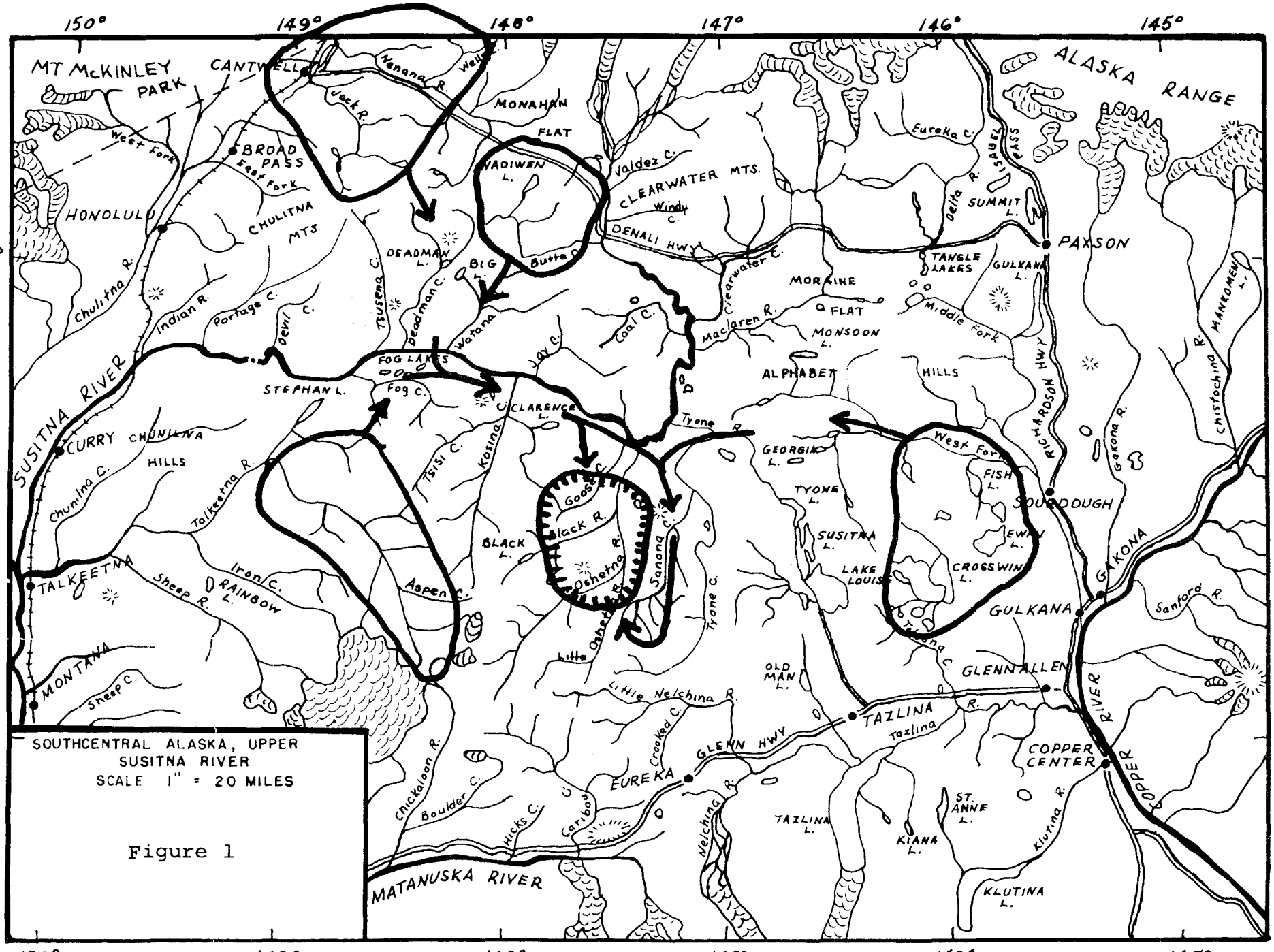
By mid-June the caribou had concentrated along the upper portion of Sanona Creek, in excess of 20,000 adults plus calves. On June 15 and 16 these moved to the northwest across the Oshetna and Black Rivers. This concentration remained fairly intact and drifted northward past Clarence Lake, across the Susitna River, and onto the Coal Creek "plateau", with stragglers remaining along the entire route well into July. The animals then moved eastward along the Maclaren River drainage onto Moraine Flat, and on July 20 over 30,000 were clustered on the hills to the south of Tangle Lakes. This July movement and concentration are the first such observations on record.

Figure 1. Winter concentrations of Nelchina herd in March, 1960, and subsequent movements in April and May to main calving grounds.

Winter concentrations.

Main routes used to calving grounds.

Main calving grounds.



SOUTHCENTRAL ALASKA, UPPER SUSITNA RIVER
SCALE 1" = 20 MILES

Figure 1

In late July and early August the herd moved westward again and by late August had spread out over the Fog Lakes-Clarence Lake-Deadman Lake-Nadiwen Lake-Coal Creek "plateau" region. Many animals remained in the Fog Lakes area well into September, but a large portion moved eastward in early September along the Maclaren River drainage once again. Many bulls had joined the ranks by this time. Figure 2 shows the main concentrations and movements occurring during the summer, 1960.

Fall

By mid-September the main herd had reached Paxson Lake and had swung onto the eastern portion of the Lake Louise Flat. Others had moved southward from the Coal Creek-Maclaren River area along Sanona and Tyone Creeks. Bulls were drifting southward and northward from their various summering grounds, the principal ones being Monahan Flat and the adjacent hills, the Clearwater Mountains, and the Talkeetna River basin, and the Caribou Creek basin. During the rut in early October the main concentrations were in the Eureka area, the Talkeetna River basin, the upper Susitna River, and mostly the Lake Louise Flat.

Winter

In late October and throughout November the caribou were moving continually. A large portion of the herd remained on the Lake Louise Flat but continued to move more or less in a clockwise fashion. One group of 500 animals or so crossed the Tazlina River to the south and spent much of December and January in the hills north of St. Anne Lake. Others spread out over the southern portion of the Flat from Eureka to Glennallen, while a portion of them moved northward along the upper Susitna River into the Nadiwen Lake area. Another large group moved into the Talkeetna River basin, and another to Tangle Lakes.

In late December and early January many of the caribou on the Lake Louise Flat moved up the Susitna River to the Monahan Flat, some continuing to Cantwell. By late January the herd was established on the wintering grounds, with the following concentrations noted: Cantwell--5,000+ caribou;

Figure 2. Summer and early fall concentrations of Nelchina herd in 1960 and main movement routes used.


Post-calving concentration in mid-June.


Main route used during late June.

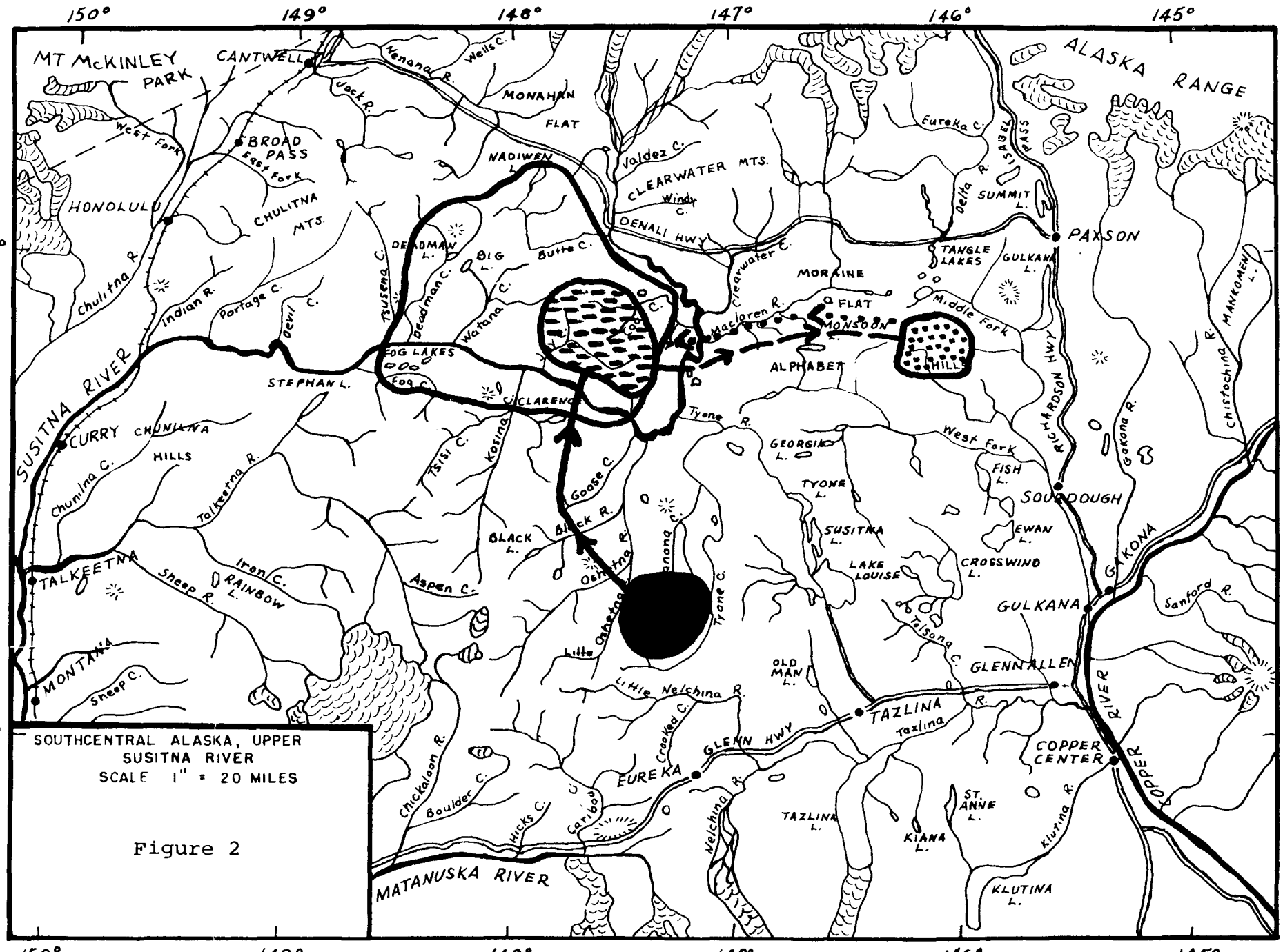

Concentration in late June and early July.


Main route used during early July.


Concentration in mid- and late July.


Main route used during late July and early August.


Concentration during August and early September.



SOUTHCENTRAL ALASKA, UPPER SUSITNA RIVER
SCALE 1" = 20 MILES

Figure 2

Nadiwen Lake-Monahan Flat--20,000+; Talkeetna River--10,000+; Lake Louise Flat--5,000+. Animals were present in practically every portion of the range, and the adult bulls had dissociated themselves from the main groups as usual. These concentrations remained through mid-March, 1961. Figure 3 depicts the main concentrations and movements observed during the fall and winter.

Discussion

It becomes more and more evident that the Nelchina caribou are beginning to use practically every portion of what is considered to be their range. Although the calving grounds have remained essentially the same during the past five years, the western shift in winter use from the Lake Louise Flat has become more pronounced and the movements throughout the year more continual in nature. The animals are reaching the peripheries of the range commonly now, notably in the Cantwell and Talkeetna areas to the west and along the Gakona and Chistochina Rivers to the east. An intermingling and possibly an interchange of caribou may be taking place between the Nelchina herd and the McKinley-Minchumina herd in the northwest and the Mentasta Pass herd in the east. As far as is known, however, no ingress nor egress of note has taken place. Much of this change in the movement pattern can be attributed to the steady increase in population size. As the herd continues to grow one can expect to see a greater dispersal of animals and possibly an extensive emigration.

Total Numbers

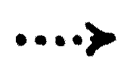
The last census of the Nelchina caribou herd was made in March, 1956, by personnel of the United States Fish and Wildlife Service, the total size being estimated at 40,000. At that time the herd was still using the Lake Louise Flat to a great extent during the winter, and the animals were so dispersed over this flat terrain as to permit the use of a transect sampling technique for the censusing. Since then, however, the movement pattern has changed so that now the herd mostly winters in the mountains and uses two, three, or four widely separated sections of the range. Censusing under such circumstances is difficult and costly, so no attempt has been made thus far.

Figure 3. Late fall and winter concentrations of Nelchina herd in 1960-61 and main movement routes used.

Concentration in early and mid-September.

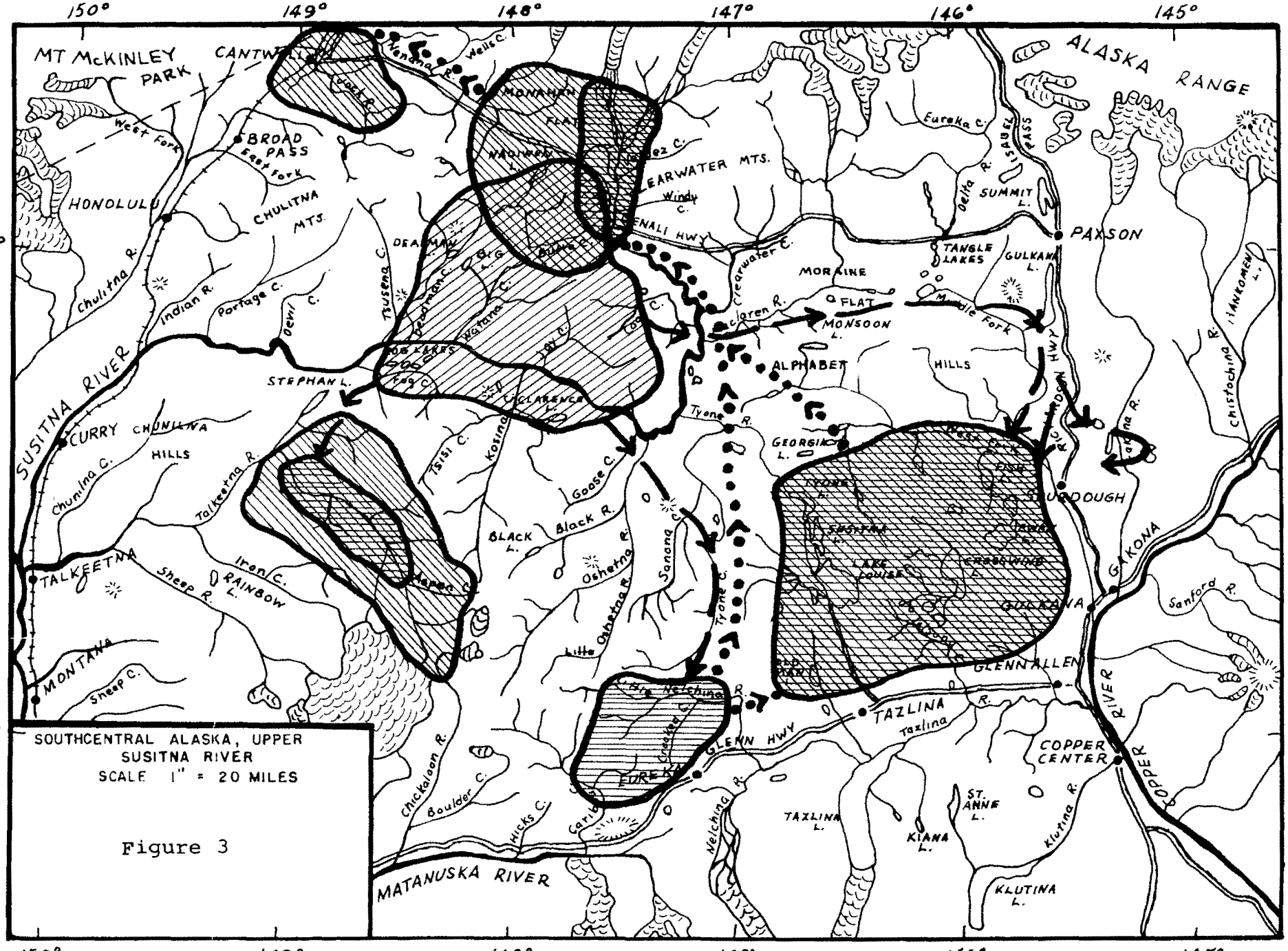
Main routes used in mid- and late September.

Concentrations in October.



Main routes used during November-January period.

Concentrations in February and March, 1961.



SOUTHCENTRAL ALASKA, UPPER SUSITNA RIVER
SCALE 1" = 20 MILES

Figure 3

Recent population estimates have been based upon data concerning calf crops, calf mortality, hunters' kill, and natural mortality, as discussed in the P-R completion report for W-3-R-13, May 1, 1959. The Nelchina herd has had about a 9 per cent annual increment during the past 15 years, with last year's total estimate being 55,000 animals. With a continued high calf crop and high calf survival during the past year, the herd is estimated at about 57,000.

RECOMMENDATIONS

The movements and distribution of the Nelchina caribou should be followed closely during this period of obvious herd expansion to determine the effects of an increased population. It has become increasingly important to check all movements near the periphery of the present range to note any ingress or egress of animals.

A census of this herd is needed in order to test the validity of our estimates of productivity and mortality since 1956. An adequate census will either confirm or refute present management techniques and thus permit a much needed evaluation.

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Volume 2 Report No. C-2c

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-c Title: Herd Composition--Nelchina Herd

PERIOD COVERED: May 1, 1960, to April 30, 1961

ABSTRACT:

Aerial and ground counts were obtained from the Nelchina herd during early and late winter to trace calf survival and to note composition changes. Results of these counts do not significantly alter past years' conclusions. The Nelchina herd remains young, typical of an expanding population, and, as of May 1, 1961, contains approximately 20 per cent yearlings. Information regarding the present bull:cow ratio is not available.

OBJECTIVES:

To determine sex and age ratios in order to ascertain calf survival and herd composition as an index to the current population status of the herd.

TECHNIQUES:

Ground and aerial composition counts are taken periodically from main portions of the Nelchina Herd to provide information on the calf crop, the survival of calves, and the sex and age composition of major

concentrations of caribou, and of the herd. The time and number of these varies from year to year depending upon the distribution of the animals, weather, etc., but usually there are four counts:

1) In mid-June an aerial count is made to determine the size of the calf crop.

2) During the rut in early October a ground segregation count is attempted to obtain data on sex and age ratios.

3) At the same time, or later in October, an aerial count is made to determine calf survival through the summer and fall.

4) In late March or early April, a final aerial count provides data on calf survival throughout the year.

In addition to these, occasionally an aerial count is made of a large movement of caribou to determine what segment of the herd is involved. An attempt is made on each to classify the animals as completely as possible. Complete segregation is possible only from the ground on small groups (less than 50 animals), unless one has ideal circumstances, such as a close vantage point, undisturbed, filing caribou, and good lighting. Segregation from the air is limited largely to calves, adult bulls (over two years old), and "others".

During this past year all four of the counts outlined above were made as scheduled. The data obtained are filed in the Anchorage P-R office of the Alaska Department of Fish and Game.

FINDINGS:

In mid-June, 1960, the bulk (20,000+) of the calving segment had concentrated along the upper reaches of Sanona Creek, and on June 15 began moving westward. Keough and Skoog landed the next morning near the mouth of the Little Oshetna River and obtained calf counts as

the rear half of the movement streamed past toward the Black River. The animals moved too quickly for complete segregation, so we were able to classify them only as calves, adults, and adult bulls (over two years old). The 5,608 animals tallied (less than half of those that passed) consisted of 1,699 calves and 3,909 adults, of which 235 were adult bulls.

At the end of September what was thought to be the major portion of the herd was sighted moving into the Eureka area. Later it was found that probably less than 10,000 animals were involved. An aerial count of 1,296 of these was taken on September 29, 1960; the count included 243 calves, and bulls were not segregated. The calf/adult ratio of 23 per cent (243/1,053) seemed quite low for that time of year.

The next day Keough and Skoog walked to the head of Crooked Creek to spend four days taking ground composition counts. Presumably the caribou are dispersed randomly at that time because of the rut, so complete segregation counts then should reveal the "true" sex and age ratios of the herd. During the September 30 to October 3 period a total of 1,029 animals was tallied, but only 482 of these were segregated completely. Table 1 lists the results. The comparable percentages obtained in the various classification of counts, e. g. calves and large bulls, indicate that the composition of the total groups tallied was quite uniform. Also, the calf/adult ratio of 26 per cent compares closely with the 23 per cent obtained from the aerial count. Thus it is thought that these counts as a whole probably were quite representative of that particular segment of the herd. Yet the calf/adult (26:100) and bull/cow (43:100) ratios seemed abnormally low, implying that that segment was not representative of the entire herd. Calf counts the following March showed that the October calf counts were low, as supposed, and therefore the bull/cow ratio obtained probably was not valid either.

Over 20,000 caribou spent much of the winter in the Nadiwen Lake region, including most of the cows and calves. On March 23 and 24, 1961, aerial counts were

Table 1. Summary of ground composition counts made on upper Crooked Creek, 9/30/60 - 10/3/60, Nelchina caribou herd.

Total Animals	Calves		Cows		BULLS							
					Total		Small		Medium		Large	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1,029	209	20.3	-		-		-		-		-	
885	181	20.4	-		-		-		-		60	6.8
793	163	20.5	-		-		-		57	7.2	54	6.8
482	104	21.5	264	54.8	114	23.7	52	10.8	30	6.2	32	6.6

Ratios: Calf/Adult = 209/820 = .26
Calf/Cow = 104/264 = .39
Bull/Cow = 114/264 = .43
Bulls: Small/Medium/Large = 46/26/28

*Bulls were segregated on the basis of antler size. Small bulls probably are 1-2 year olds; Medium, 3-5 year olds; and Large, 6 years and older.

made on these animals as they streamed southward in long files. The 2,376 caribou tallied included 536 calves and 1,840 adults, of which 147 were classed as bulls (over two years old). At that time of year those bulls are antlerless or have small velvet knobs.

Table 2 lists the June, October, and March counts, as pertains to calf survival. Note the obvious discrepancy in the calf ratios between the October and March figures. Obvious also is the absence of most of the adult bulls from the cow-calf segment of the herd, both before and after the rut. This phenomenon is characteristic of caribou behavior and has been discussed much in past reports. The data as pertains to calf survival are discussed in the report on "Productivity", Job 2d.

Data regarding the sex and age ratios in this herd remain insufficient to make definite statements. In 1956 a 76:100 bull-cow ratio was obtained; in 1959, a 58:100 ratio; and now in 1960, 43:100. Unfortunately none of these are particularly reliable, as far as known, because of the small sample sizes. The trend indicated is interesting, however, because it reflects what might be considered the obvious result of an annual bull-kill which has averaged over 70 per cent of the total for the past ten years. More information is needed before any evaluation can be attempted. With no new contradictory evidence available, one can only reiterate words of the past which essentially point out that the herd's population seems to be young and expanding. As of May 1, 1961, the herd again seems to contain about 20 per cent yearlings. The bull:cow ratio is not available.

RECOMMENDATIONS:

Calf/adult counts should be continued in order to trace the survival of calves from mid-June through March. These are necessary to assess the annual increment. More complete composition counts are needed periodically and in conjunction with the calf counts, in order to properly evaluate the "adult" segment used as a base for computing calf survival and to detect changes in composition occurring with major movements.

Table 2. Summary of periodic composition counts taken during 1960-61, primarily to ascertain calf survival in the Nelchina caribou herd.

Date	Total Animals	Calves	ADULTS			CALF RATIOS		
			Total	Bulls Over 2 Yrs. Old		Calf/ Total	Calf/ Adult	Calf/Adult Minus Bulls
				No.	%			
6/16/60	5,608	1,699	3,909	235	6.0	.30	.44	.46
10/3/60	2,325	452	1,873	330	17.6	.19	.24	.29
3/24/61	2,376	536	1,840	147	8.0	.23	.29	.32

Reliable sex and age ratios are still lacking for this herd and the effort to obtain significant data should be continued. Ground counts during the rut are very important, as are the age data from all caribou carcasses.

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Volume 2 Report No. C-2d

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-d Title: Productivity--Nelchina Herd

PERIOD COVERED: August 1, 1959, to April 30, 1961

ABSTRACT:

The limited observations of caribou behavior made during the rut in October, 1959, will be evaluated at a later date after more data have been obtained. Aerial observations during October indicated that the caribou bands contained full complements of adult bulls, so it was assumed that breeding progressed normally. Fertility data obtained later and calf counts in June, 1960, substantiated the expected high incidence of pregnancy among the cows. Once again it was estimated that about 60 per cent of the cows older than yearlings were accompanied by calves by late June. The calf production in June, 1960, was estimated at 15,000 animals.

An estimated 63 per cent of those calves survived to April 1, 1961, the high survival being attributable in part to the mild winter. Thus the Nelchina herd received an increment of about 9,500 yearlings.

OBJECTIVES:

To obtain information regarding breeding behavior and sexual cycles, fertility and natality rates, growth

of the fetus and calf, magnitude of the calf crop, and survival of calves to the yearling age.

To determine the factors affecting these elements of productivity.

TECHNIQUES:

This project attempts to determine the elements of productivity as reflected by one calf segment of the population during the period from conception, through parturition, to the yearling age-class. Data collected during this twenty-month period would encompass breeding behavior, sexual cycles, fertility and natality rates, progression and magnitude of calving, and the survival of calves through their first winter.

Ground surveys were planned for early October, 1959, to obtain information on breeding behavior. Testes and ovaries were collected from all carcasses examined during the year (August, 1959, to May, 1960) for eventual analysis in determining the sexual cycles of caribou; these carcasses also provided data regarding the fertility of the cows.

Periodic aerial counts during the period May, 1960, to April, 1961, were planned to ascertain the size of the calf crop and the survival of the calves through the winter. These counts were evaluated in terms of the number of calves produced and the number of yearlings added to the herd the following spring.

The data used for this report are filed at the Anchorage P-R office of the Alaska Department of Fish and Game.

FINDINGS:

A major portion of the Nelchina caribou moved into the Caribou Creek-Eureka area in early October, 1959. Unfortunately the main groups moved northward before the writer could reach them by foot, but he was able to obtain some information on breeding behavior from a small

segment of the herd along lower Caribou Creek during October 9-13. To date observations of breeding behavior are too few for an evaluation, so none will be attempted in this report. Of interest, however, is the fact that few bulls have been seen to mount cows successfully during the main daylight hours, i.e. 0900-1600, when most observations have been made during the past few years. The bulls, in fact, seem quite indolent at that time of day, in contrast to a noticeably more active behavior during the hours prior to about 0900. The observations again are too few to be conclusive, but the writer hypothesizes that perhaps most of the actual mating takes place during the night and/or early morning. Such a supposition also seems logical from the standpoint that caribou usually do not seem to move any great distances at night and seem to be most active during the first few hours of daylight. More data are needed. It is presumed, however, that breeding progressed normally during the fall of 1959, because the many groups observed from the air during the rut all seemed to contain a "full" complement of adult bulls.

Few data were collected regarding fertility, of 17 adult cows (2 years or older) examined, however, 16 or 94 per cent were pregnant. In addition, a ground segregation count of 241 animals during April showed that 133 of 137 adult cows bore hard antlers; most of these probably were pregnant, for most non-pregnant cows over 2 years old drop their antlers in March or early April. The samples, although not large enough to be significant, suggest a high fertility rate among cows older than yearlings.

A high fertility rate has been characteristic of the Nelchina herd during recent years, and this was borne out for 1959-60 by the high calf crop recorded in June. On June 16, 1960, 5,608 animals were tallied, including 1,699 calves and 3,909 adults, of which 235 were adult bulls (3 years and older). The calf/adult ratio of 43 per cent (1,699:3,909) compares closely with those obtained at that period in recent years, and indicates that again about 60 per cent of the cows 2 years and older were accompanied by calves in mid-June. The total calf production was estimated at 15,000 calves,

based upon a herd size of 55,000 animals, of which 46 per cent or 25,300 were adult cows, of which 60 per cent had calves on June 16, 1960.

To trace the survival of these calves through the year, aerial and ground counts were made in early and late winter. The results of these have been presented in the report "Herd Composition", Job 2c, Table 2. In determining calf survival from these periodic counts it is necessary to compare the calf tally to a base that remains fairly constant. The cow segment is the least variable, but unfortunately it is difficult to obtain counts in which the cows can be segregated completely. Next best is that segment which contains the cows plus most of the bulls under 3 years old, and usually that constitutes the major portion of the principal herd concentrations during the year. This latter segment, or base, can be obtained by eliminating from the counts the adult bulls, identified in early winter by their large antlers and in late winter by their lack of antlers. Table 1 lists the calf:adult (minus bulls) ratios obtained during 1960-61, and shows the procedure for computing calf survival.

Calf mortality is computed from the June and March counts only, because the October counts were not representative of the main herd. A 37 per cent mortality is indicated for the period mid-June, 1960, through March, 1961. Such a high calf survival has been characteristic of this herd during the past five years. The main factors for this probably have been the extremely mild winters and the relatively low wolf population.

In mid-June, after the initial post-natal mortality, an estimated 15,000 calves had been added to the herd. About 63 per cent of these survived to April, 1961, and thus the Nelchina caribou received an increment of about 9,500 yearlings.

RECOMMENDATIONS:

Information on both the breeding behavior and sexual cycles of caribou remains inadequate. An attempt

Table 1. Computation of calf survival in the Nelchina caribou herd, June, 1960, to April, 1961, as determined from periodic calf:adult ratios.

Date of Count	Calf:adult Ratios (Minus Adult Bulls)*	Per Cent Calf Mortality	Per Cent Calf Survival
6/16/60	1,699:3,674 = .46	-----	100
10/3/60	452:1,543 = .29**	**	**
3/24/61	536:1,860 = .29***	37 (.17:.46)	63 (.29:.46)

* Adult Bulls--those 3 years and older.

**Counts obtained were not representative of main herd.

***Adult tally increased by 9 per cent to include animals that died since June, 1960; total adult mortality estimated at 13 per cent; 9 per cent represents estimate exclusive of adult bulls.

should be made to close this gap in our knowledge. In addition, more data concerning fertility rates would serve to round out this phase of the productivity study. A larger collection of testes, ovaries, and fetuses, which could supply much of the desired information, should be accumulated.

Calf counts should be taken at various times of the year in order to determine the calf crop and the survival of calves to the yearling age-class.

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Volume 2 Report No. C-2e

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-e Title: Analysis of Range--Nelchina Herd

PERIOD COVERED: June 15, 1960, to September 30, 1960

ABSTRACT:

Two field crews were used for the range studies in the summer of 1960 during the one and a half months available. Keough directed one crew in the construction of twenty-four enclosures in major wintering areas; the vegetation analyses were postponed a year in order that as many enclosures as possible could be built. Skoog directed the other crew in a study of a major wintering area at the head of the Talkeetna River. A total of 600 meter-square quadrats and 100-foot transects were examined in 22 different vegetation stands to obtain quantitative data on plant-species frequency and cover and on caribou usage. It was determined that nine months of intensive use during three winters by over 20,000 caribou had resulted in about 9 per cent of the lichen cover being destroyed and 18 per cent grazed lightly in the main lichen stands used.

OBJECTIVES:

To analyze further the vegetation types, and their composition, occurring on the Nelchina caribou range, examining regions and elevations not visited previously.

To determine quantitatively the distribution throughout the range of the various vegetation types identified.

To establish permanent exclosures in as many portions of the winter range as possible.

TECHNIQUES:

The purpose of this study was to continue the work that has been pursued in recent years on the Nelchina range. As described in Job Completion Report W-3-R-13, Job 4, the range has been divided into fifteen units based upon topography, drainage, vegetation types, and caribou usage, and each of these units will be analyzed to obtain an assessment as to its vegetation makeup and relative condition as related to present and future caribou usage. This study, as with most range studies, is long-range in scope and requires a great deal of time and a great deal of field work, especially when considering the large area involved (18,000 square miles) and the wide variety of habitats therein. Practical access to some sections is possible only by horse or by helicopter. With only one or two crews employed each summer the work cannot progress very rapidly, and limited funds and personnel and limited time due to other more pressing studies have precluded intensive efforts thusfar.

One segment of the range work has been directed toward establishing enclosures in many of the major wintering grounds, the purpose being to provide a means for comparing vegetation changes taking place on areas open to caribou grazing as opposed to those closed (the enclosures). Each "range station" consists of two plots, one fenced and one not, each containing two meter-square quadrats. The vegetation in each quadrat was analyzed by the modified Hult-Sernander method used by Dr. Herbert C. Hanson, as described in Job Completion Report W-3-R-12, Job 6, June 30, 1958; in addition, a complete description of the vegetation stand was made, as well as a complete enumeration of the plant species present. The fenced plot lies within a six-foot-high fence of woven and barbed wire measuring about fifteen by thirty feet, supported by six eight-foot steel posts, with each corner

post braced by one or two "deadmen". Photographs were taken at each site and photo points established to allow future duplication. Each station was marked with an orange-painted, five-gallon can on a tree or post to facilitate identification from the air.

Seven such stations were constructed by a two-man crew in the summer of 1955, and eight more by a similar crew in 1956. During 1960 a three-man crew headed by Edward P. Keough constructed twenty-four additional enclosures. In an effort to build as many of these as possible, the crew did not take the vegetation analyses, which were postponed until this year. All thirty-nine stations have been established in important wintering areas and in the major vegetation types utilized by caribou during that season.

Another segment of this study has consisted of determining the major types comprising the range vegetation, including their composition, distribution, and relative amount of ground coverage. Dr. Herbert C. Hanson, directing a three-man crew, initiated this phase in 1957 by identifying the major types present and by analyzing representative stands in each at various sites throughout the range. Quantitative data were obtained regarding the species composition of the flowering plants present in each stand, but non-flowering plants, such as lichens and mosses, were considered only as groups. Every major section of the range was not examined during the three-months of field work because of the short time-element, and most work was done below 4,000 feet elevation; at least one vegetation type--the White Birch--was not included in the survey, and others, at the higher elevations, were not represented by sufficient stands. The analysis method used was described in the Job 6 Completion Report for W-3-R-12, dated June 30, 1958, and that method has been continued in order to provide a continuity and parallelism in the work. In 1958 the writer began studies designed to determine the range distribution of the various species of forage lichens, their abundance and condition in the major wintering areas, and the various stages of lichen succession evident. The two-month effort that summer

merely initiated the project, and much work remains. In 1959, the change of administration from Federal to State disrupted the summer's field work to the extent that little was obtained other than general observations.

The recent continued westward shift in range use by the Nelchina caribou makes it necessary to obtain more detailed information about the western portion of the Nelchina range. Much of that region has been examined by wildlife biologists only from the air, and relatively little is known of the plant distribution or of the abundance and availability of lichen forage. The southwest quarter (Range Units 10, 11, 14, and part of 15) has received least attention, because of the few caribou normally there and to some extent because of its inaccessibility. Since 1956, however, that section has become a major wintering ground, especially the area at the head of the Talkeetna River. A few thousand caribou first wintered there in 1956-57, and over 20,000 during each of the next three winters. The latter area was chosen for study during 1960 for the following reasons:

1) It was an important caribou wintering ground.

2) Little information presently was available concerning the plants of that locality.

3) Much of the terrain lay above 4,000 feet elevation, and thus quantitative data could be obtained from vegetation stands at elevations not yet checked sufficiently.

4) The area had been relatively untouched by caribou prior to 1956, so it would be possible to measure the effect of three winters of concentrated grazing upon near-climax lichen stands.

The Hanson technique was used to obtain quantitative data on the species composition of the flowering plants in representative stands; this technique was expanded to include the lichen species also. The condition of the forage lichens was evaluated by the species composition, height, and cover data obtained; an attempt

was made at determining the effect of caribou usage by obtaining measurements of the plant cover disrupted, as revealed along one-hundred-foot line-intercept transects. Along each transect the amount of ground disturbed by caribou, ground squirrels, frost, water, or other activity and that covered by moss pedestals was recorded in tenths of a foot. Disturbed ground was considered to be that in which the turf had been exposed and the vegetation torn loose or compacted to a thin, dead appearing layer. Detailed descriptions were made of the general distribution of vegetation types, the plant successions evident, and the noticeable effects of caribou usage. The summer's work was not designed to be a complete study in itself, but to supplement the existing data.

That portion of the upper Talkeetna River is inaccessible except by foot, horse, or helicopter. Of the three, horses were considered to be the most practical method of travel, considering costs, mobility, amount of area to be covered, and amount of gear to be carried. A string of six horses (three saddle and three pack) was used to reach the main area of work on the divide between the Chickaloon and Talkeetna Rivers. The travel route along the Chickaloon River allowed a cursory examination of that area also. The three-man crew consisted of two biologists and one wrangler/cook.

A third segment of the range studies seeks to determine quantitatively the areal distribution of the major vegetation types throughout the Nelchina caribou range. Hunter-check station operations in the fall of 1960 interfered with the plans to complete this phase, so it was postponed.

FINDINGS:

The range studies during 1960 were restricted to only a month and a half of field work, due to caribou surveys and hunter-check stations; and by working long hours the two crews in operation were able to complete successfully a large portion of their respective tasks. Keough directed a three-man crew in constructing range

enclosures at various sites within some of the principal caribou wintering areas. Skoog headed the other three-man crew, which analyzed representative stands of major vegetation types along the upper Talkeetna River. Both crews were in the field from about July 1 to August 15.

Range Enclosure Construction

Twenty-four enclosures were constructed during the summer, of which twenty were in the northern half of the range. Twelve of the total were located along the highway system (eleven along the Denali Highway) and the remaining twelve, on the shores of lakes in various areas. Transportation of the fencing, supplies, and personnel was accomplished by use of truck and airplane, the latter being a 150 HP Piper Supercub. A brief description of each station site follows, numbered in accord with the fifteen previously established.

Station 16.--Glenn Highway between Mile 130 and 131, about 230 yards south of telephone pole #6700, in Dwarf Birch vegetation type. Elevation about 3,000 feet. Constructed 7/7/60.

Station 17.--Denali Highway, Mile 8.7, about 200 yards south, in Heath vegetation type. Elevation about 3,500 feet. Constructed 7/21/60.

Station 18.--Denali Highway, Mile 26.1, about 150 yards north, in Dwarf Birch vegetation type. Elevation about 3,400 feet. Constructed 7/19/60.

Station 19.--Denali Highway, Mile 29, about 300 yards north, in Festuca vegetation type. Elevation about 3,400 feet. Constructed 7/19/60.

Station 20.--Denali Highway, Mile 47.7, about 180 yards north, in Dwarf Birch vegetation type. Elevation about 3,100 feet. Constructed 7/18/60.

Station 21.--Denali Highway, Mile 56.1, about 180 yards north, in Festuca vegetation type. Elevation about 3,100 feet. Constructed 7/18/60.

Station 22.--Denali Highway, Mile 65, about 100 yards north, in Dwarf Birch vegetation type. Elevation about 3,000 feet. Constructed 8/14/60.

Station 23.--Denali Highway, Mile 94.4, about 300 yards south, in Heath vegetation type. Elevation about 3,000 feet. Constructed 7/17/60.

Station 24.--Denali Highway, Mile 100.1, about 200 yards north, in Dwarf Birch vegetation type. Elevation about 3,100 feet. Constructed 7/16/60.

Station 25.--Denali Highway, Mile 108.2, about 100 yards south, in Dwarf Birch vegetation type. Elevation about 2,700 feet. Constructed 7/16/60.

Station 26.--Denali Highway, Mile 115, about 150 yards southwest, in Heath vegetation type. Elevation about 3,000 feet. Constructed 7/15/60.

Station 27.--Denali Highway, Mile 123.9, about 200 yards north, in Dwarf Birch vegetation type. Elevation about 2,300 feet. Constructed 7/15/60.

Station 28.--Black Lake, northeast shore, about 100 yards inland, in Dwarf Birch vegetation type. Elevation about 3,500 feet. Constructed 8/2/60.

Station 29.--Clarence Lake, south shore, about 125 yards inland, in Dwarf Birch vegetation type. Elevation about 3,000 feet. Constructed 8/3/60.

Station 30.--Fog Lake #3, southeast shore, about 30 yards inland, in Dwarf Birch vegetation type. Elevation about 2,400 feet. Constructed 8/3/60.

Station 31.--Deadman Lake, west shore, about 75 yards inland, in Heath vegetation type. Elevation about 3,100 feet. Constructed 8/9/60.

Station 32.--Nadiwen Lake, west shore, about 100 yards inland, in Heath vegetation type. Elevation about 3,300 feet. Constructed 8/9/60.

Station 33.--Soule Creek Lake, south shore, about 80 yards inland, in Heath vegetation type. Elevation about 3,700 feet. Constructed 8/8/60.

Station 34.--Jack Lake, northeast shore, about 100 yards inland, in Dwarf Birch vegetation type. Elevation about 3,300 feet. Constructed 8/8/60.

Station 35.--Monahan Flat Lake, east shore, about 150 yards inland, in Heath vegetation type. Elevation about 2,700 feet. Constructed 8/7/60.

Station 36.--Monsoon Lake, west shore, about 50 yards inland, in Dwarf Birch vegetation type. Elevation about 3,000 feet. Constructed 8/11/60.

Station 37.--Dickey Lake, east shore, about 100 yards inland, in Dwarf Birch vegetation type. Elevation about 3,000 feet. Constructed 8/11/60.

Station 38.--Boulder Creek Lake, west shore, about 100 yards inland, in Festuca vegetation type. Elevation about 3,900 feet. Constructed 8/10/60.

Station 39.--Summit Lake, west shore, about 100 yards inland, in Dwarf Birch vegetation type. Elevation about 3,400 feet. Constructed 8/13/60.

These enclosures bring the total number of range stations established to thirty-eight, Station 3 of the original fifteen having been destroyed by a caribou migration. The remaining stations are distributed among the fifteen Range Units as follows: Unit 1--2; Unit 2--4; Unit 4--2; Unit 5--3; Unit 6--8; Unit 8--2; Unit 9--1; Unit 12--2; Unit 13--13; and Unit 15--1. A few more stations are needed to provide adequate coverage, the most important wintering area not represented presently being Range Unit 11, the upper Talkeetna River area.

Talkeetna River Study.

Thirty-six days were expended on this study, including six days of packing into and out of the area.

The extremely wet weather during that period (twenty-six days of rain) made the trip somewhat unpleasant at times and made plant collecting rather difficult. Of 208 plant specimens collected, however, only two were destroyed by mold. A total of 600 meter-square quadrats and 100-foot transects was examined in 22 different vegetation stands to obtain quantitative data on plant-species frequency and cover and on caribou usage. All stands were located above 2,600 feet elevation, and sixteen were above 4,000 feet. The following vegetation types were represented: Heath, 7 stands; Sedge Meadow, 5; Dwarf Birch, 3; Spruce, 2; Festuca, 2; Willow, 2; and Lichen (early succession), 1. Of these, six were climax stands of Cladonia alpestris, five located in Heath and one in Festuca.

An attempt was made to measure the effect of three years of intensive caribou grazing by the use of 100-foot transects. These were run across the main lichen areas of caribou winter use, as had been determined previously by aerial observations during past winters. The disturbance to the lichen cover attributed to caribou was designated as either "light" (tops of lichen plants eaten; loose lichens on surface) or "heavy" (turf exposed; lichen plants destroyed or fragmented). The extent of such disturbance was recorded in tenths of a foot along the edge of the 100-foot tape measure. In climax stands of Cladonia alpestris light grazing was easily detected by the greyish color, the grey being the exposed lower portion of the plants after the yellow apical "cones" had been removed.

In 9,000 feet of transects across the main lichen areas 2,448 feet were recorded as being disturbed by caribou, or about 27 per cent of the total. Of that, 1,609 feet or 18 per cent were considered "light" grazing, and the remaining 839 feet or 9 per cent, "heavy". Lichens in the areas of "light" grazing probably will produce new growth comparatively soon, if undisturbed for a few years. Those in the areas of "heavy" grazing, however, essentially have been destroyed, and many years will be needed before they return to their former state. No disturbance of any magnitude attributed to caribou was detected in the stands

of Sedge Meadow, which cover about ten per cent of that region and are an important source of winter forage.

Assuming the above data can be applied to the lichen stands in that wintering area as a whole, one can evaluate to a certain extent the effect of the caribou after three winters of intensive use. The first winter, 1956-57, probably resulted in little change, because only several thousand (5,000?) animals were spread out thinly over an area that essentially had been ungrazed. If that year is disregarded, then nine months (three winters of three months each) of winter use by over 20,000 caribou on an area of about 100 square miles (about one animal per three acres) have resulted in 9 per cent of the lichen forage being destroyed and 18 per cent grazed lightly. Thus ten years of such grazing might result in complete destruction of about 30 per cent of lichen cover, with light damage to about 60 per cent. Sedge probably would remain equally abundant during the same period. The data are inadequate for a statistical evaluation and such postulations are rather uncertain without one, but they do provide an indication that under continued heavy use of such an intensity the range probably will deteriorate rapidly.

The quantitative data obtained from the meter-square quadrat analysis is not presented, because that information means little by itself. The data supplement that obtained previously and will provide for a more meaningful analysis of the major vegetation types.

RECOMMENDATIONS:

This range work is of the utmost importance to the management of the Nelchina caribou herd and, by extrapolation, to all the herds of Alaska. A great deal of work remains to be done and the task is difficult with the limited funds and personnel available. The following projects rate priority in future planning:

1) Per cent coverage of the major vegetation types within each of the range units.

2) Determination of lichen cover and condition within each major type within each unit, and distribution of forage lichens over the entire range.

3) Determination of the effect of caribou grazing in the major wintering areas.

4) Determination of the plants and major types utilized most by caribou during the various seasons.

5) Establishment of permanent enclosures in the southwest quarter of the range.

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Volume 2 Report No. C-2f

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-f Title: Winter Range Utilization--Nelchina Herd

PERIOD COVERED: November 1, 1960, to April 30, 1961

ABSTRACT:

The major wintering grounds utilized by the Nelchina caribou herd during the 1960-61 winter were in Range Units 1, 2, 5, 11, and 13. The bulk (over 20,000 animals) of the herd concentrated in the Nadiwen Lake-upper Butte Creek portion of Unit 5, while another major segment (over 10,000) wintered in Unit 11 along the Talkeetna River once again. The light snowfall throughout the range permitted the caribou to forage with little effort.

The main vegetation types utilized were those above timberline--mostly the Heath, Dwarf Birch, and Sedge Meadow. As usual, sedge and lichen were the principal food plants. Of special interest was the extensive use made of the vegetation in muskrat pushups during October and November on the Lake Louise Flat (Unit 13). Such use probably had an adverse effect upon the muskrat population.

OBJECTIVES:

To determine quantitatively the plant associations utilized most by caribou during the winter months.

To determine the food plants most frequently sought and eaten by caribou during the winter months.

TECHNIQUES:

Work on this study during the winter of 1960-61 was limited to noting and recording the portions of the range receiving major use by the Nelchina caribou. Periodic aerial reconnaissance flights were the means used to gather this information, which was recorded whenever possible according to the major vegetation types used, as well as to the specific area of the range used. No quantitative work from the ground was done this year.

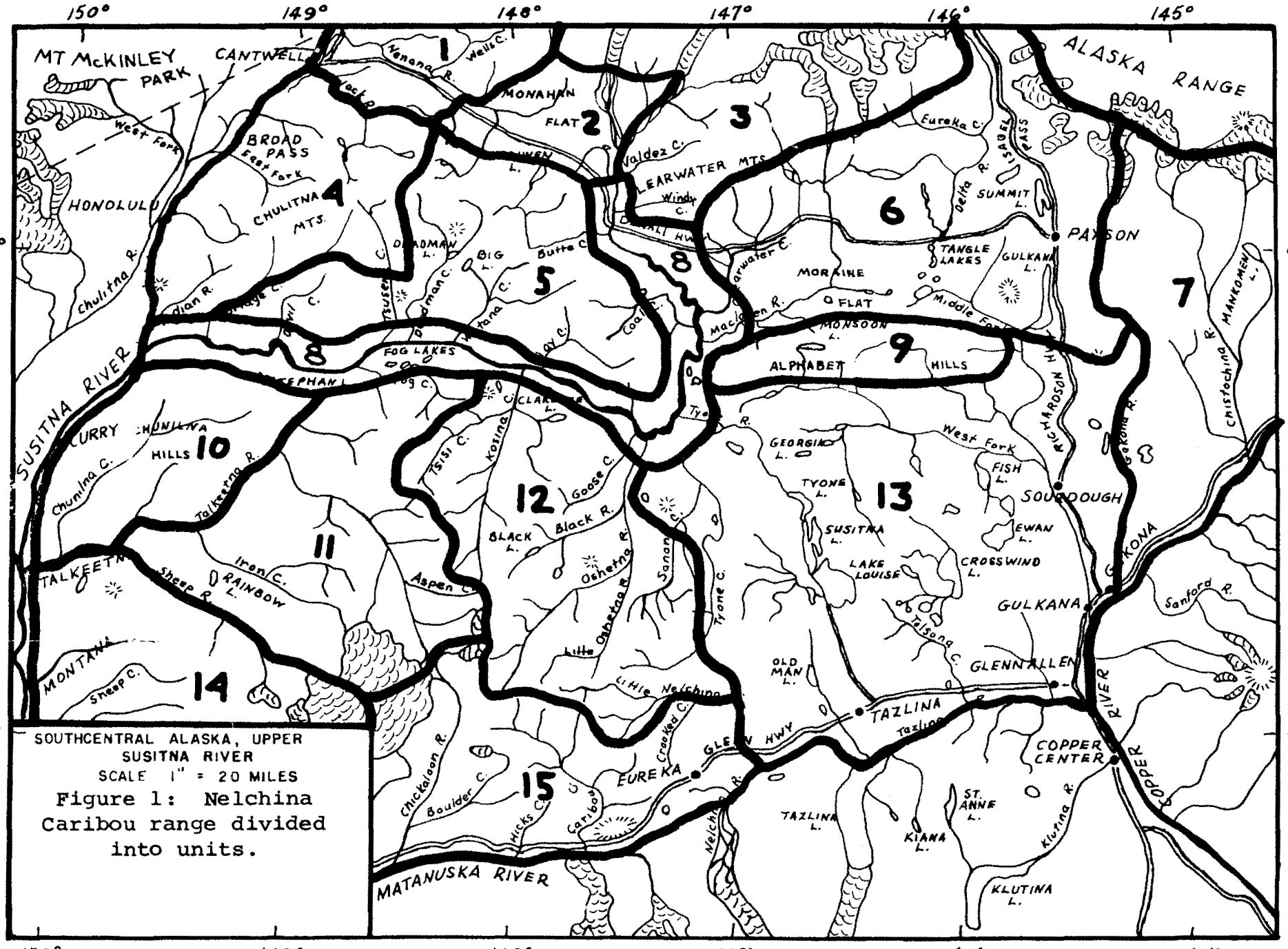
The data used for this report are filed at the Anchorage P-R office of the Alaska Department of Fish and Game.

FINDINGS:

The Nelchina caribou used a variety of wintering grounds during the 1960-61 season in widely scattered portions of the range. The extremely light snowfall throughout provided little restriction to their movements. The Nelchina Range has been divided into fifteen units, as discussed in P-R completion report for W-3-R-13, May 1, 1959, and these were employed in describing caribou usage during the winter period, mid-October to mid-April. Figure 1 depicts these units. Those areas receiving major use by caribou included Range Units 1, 2, 5, 11, and 13; those receiving moderate use, Range Units 6, and 8; and those receiving minor use, Range Units 3, 4, 7, 9, 10, 12, 14, and 15. These areas are discussed in more detail below.

Areas of Major Winter Use

Range Unit 1: Upper Nenana River.--This area lies in the northwest corner of the range, west of Monahan



SOUTHCENTRAL ALASKA, UPPER SUSITNA RIVER
SCALE 1" = 20 MILES

Figure 1: Nelchina Caribou range divided into units.

Flat and near the railroad station of Cantwell, totaling about 500 square miles. The altitude ranges from 2,100 feet near Windy to 7,000 feet along the northern divide, with an average elevation of about 3,500 feet. Generally the snowfall here is higher than in most portions of the range and the frequent strong winds form hard drifts, although many sections of ground above timberline are bared.

The vegetation consists of three major types: Spruce, Dwarf Birch, and Heath. The first extends along the streams and valleys below 3,000 feet; the second occupies areas above and occasionally within the Spruce, generally below 4,000 feet; and the third ranges from timberline, on exposed sites, to well above 4,000 feet. Bog and Sedge occur sporadically on poorly drained sites near the Nenana River; Sedge Meadow is present on poorly drained sites above timberline; and Willow extends along most drainageways.

Caribou moved into this region during January, several thousand continuing westward along the Nenana River from the main concentration on Monahan Flat. Cows, calves, and yearlings were present, but a large percentage of the animals were adult bulls. Most of the caribou scattered over the Reindeer Hills (just east of the railroad) and over the slopes adjacent to Brushkasna and Wells Creeks, mostly above timberline. The main vegetation types utilized were the Heath and the Dwarf Birch, both of which contain excellent stands of forage lichens. Sedge Meadow was used commonly and the Spruce occasionally. The animals remained through March, but were so scattered for the most part that the total effect upon the range must have been slight.

Range Unit 2: Monahan Flat.--This portion of the range lies immediately to the east of Unit 1 and encompasses some 400 square miles of poorly drained, relatively flat terrain dividing the upper drainages of the Nenana and Susitna Rivers. The elevation ranges from about 2,600 feet on the east to about 3,200 feet on the north and south, averaging about 2,800 feet. The snowfall approximates that to the west, but because of the

relatively flat terrain the snow-cover remains fairly deep (2-5 feet) and few areas are bared.

The main vegetation types are Sedge, Bog, Dwarf Birch, and Spruce, the ground coverage being estimated at 10, 30, 45, and 15 per cent, respectively. Willow occurs along many of the drainageways and Heath on the few wind-exposed ridges, but the ground coverage of these is quite small. White Spruce occurs on well drained sites mostly at the higher elevations to the south, but Black Spruce stands occur sporadically throughout the area. Dwarf Birch occupies much of the northern half of the unit and the many "islands" amidst the bogs. All the major vegetation types except Sedge and certain portions of the Spruce contain excellent forage lichens.

Segments of the Nelchina caribou moved onto the Monahan Flat during October, November, December, and January, with the greatest concentration occurring there in early January (perhaps 10-15,000 animals). Although most of these caribou were merely transients through Unit 2, at any one time there probably were several thousand caribou on the southern half of the unit throughout the November-March period. The vegetation types utilized most were Sedge, Dwarf Birch, and Bog and the principal food plants were lichen and sedge. Generally the animals were scattered thinly over the area and were in those types most resistant to foraging. These facts, plus the fact that the area has been used little during the past 20-30 years or more, suggest that damage to the range probably was minimal.

Range Unit 5: Deadman Lake.--This region encompasses an area of about 1,300 square miles in the northwest quarter of the range, adjacent to the right bank of the upper Susitna River. The terrain consists mostly of rolling hills above timberline, averaging about 3,500 feet in elevation, with more rugged mountains in the southeast section having peaks reaching to 6,000 feet. Snowfall is moderate, generally less than three feet, and the winds bare many of the exposed ridges and knolls.

Heath is the dominant vegetation type, followed by Dwarf Birch, Sedge Meadow, and Fescue. Willow is common along most drainageways. The Spruce type is limited to finger-like stands extending up the larger streams. Excellent lichen stands undoubtedly occurred in the recent past, but heavy caribou usage has severely reduced the amount of primary lichens (Cladonia alpestris, C. sylvatica, and C. rangiferina) available. Other lichen forage remains plentiful, however, and sedges are very abundant also.

During the past winter this area supported the bulk of the Nelchina herd, in excess of 20,000 animals. Several thousand were present as early as November, but most did not arrive until January. The main concentration lay to the north in the Nadiwen Lake-upper Butte Creek area, with bands extending north onto Monahan Flat and west to Brushkana Creek. Heath, Dwarf Birch, and Sedge Meadow were the chief types utilized, and I suspect that sedge was at least equal in importance to lichen as a food plant. This concentration of caribou remained through late March, and the intensive use during that period probably had a noticeably adverse effect upon the lichen stands.

Range Unit 11: Talkeetna River.--This unit includes the drainages of the upper portions of the Talkeetna River and covers about 1,500 square miles. The terrain consists generally of high, rugged mountains with peaks to well over 8,000 feet, interspersed with many flat-topped hills and long, rounded ridges and cut by deep valleys of the major streams. The snow-cover is moderate to heavy, but the frequent winds bare many of the upper slopes and ridges.

Spruce extends up all the streams to about the 3,000-foot contour level, but most of the area is above timberline. Heath, Sedge Meadow, and Dwarf Birch are the dominant vegetation types, the last forming a transition zone above the Spruce. Lichens are plentiful, but are showing the effect of heavy use during the past five winters; climax stands of lichen are common on the slopes of the Talkeetna River valley. Sedge Meadow is dominant on the many "plateaus" and other poorly drained sites.

A group of over 10,000 caribou was present in this area throughout the winter, during which time there were animals in almost every section. Most foraging took place above timberline and the Heath and Sedge Meadow were the types most affected. Although fewer animals wintered there this year, continued heavy use can only result in a steady decrease in the lichen forage. Fortunately the Sedge Meadow is common and well interspersed, and so acts as a buffer.

Range Unit 13: Lake Louise Flat.--This area consists of a nearly level plateau lying at an average elevation of about 2,400 feet, encompassing about 3,300 square miles of the southeast quadrant of the Nelchina Range. The region as a whole is poorly drained and contains many lakes and ponds. The snow-cover is rather light (less than three feet), and the dry, powdery texture resembles closely that of the snow common to the "windless" areas of the Interior.

Spruce is by far the major vegetation type, covering at least 75 per cent of the area, with Aspen-Poplar, Sedge, Bog, and Dwarf Birch interspersed. The lichen growth is in poor to fair condition, largely because of heavy caribou usage and frequent fires. Sedge lines most of the many small lakes and ponds and probably provides abundant forage.

A major portion (20,000+) of the herd utilized the Flat during the October to December period, with perhaps the most intensive use occurring in the southern half. During October and November the animals fed extensively on the sedge protruding through the ice and also on the vegetation in muskrat pushups. So extensive was the latter utilization that it probably was a serious depressant upon the muskrat population, which seemed to be quite high last fall, judging from the amount of activity observed. After December the caribou numbers decreased to about 5,000 animals, and most were concentrated in the northeast portion. Needless to say, the Spruce type was the main one utilized, with Sedge and Dwarf Birch being of secondary importance. The unit is suffering from overuse by caribou, as far as lichens are concerned,

and this general depletion possibly was the main cause of the westward shift from this once-favored wintering area to areas containing better lichen forage.

Areas of Moderate Winter Use.

Range Unit 6: Tangle Lakes.--This unit comprises about 1,000 square miles of the northeast quadrant of the Nelchina range and consists mostly of gentle slopes and rolling terrain, with a few rugged mountains here and there. The elevation averages about 3,500 feet. Most of the region has been glaciated heavily, as evidenced by the many moraines and eskers remaining. Snowfall is rather heavy compared with other portions of the range, and the frequent strong winds build deep, hard drifts.

The area lies mostly above timberline, and the Dwarf Birch type covers about 75 per cent of the ground. On exposed slopes and above 4,000 feet elevation the Heath becomes dominant. Willow, Sedge Meadow, and Fescue occur commonly. Sedge is present around some of the lakes. Spruce is scattered in distribution, mainly along the valleys of the major streams. Excellent stands of forage lichens occur on the southern third of the unit; good stands occur on the middle third, heavy use being the main cause of depletion; and only poor to fair stands on the northern third.

Winter use of this area was limited to several thousand animals during the November-December period. Most of these animals grazed the lichen-covered Moraine Flat, west of the Tangle Lakes, which consists primarily of the Dwarf Birch type, but it is doubtful that they were able to effect much change in the lush lichen growths present there. After early January only scattered individuals remained.

Range Unit 8: Upper Susitna Bottomland.--This section encompasses about 1,000 square miles on both banks of the upper Susitna River, from the Alaska Railroad upstream to the mouth of Valdez Creek, the boundaries on both sides approximating timberline. The elevation varies

from 800 to 3,400 feet, averaging about 2,400 feet. Snowfall usually is less than three feet, and bared areas are few.

The Spruce vegetation type covers about 90 per cent of the ground, and Sedge, Bog, and Willow comprise most of the remaining area. Forage-lichen stands are poor or fair; the spruce tends to be too thick and the ground too damp over much of the area to support a good lichen growth.

Caribou usage is limited largely to transient animals, for the unit lies across many of their major routes of travel. During the October-December period last year, however, caribou settled for brief periods in the Fog Lakes area and in the area encompassing the lower portions of Clearwater Creek and the Maclaren River. Both these areas contain fair amounts of the forage lichens. The unit as a whole probably will never be an important wintering ground.

Areas of Minor Winter Use.

The remaining portions of the Nelchina Range were utilized but little by caribou during the 1960-61 winter, although individual animals or scattered small bands were present throughout at various times. Those range units adjacent to major wintering areas, such as Units 3, 7, 9, and 15, sometimes had fair numbers of caribou along the peripheries, but nothing that would constitute more than minor range use. Good wintering grounds, based upon the abundance of lichens and sedges, occur in Units 3, 4, 9, 10, and 15. Unit 12 has abundant sedge but practically no lichens, and consistently has been an area where one seldom sees a caribou track in winter; presumably lichen forage is desired to a certain extent during that time of year.

RECOMMENDATIONS:

The problems confronting this study were described sufficiently in the completion report for W-3-R-12, June 30, 1958, and need not be repeated here. The writer believes the potential value of this project to be great,

provided that sufficient time were available and conditions such that significant data could be obtained. Little is known at present regarding the effect of caribou upon the range, and certainly that information is of utmost importance in attempting to manage caribou herds. Greater emphasis should be placed upon this job in the future.

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James W. Brooks, Director
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Volume 2 Report No. C-2g

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 2-g Title: Mortality--Nelchina Herd

PERIOD COVERED: May 1, 1960, to April 30, 1961

ABSTRACT:

Only two of sixty-two caribou carcasses examined last year were considered to be in poor condition. One of these had a mange infection and the other, an intestine blockage. Another animal had a lung-worm infestation that possibly would have caused death eventually. All the animals examined were parasitized in one way or another, but even those with heavy infestations of warble and nose-bot larvae were not in poor condition. Ten wolf kills were noted from the air, and three natural deaths. Of 8,610 animals observed closely only 6 were noted to limp, indicating a low incidence of cripples.

No attempt was made to evaluate these limited data in terms of the whole herd, but natural mortality probably is at a minimum. The Nelchina caribou generally seem to be in excellent condition.

OBJECTIVES:

To determine the incidence of mortality from various factors, other than hunting, which operate against the Nelchina caribou herd.

TECHNIQUES:

Carcasses of caribou were examined whenever possible to check for evidence of parasites, disease, crippling, predation, and other possible factors influencing mortality. Weights, measurements, and specimens were taken as the opportunity arose. Field observations of live animals that seemed to be diseased or crippled were recorded also.

FINDINGS:

The main purpose of this job is to record all instances of natural mortality (other than that due to man) affecting the caribou, in order that these eventually can be evaluated in terms of an annual herd loss. At present this job has been relegated to the background, and data are obtained only in conjunction with other studies.

During the past year sixty-two carcasses of man-killed caribou were examined in the field. All but two of these were in good to excellent condition (more than one-fourth of kidney hidden by fat), and there was no evidence of injury or disease. Parasites were present in all the animals, although the viscera of some was not available for examination. The following record of parasitism was recorded: warbles--100 per cent (62 of 62); nose bots--77 per cent (20 of 26); liver tapeworm--28 per cent (9 of 32); liver bacterial cyst--15 per cent (3 of 20); lung hydatid cyst--5 per cent (3 of 55); lung worms -2 per cent (1 of 55); and mange--2 per cent (1 of 62). The animal with the lung worms, a cow in the 7-9 year age-class, was in good condition when killed on October 2, 1960, and was followed by a calf. The one animal with mange, a bull in the 2 year age-class, was in poor condition and had practically no fat whatsoever; it still bore velveted antlers when killed by a hunter on October 23, 1960. The other animal in poor condition when examined was a yearling bull killed by the writer on October 2. This animal was practically rotting on its feet due to a complete blockage of the duodenum by a large blood clot just below the pylorus, and I suspect

that death was not far away. It was interesting to note that several caribou that were heavily infested with warbles and nose bots (more than 100 larvae) were still in good or excellent condition in late April. One yearling bull killed on April 19 had 350 warble larvae and 109 nose bots, yet its general condition was not poor, even though the visceral fat was minimal. In a severe winter, however, such animals might very well succumb.

Generally speaking, the thousands of caribou observed from the ground and from the air during the year seemed to be in fine condition. Cripples are relatively uncommon in this herd, and only 6 (0.1 per cent) of 8,610 animals observed closely were noted to limp. Of thirteen carcasses sighted from the air, ten were thought to be wolf kills and three, natural deaths. The latter were so judged, because the carcasses were intact and in positions suggesting non-violent deaths.

A wolf census in March resulted in a population estimate by Game Biologist Gerry Atwell of 100 - 125 wolves in the 18,000 square miles of the Nelchina Range. This population has shown a steady increase since the low in 1955, but predation on caribou still seems to be relatively light for few carcasses are sighted. This can be explained partly by the fact that the wolves are preying to a great extent upon moose. As the Nelchina wolf study progresses, however, perhaps more exact data can be obtained regarding the wolf kill.

The Nelchina caribou herd seems to be in excellent condition, with little evidence of disease. Natural mortality, including predation by wolves, probably is at a minimum, and the mild winter of 1960-61, combined with an abnormally low snowfall, further reduced the possibility of a large mortality.

RECOMMENDATIONS:

Knowledge of natural mortality is necessary to caribou management in order to properly assess the annual herd increment. Data are lacking due to the present low

rate of natural mortality, and consequently several years will be needed before proper assessment is possible.

SUBMITTED BY:

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Volume 2 Report No. C-2h

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Studies

Job No: 2-h Title: Characteristics of the Hunter Harvest--Nelchina Herd

PERIOD COVERED: August 1, 1960, to January 31, 1961

ABSTRACT:

The 1960 caribou hunting season extended from August 20 to December 31 and the relatively ideal hunting conditions during this period resulted in the highest kill ever recorded for the Nelchina herd. Harvest data were obtained from two hunter-check stations operated from August 20 through October 3, from field checks of hunters, from guide reports, and from talks with residents. The data obtained are summarized below.

1. The total harvest was estimated at 5,500 caribou, two-thirds of which were taken during August and September.

2. Males comprised 66 per cent of the animals taken; 85 per cent of the animals were judged to be less than 8 years of age, and 47 per cent less than 3.

3. Of the total hunters checked, 93 per cent were residents; 64 per cent were from southcentral Alaska, 31 per cent from interior; 1 per cent

from southeastern; and 4 per cent from "out of State".

4. Thirty-four per cent of all hunters were successful: Southcentral hunters were 36 per cent successful and accounted for 72 per cent of the kill; Interior hunters, 24 per cent successful and 21 per cent; Southeastern hunters, 43 per cent and 1 per cent; and "out of State", 59 and 6 per cent.

5. Of the total hunters checked, 75 per cent hunted by foot from the highway system, with 25 per cent successful, accounting for 51 per cent of the kill; 64 per cent of the airplane hunters were successful, comprising 11 per cent of the kill; 57 per cent of the tractor hunters were successful, comprising 27 per cent of the kill.

6. Commercial transportation was utilized by 9 per cent of the hunters, who accounted for 20 per cent of the kill.

7. Twenty-eight per cent of hunters had their meat butchered commercially.

OBJECTIVES:

To determine the chronology and areal distribution, the magnitude, and the composition of the hunter harvest.

To determine hunter success.

TECHNIQUES:

Two hunter-check stations were operated from August 20 through October 3, 1960, to gain information on the extent and characteristics of the caribou kill. One station was situated at Mile 77 on the Glenn Highway to check hunters using the Eureka and Lake Louise areas. The other was located at Mile 2 on the Denali Highway and was used to check the kill along that highway. Both stations operated on a twenty-four hour daily basis

throughout the period, and detailed information was obtained from each hunting party. Figure 1 is a copy of the card used to record this information and illustrates the type of data gathered. After the close of the check stations at the end of September, two men patrolled the Glenn and Richardson Highways by car until early November to obtain estimates of the caribou kill and to obtain specimens from the carcasses examined.

Interviews with guides, outfitters, and road-house proprietors operating in the Nelchina Caribou range area provided additional information on the caribou take. Guide reports were utilized to fill-in the take of those guides not interviewed.

As an additional indication of the caribou kill, cold-storage and meat-processing plants in the Anchorage area were contacted to obtain estimates of the total number of caribou processed during the hunting season. These data were correlated with that obtained from the check-stations, i. e. the ratio of hunters butchering their meat themselves versus those utilizing commercial facilities, to obtain a total kill estimate.

Lower jaws were collected whenever possible and used to determine the age structure of the hunters' kill. Reproductive tracts and other specimens were obtained whenever possible and preserved for future study.

Much of the planning and administration of this project was done by Edward P. Keough, Game Biologist, who has since left the Department's employ. The data used in this report are filed at the Anchorage P-R office of the Alaska Department of Fish and Game.

FINDINGS:

The Nelchina caribou range encompasses about 18,000 square miles, most of which are inaccessable to the majority of hunters. More than 75 per cent of the hunting is done from the three highways--Glenn, Richardson, and Denali--which border the main part of the range. Most hunters remain close to the road, but some use swamp buggies and track vehicles to reach areas farther back.

Figure 1. Copy of card used at hunter-check stations during 1960 hunting season showing type of information recorded for each hunting party.

HUNTERS RESIDENCE:

Recorded By: Time: Date:

Butchering: Commercial.....Private.....

Area Hunted: .....Hwy. Mile.....

NUMBER OF HUNTERS:

Total	M	C	B	Other (specify)
.....	.....	.....	.....	.....

Days Out	RESIDENT No.	RESIDENT W/Guide	NON-RESIDENT No.	NON-RESIDENT W/Guide
.....	.....	.....	.....	.....

HOUSING AND MESSING FACILITIES:

None Tent Trailer Truck Unit
Lodge Cabin

METHOD:	Foot	Horse	Boat	Tractor	Plane	Car
Private	....	.....	....	.....	.....	.....
Commer.	....	.....	....	.....	.....	.....

Name of Guide or Outfitter.....

Hunter	Species Taken	Sex	Age
1			
2			
3			
4			
5			
6			

Specimens

Remarks

Others utilize boats along the few waterways, i.e. the Lake Louise system, the upper Susitna River, the Maclaren River, and the Tangle Lakes system. Much of the range is accessible by airplane via the many lakes and river bars, but probably less than 5 per cent of the hunters use this mode of transportation. The only practical means of penetrating some areas is by horseback, and this is done by a few during the early part of the season. Cold and snow begin to hamper the hunting during the last of September, and usually the Denali Highway, the main hunting area for the foot hunter, is closed by snow in the first week of October. The magnitude of the caribou kill depends to great extent upon the distribution and movements of the herd, but the long hunting season--August 20 through December 31--provides reasonable assurance that a major portion of the herd will become accessible to hunters at least once during that period.

Conditions Affecting Harvest

At the opening of the season in 1960 only a few scattered bands of caribou were present in the Caribou Creek-Eureka area, a favored one for tractor and horse hunters. Probably less than 5,000 animals were in that region. The main herd was to the north in the Deadman Lake-Coal Creek-Fog Lakes region, just south of the Denali Highway. Scattered bands of caribou occurred all along that road, however, and hunting was fairly good until the road closed in early October. A major eastward movement in mid-September brought large numbers of animals into the Tangle Lakes area for 3-5 days, but these swung south onto the Lake Louise Flat. The usual southward movement of bulls from the summering area in the north took place in mid-September as expected, and bands of these crossed the Denali Highway between the Maclaren and Susitna Rivers for 10-12 days. The unusually rainy weather through August and September probably caused a somewhat lower total kill than was possible, but any hunter willing to exert a bit of effort should have had ample opportunity to kill a caribou. The Denali Highway thus was the most important hunting area before the snows closed that road on October 7.

In late September and throughout October the main herd was on the Lake Louise Flat, with a major segment in the Eureka area. A late freeze-up and poor weather pretty well eliminated much of the airplane hunting at this time. Hunters concentrated in the Eureka area and along the Lake Louise road; much of the hunting was via track vehicles. Animals were taken also along the Richardson Highway, north of Sourdough, from scattered bands present there.

Most of the herd moved northwestward in late October and early November, but caribou remained accessible to hunters along the Glenn Highway and the Lake Louise Road from Eureka to Glennallen and also along the Richardson Highway near Sourdough throughout the remaining portion of the season. After the lakes finally froze, airplane hunters could reach the caribou with a minimum of effort in many sections of the range. Again, any hunter willing to spend some effort and to face the winter weather had little trouble killing a caribou. The extremely light snow-fall (less than 10" on the ground) and mild weather (usually above zero degrees) through December resulted in near ideal hunting conditions for that time of year.

Characteristics of Harvest

The main effort to obtain harvest data in 1960 was expended during the fall via hunter-check stations, which were in operation from August 20 through October 3. The Denali station served to obtain records of the hunting along the Denali Highway, and the King Mountain station, of the hunting along the Glenn and Richardson Highways and in the Eureka and Lake Louise areas. Hunters passing through the latter station who had been checked earlier at the Denali station were bypassed in order to avoid duplication of data. Tables 1, 2, and 3 summarize some of the information obtained.

A total of 2,530 hunting parties checked through the stations during the 45-day period, that total including 5,209 hunters, for an average of 2.1 hunters per party. Of these, 34 per cent killed 2,438 caribou--1.5

Table 1. 1960 hunter-check station data, Nelchina herd: total hunters, hunter success, and caribou kill--August 20 to October 3, 1960.

Item Tallied	CHECK STATION		Total
	King Mt.	Denali Hwy.	
Total Hunting Parties	638	1,892	2,530
Total Hunters	1,396	3,813	5,209
Hunters/Party	2.2	2.0	2.1
Total Caribou Hunters	942	3,725	4,667
Successful Hunters	354	1,254	1,608
Success Ratio	37%	33%	34%
Caribou Kill	560	1,974	2,534
Caribou/Successful Hunter	1.4	1.5	1.5

Table 2. 1960 hunter-check station data, Nelchina herd: total hunters, hunter success, and caribou kill, as related to hunter residency--August 20 to October 3, 1960.

Check Station	Type Hunting License			Place of Residence				
	Resident	Non-Resident	Total	Interior	Southcentral	Southeastern	Out of State	Total
KING MT:								
No. Hunters	1,271	57	1,328	1	836	4	35	876
% of Total	96	4	100	-	95	1	4	100
Successful	-	-	-	1	305	3	24	333
% Success	-	-	-	100	36	75	69	38
Kill	-	-	-	1	441	3	34	479
% of Total	-	-	-	-	92	1	7	100
No./Hunter	-	-	-	1.0	1.4	1.0	1.4	1.4
DENALI HWY:								
No. Hunters	3,439	310	3,749	1,477	2,155	19	147	3,798
% of Total	92	8	100	39	56	1	4	100
Successful	-	-	-	356	785	7	83	1,231
% Success	-	-	-	24	36	37	56	45
Kill	-	-	-	486	1,229	10	105	1,850
% of Total	-	-	-	26	67	1	6	100
No./Hunter	-	-	-	1.4	1.6	1.4	1.3	1.5
TOTALS:								
No. Hunters	4,710	367	5,077	1,478	2,991	23	182	4,674
% of Total	93	7	100	31	64	1	4	100
Successful	-	-	-	357	1,090	10	107	1,564
% Success	-	-	-	24	36	43	59	33
Kill	-	-	-	487	1,690	13	139	2,329
% of Total	-	-	-	21	72	1	6	100
No./Hunter	-	-	-	1.4	1.6	1.3	1.3	1.5

Table 3. 1960 hunter-check station data, Nelchina herd: total hunters, hunter success, and caribou kills, as related to method of hunting--August 20 to October 3, 1960.

Station	PRIVATE						COMMERCIAL					Total
	Foot	Horse	Boat	Tractor	Plane	Total	Horse	Boat	Tractor	Plane	Total	
KING MT:												
No. Hunters	291	6	246	190	84	817	1	0	11	51	63	880
% of Total	36	1	30	23	10	93	2	0	17	81	7	19
Successful	45	2	113	97	39	296	1	0	11	32	44	340
% Success	15	33	46	51	46	36	100	0	100	63	70	39
Kill	66	6	168	133	59	432	1	0	16	45	62	494
% of Total	15	1	39	31	14	100	1	0	26	73	100	-
No./Hunter	1.5	3.0	1.5	1.4	1.5	1.5	1.0	0	1.5	1.4	1.4	1.5
DENALI:												
No. Hunters	3,127	0	82	260	2	3,471	11	2	202	125	340	3,811
% of Total	90	0	2	8	-	91	3	1	59	37	9	81
Successful	819	0	47	130	2	998	7	1	138	88	234	1,232
% Success	26	0	57	50	100	29	64	50	68	70	69	32
Kill	1,142	0	76	239	4	1,461	7	1	260	154	422	1,883
% of Total	78	-	5	17	-	100	2	-	62	36	100	-
No./Hunter	1.4	0	1.6	1.8	2.0	1.5	1.0	1.0	1.9	1.8	1.8	1.5
TOTALS:												
No. Hunters	3,418	6	328	450	86	4,288	12	2	213	176	403	4,691
% of Total	80	-	8	10	2	91	3	-	53	44	9	100
Successful	864	2	160	227	41	1,294	8	1	149	120	278	1,572
% Success	25	33	49	50	48	30	75	50	70	68	69	34
Kill	1,208	6	244	372	63	1,893	8	1	276	199	484	2,377
% of Total	64	-	13	20	3	100	2	-	57	41	100	-
No./Hunter	1.4	3.0	1.5	1.6	1.5	1.5	1.0	1.0	1.9	1.7	1.7	1.5

animals per successful hunter. These averages show little variance with the data obtained in past years, although 1960 was the first year that substantial numbers of caribou were taken along the Denali Highway during the first of the season. The Denali station checked 80 per cent of the caribou hunters and accounted for 79 per cent of the kill. In the past the main kill for that period has taken place in the Caribou Creek-Eureka area.

Table 2 summarizes the information obtained regarding hunters' residency. Non-resident license holders were a distinct minority, constituting only 367 or 7 per cent of the 5,077 hunters checked. The "place of residence" information was obtained from a sample of 4,674 hunters, segregated according to the following areas: interior Alaska (north of Alaska Range), southcentral Alaska (south of Alaska Range), southeastern Alaska, and "out of State". Most hunters of Nelchina caribou came from interior (31 per cent) and southcentral (64 per cent) Alaska as expected. Only 1 of the 1,478 Interior hunters checked through the King Mountain station, and the remaining comprised 39 per cent of those hunting along the Denali Highway. The Interior group took 21 per cent of the total caribou killed, averaging 1.4/successful hunter, and the Southcentral hunters took 72 per cent, averaging 1.6. Southeastern Alaska hunters comprised 1 per cent of the total number of hunters, and "out of State" hunters, 4 per cent. Hunter success for the various areas was as follows: Interior, 24 per cent; Southcentral, 36 per cent; Southeastern, 43 per cent; and "out of State", 59 per cent.

Table 3 analyzes the 1960 hunting statistics in relation to the principal method or mode of transportation used. The data reveal that about 75 per cent of <u>all</u> hunters hunted by foot from the road system. Although the success of these foot hunters was only 25 per cent, their kill comprised 51 per cent of the total. Airplanes and track vehicles were the most efficient "methods", with a hunter success of about 64 and 57 per cent, respectively, the kill comprising 11 and 27 per cent of the total. Thus the "foot" and the "tractor" hunters accounted for almost 80 per cent of the kill,

illustrating the importance of caribou being reasonably close to the roads to sustain a substantial harvest. Only 403 or 9 per cent of the 4,691 hunters checked hired commercial transportation, but these took 484 or 20 per cent of the 2,377 caribou killed.

It would be well to emphasize that the above data pertain only to the period of check-station operation--August 20 to October 3, 1960--when about two-thirds of the caribou kill took place. Most of the remaining animals were taken during October by "foot" and "tractor" hunters in the Eureka and Lake Louise areas.

Magnitude of Harvest

The hunter-check stations during August and September and the two-man field crew during October provided most of the known kill figures for last year. Additional figures were obtained from guide reports and talks with guides. Estimates were necessary to fill-in the gaps, of course, and these were based upon talks with residents, vehicle counts in the hunting areas, aerial observations, and availability of caribou. Table 4 presents the estimate of the total hunter kill from the Nelchina caribou herd for the 1960 hunting season. The 5,500 estimate indicated is the highest on record for this herd.

This figure is substantiated in part by an estimate obtained by using a technique devised by Keough. In this method the proportion of hunters butchering their own caribou versus those using commercial facilities first was obtained at the hunter-check stations, i.e. each hunter was asked how he intended to butcher his animal. At the close of the hunting season a check of the commercial cold storage and butchering plants in southcentral Alaska provided figures as to the approximate numbers of caribou processed by them. The two sets of data then were used to estimate the total kill. Table 5 presents the check-station data regarding "butchering".

A total of 1,132 caribou was reported as being processed during the 1960 season by the commercial plants of southcentral Alaska checked. This figure probably

Table 4. 1960 kill estimate for Nelchina caribou herd, based upon known kills and upon estimates.

CATEGORY	DATA SOURCE	TIME PERIOD	CARIBOU KILL Known	Tot.Est.
ROAD	Check Stations.	8/20-10/3	2,534	3,000
	Field checks, talks w/residents, estimates.	10/4-11/7	600	1,700
	Talks w/residents, estimates.	11/8-12/31	-	100
AIRPLANE	Talks w/residents, estimates.	8/20-12/31	-	*300
GUIDE	Guide reports, interviews, estimates.	8/20-12/31	125	*200
CRIPPLING LOSS	Estimates	8/20-12/31	-	200
TOTAL ESTIMATE	-	8/20-12/31	3,259	5,500

*These estimates do not include those animals checked along road system.

Table 5. 1960 hunter-check station data, Nelchina herd: proportion of hunters butchering caribou themselves versus those using commercial facilities.

CATEGORY	KING MT.	DENALI HWY.	TOTAL
HUNTERS USING PRIVATE FACILITIES:			
Resident Hunters	785	2,478	3,263
% of Total Residents	76	72	73
Non-Resident Hunters	32	177	209
% of Total Non-Residents	56	57	57
Total Hunters	817	2,655	3,472
% of Total Hunters	75	71	72
HUNTERS USING COMMERCIAL FACILITIES:			
Resident Hunters	250	961	1,211
% of Total Residents	24	28	27
Non-Resident Hunters	25	133	158
% of Total Non-Residents	44	43	43
Total Hunters	275	1,094	1,369
% of Total Hunters	25	29	28
TOTALS:			
Total Resident Hunters	1,035	3,439	4,474
Total Non-Resident Hunters	57	310	367
Total Hunters	1,092	3,749	4,841

represents the majority of the caribou butchered commercially in this region, but must be considered minimal because the processing information was not available from all plants. Table 2 indicates that hunters from south-central Alaska averaged 1.6 animals/hunter, and so the 1,132 represents 708 successful hunters. Table 5 shows that 28 per cent of the hunters checked intended to have their animals butchered commercially. That proportion indicates that 2,529 Southcentral hunters were successful (100 x 708/28) in hunting caribou. These averaged 1.6 animals each, so the total kill for hunters from south-central Alaska was 4,046. Table 2 indicates further that the Southcentral kill constituted 72 per cent of the total, and hence the total kill was 5,619. This figure could be assumed to be minimal because the base of 1,132 commercially butchered caribou is minimal, but the variables are such that it is difficult to evaluate the result. The data available suggest that the kill estimate of 5,500 caribou is reasonably accurate--plus or minus several hundred animals.

Structure of Harvest

All caribou carcasses checked during the season were examined to determine sex and age whenever possible. Lower jaws were collected by various people and later checked for age. Reproductive tracts were collected as available and preserved for future study. The most intensive effort to obtain this information was made during the hunter-check station operations in August and September, and hence these data predominate. Table 6 presents the sex and age structure of the 1960 kill.

The data reveal that once again the males constituted the major portion of the kill, totaling about 66 per cent of the 2,535 carcasses sexed. Hunter selectivity seems to be the main cause of this bias, for most hunters seem to shoot the largest antlered animals first from any group encountered; caribou distribution also plays a part, for bulls are usually the more accessible early in the season. Only 2 per cent of the animals checked for age were classed as "old" (probably over 12 years of age), but 85 per cent as "young" and "prime"

Table 6. Sex and age ratio of 1960 caribou kill, Nelchina herd, as obtained from the examination of hunters' kills.

	MALE		FEMALE		UNKNOWN		TOTAL	
	No.	%	No.	%	No.	%	No.	%
Age Ratio:								
I. Calf	36	15	20	12	29	42	85	18
II. Yearling	43	18	24	15	9	13	76	16
III. Two-Year	31	13	22	14	10	14	63	13
IV. Prime (3-7)	96	41	64	39	16	23	176	38
V. Mature (8-12)	25	10	30	18	3	4	58	13
VI. Old (13+)	4	2	4	2	3	4	11	2
TOTAL	235	100	164	100	70	100	469	100
Sex Ratio:	1,675	66	860	34	-	-	2,535	100

(probably less than 8 years of age). Such an age distribution is what might be expected from a stable or increasing herd.

RECOMMENDATIONS:

Harvest data are needed each year to properly assess the status of the Nelchina herd, and various sampling techniques should be investigated in order to facilitate this task. Data from commercial meat processing plants provide the basis for one method of estimation that should be explored further. A hunter questionnaire might be considered, also.

SUBMITTED BY:

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Volume 2 Report No. C-3a

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Steese-Fortymile Caribou Studies

Job No: 3-a Title: Assessment of Herd Status

PERIOD COVERED: July 1, 1960 to June 30, 1961

ABSTRACT:

In early May the calving segment of the herd moved out of Canada to the White Mountains. After calving they dispersed throughout the Tanana Hills until late September when the herd started moving and by early October were crossing the Taylor Highway en route to Canada. A small group wintered on the upper Tanana drainage, but the main herd was not located during the winter. However, it was believed to be south and east of Dawson, Yukon Territory. In early spring several hundred were located along the South and Main Forks of Birch Creek and the Seventymile River.

The composition of the herd from the fall counts was 49 per cent cows and yearlings, 28 per cent calves, and 23 per cent bulls. The sex ratio as taken from the hunter report forms was found to be 54 per cent males and 46 per cent females.

The initial calf:adult ratio was computed to be 71:100, the highest recorded for this herd. The calf:adult ratio in October was 56:100 and in April 43:100. These data indicate

a 40 per cent calf mortality during the year, disregarding adult mortality.

Approximately 1,800 hunters secured 1,470 caribou, 40 per cent of which were taken between mile 91 and mile 100 on the Taylor Highway. Military personnel comprised 20 per cent of the hunters, and 96 per cent of the hunters were residents of the State.

After a herd increment for the year of approximately 4,200 animals, it is estimated the herd numbers in the proximity of 50,000 animals.

OBJECTIVES:

To compile and analyze all pertinent data resulting from field investigations of the Steese-Fortymile herd in accordance with the needs of management.

PROCEDURES:

In order to effectively serve the requirements of management, all data bearing on herd characteristics and trends, both past and present, must be synthesized. The findings resulting from investigations of caribou numbers, distribution, movements, sex and age composition, productivity, survival, and mortality have been analyzed in this report to achieve this objective.

FINDINGS:

An attempt was made in other job completion reports, covering the individual phases of research performed, to analyze the findings in each case; hence, this report will attempt to condense and synthesize these findings.

Movements and Distribution

The calving segment of the herd moved northwestward out of Canada to the White Mountains arriving in early May. After calving, a general wide dispersal throughout the Tanana Hills occurred between the Steese and Taylor Highways. No large concentrations or movements were observed during the summer. In late September almost all the herd had begun to move

southeast and by early October were crossing the Taylor Highway. This crossing was completed by October 25; and the herd continued on into Canada, crossing the border via the Ladue and Sixtymile Rivers. A small group wintered on the upper Tanana drainage and the upper Ladue River. The main herd was not located during the winter, but was believed to be south and east of Dawson, Yukon Territory. In late March and early April a sizeable group (several hundred) was located along the Seventymile River. An additional group was along the South and Main Forks of Birch Creek.

Herd Composition

Composition counts made during the year provided the following information. The composition of the calving group was found to be 50 per cent cows, 39 per cent calves, 10 per cent yearlings, and 1 per cent bulls. (Very few bulls accompany the cows to the calving grounds.) Counts obtained as the herd crossed the Taylor Highway in the fall, when the bulls interspersed within the herd, gave the following breakdown: 49 per cent cows and yearlings, 23 per cent bulls, and 28 per cent calves. The sex ratio as taken from the hunter report forms was found to be 54 per cent males and 46 per cent females.

Productivity and Survival

The initial calf:adult ratio on June 2 was computed to be 71:100, the highest recorded for this herd. Complete counts were secured on 28,361 animals (as they crossed the Steese Highway to their summer range) resulting in a calf: adult ratio of 65:100. In October counts taken along the Taylor Highway gave a calf:adult ratio of 56:100, and in April counts made along the Birch Creek resulted in a calf: adult ratio of 43:100. (Bulls are not represented in these ratios.) These figures indicate that 40 per cent of the original calf crop had died before reaching the age of 11 months. These data indicate a calf crop of some 11,174 animals and a residual or increment to the herd of 6,690 yearlings. (These data do not take into consideration adult mortality during the year.)

Hunter Harvest

This herd was not available to hunters until October

when they crossed the Taylor Highway en route to their winter range. Approximately 1,800 hunters secured 1,470 caribou during the highway crossing. This figure includes an estimated 5 per cent crippling loss. Forty per cent of these animals were taken between mile 91 and mile 100. Military personnel comprised 20 per cent of the hunters, and 96 per cent of the hunters were residents. The Fairbanks area furnished 64 per cent of the hunters and the Tok area 25 per cent. The other 11 per cent were from the remainder of the State.

Numbers

By the middle of June 11,174 calves had been added to the herd, of these 60 per cent survived to the yearling age or an increment of 6,690 yearlings. Other caribou mortality during the year is estimated at 2,500 animals. (This allows for predation and other natural mortality plus the 1,470 known take by hunters.) Therefore, the resulting figure for herd increment would be approximately 4,200 animals.

During the year no opportunity to determine total numbers arose; however, from the information obtained from the calving counts, estimates can be calculated. The calving group contained 23,361 animals actually counted and a close estimation of 6,000 more that could not be counted or a total of approximately 30,000 animals. These figures indicate that 50 per cent of the calving group were adult cows (two years of age or older) and less than one per cent were bulls. Assuming that the Steese-Fortymile herd contains about the same ratio of cows to bulls as does the Nelchina herd, 76 bulls to 100 cows, then there are approximately 11,400 bulls in the herd. This gives a total figure for the herd of some 41,400 animals. This figure does not consider that portion of the herd which calved south of the Steese Highway; therefore, an estimation of the size of this herd is in the proximity of 50,000 animals.

CONCLUSIONS:

The available information on the Steese-Fortymile caribou herd indicates a productive, increasing herd numbering approximately 50,000 animals. Utilization is not equal

to the herd's potential annual increment as the animals are not accessible to hunters during a great part of the time, the exception being when they are crossing or adjacent to either the Steese or the Taylor Highways.

RECOMMENDATIONS:

The management practices that can be utilized on this herd due to its migratory nature are restricted to the manipulation of hunting seasons and bag limits. As the herd is normally available to hunters for a short period of time, changes in these regulations would not materially affect the harvest.

The research techniques presently utilized should be continued in order to detect changes in the status of the herd that would require adjustments in present management practices.

SUBMITTED BY:

Franklin F. Jones
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March 8, 1962

APPROVED BY:

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P-R Coordinator

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Division of Game

Volume 2 Report No. C-3b

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Game Investigations of Alaska

Work Plan: C Steese-Fortymile Caribou Studies

Job No: 3-b Title: Movements, Distributions, and Numbers

PERIOD COVERED: April 1, 1960 to March 31, 1961

ABSTRACT:

The calving segment of the herd moved northwestward out of Canada to the White Mountains area arriving there during the first half of May. After calving, a general wide dispersal throughout the Tanana Hills occurred between the Steese and Taylor Highways. There were no large concentrations or movements observed during the summer. By late September most of the caribou had begun to move southeast and by early October were crossing the Taylor Highway. The crossing was completed by October 25th and the herd continued on into Canada via the Ladue and Sixtymile Rivers. A few wintered on the upper Tanana drainage and the Ladue River. The main herd was not located during the winter but was believed to be south and east of Dawson. In late March and early April a sizeable group was located along the Seventymile River, the South Fork and the Main Fork of Birch Creek.

OBJECTIVES:

To determine the seasonal distribution and movements,

total numbers, and gains or losses in numbers resulting from ingress or egress of caribou on the Steese-Fortymile range.

TECHNIQUES:

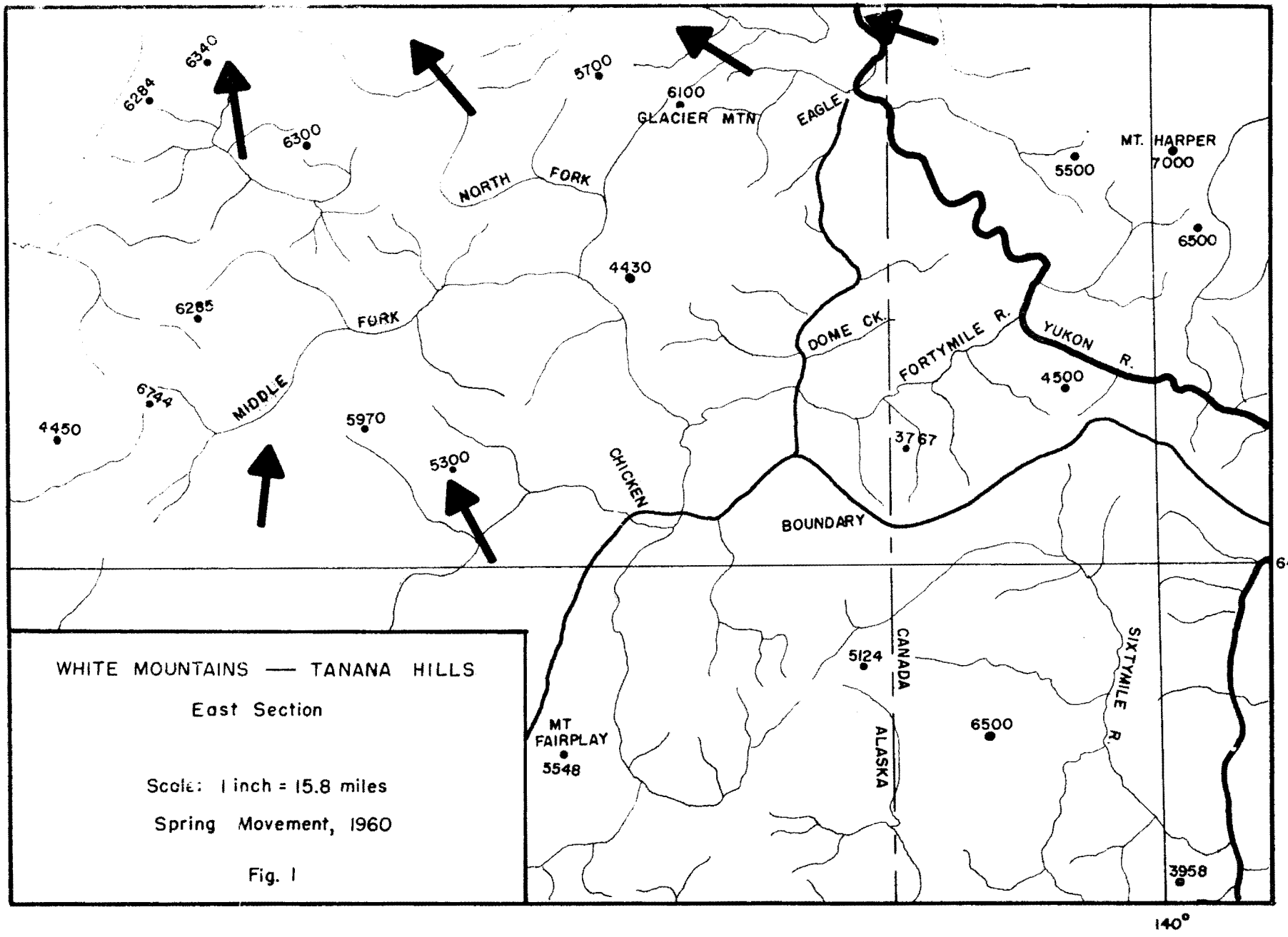
Periodic aerial surveys were conducted during the year in an attempt to locate and trace the Steese-Fortymile caribou movements and to determine the distribution of the animals. Flights were conducted when weather permitted; also reports of cooperating personnel from the Canadian Forestry Service, private and commercial pilots, and Department personnel augmented these aerial observations. The observations by Game Biologists, Pete Shepherd and Wally Bentley, were particularly helpful.

FINDINGS:

The general patterns of movement and distribution from April 1, 1960, to March 31, 1961, were of a more normal nature than in the past year. That part of the herd which remained in Canada during the past year returned to Alaska and calved in the White Mountains, according to previous custom. After calving they dispersed throughout the Tanana Hills for the summer and in early fall, along with the bull portion of the herd, crossed the Taylor Highway and moved across the border into Canada. They wintered in the Yukon Territory, probably south and east of Dawson. The year's movements and distribution are discussed in detail beginning with the spring.

Movements and Distribution

Spring (April-June, 1960). By the middle of April the caribou wintering in the Fortymile, and those few that had spent the winter months scattered throughout the Tanana Hills, started the spring migration back to the calving grounds in the White Mountains. They were joined by animals from the Seventymile and the larger portion of the herd that had spent the past year in Canada wintering around the Hungry Lakes along the Peel River. By early May this northwest movement was in full stride, and although the nature of the terrain and weather conditions prevented accurate determination and numbers, the movement was recognized as a sizeable one (Figure 1). The calving period found widely dispersed animals throughout almost the entire White



WHITE MOUNTAINS — TANANA HILLS

East Section

Scale: 1 inch = 15.8 miles

Spring Movement, 1960

Fig. 1

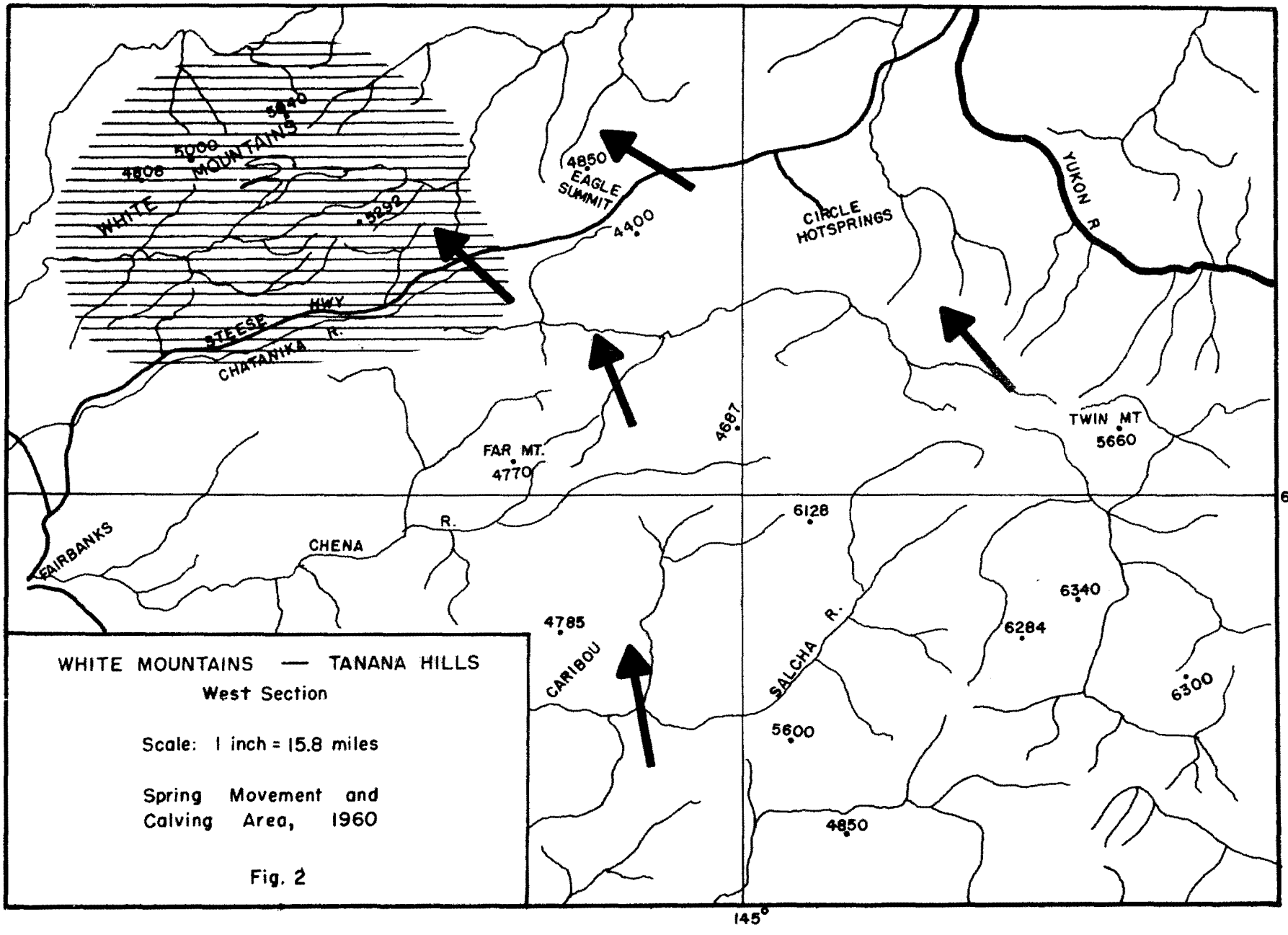
Mountains area with the main concentrations at the head of Faith Creek, Beaver Creek, O'Brien Creek, Bear Creek, and Preacher Creek, as depicted in Figure 2. More animals were still arriving from south of the highway; however, it is known that a few hundred cows had their calves south of the Steese Highway.

The southeast movement from the calving grounds was started earlier than in 1959 as a few animals were observed crossing the highway on June 2 at Twelvemile Summit, with the main groups crossing on the 6th and 7th and another peak on the 10th and 11th. A total of 23,361 caribou was counted crossing the highway and an estimated 5000-6000 animals crossed that were not tallied. The entire herd gradually dispersed into the Tanana Hills (Figure 3).

Summer: (June-August, 1960). Caribou spread out over the entire Steese-Fortymile area south of the Steese Highway during the summer months. There were no large groups located and observed caribou were in small bands. No significant movements were recorded. In late August small groups were reported in the hills southeast of Circle Hot Springs and in the vicinity of Far Mountain and Chena Dome; also, a few near the headwaters of the Salcha River (Figure 4).

Fall: (September-November,1960). Little change in movements and distribution occurred in the first half of September, but in the last half they began to bunch and shift southeast toward the Taylor Highway. Although a few crossed the highway in September, the main crossing did not start until October 6th and continued until October 25th. Crossing bands ranged in size from four to five animals to as many as three hundred, and they seemed to have an objective in sight as there was little loitering in the crossing. These animals crossed from Mile 11 to Mile 150 with the main crossings between Miles 51-60 and 81-110. As shown in Figure 5, after crossing, the herd moved down the Sixtymile and Ladue Rivers and across the border into Canada. The migration was lost in the last of October due to poor flying conditions and restriction of operations in Canada.

Winter: (December 1960-April 1961). Very few caribou wintered on the Alaska side of the Steese-Fortymile range, and reports from Canada indicated that the main herd was

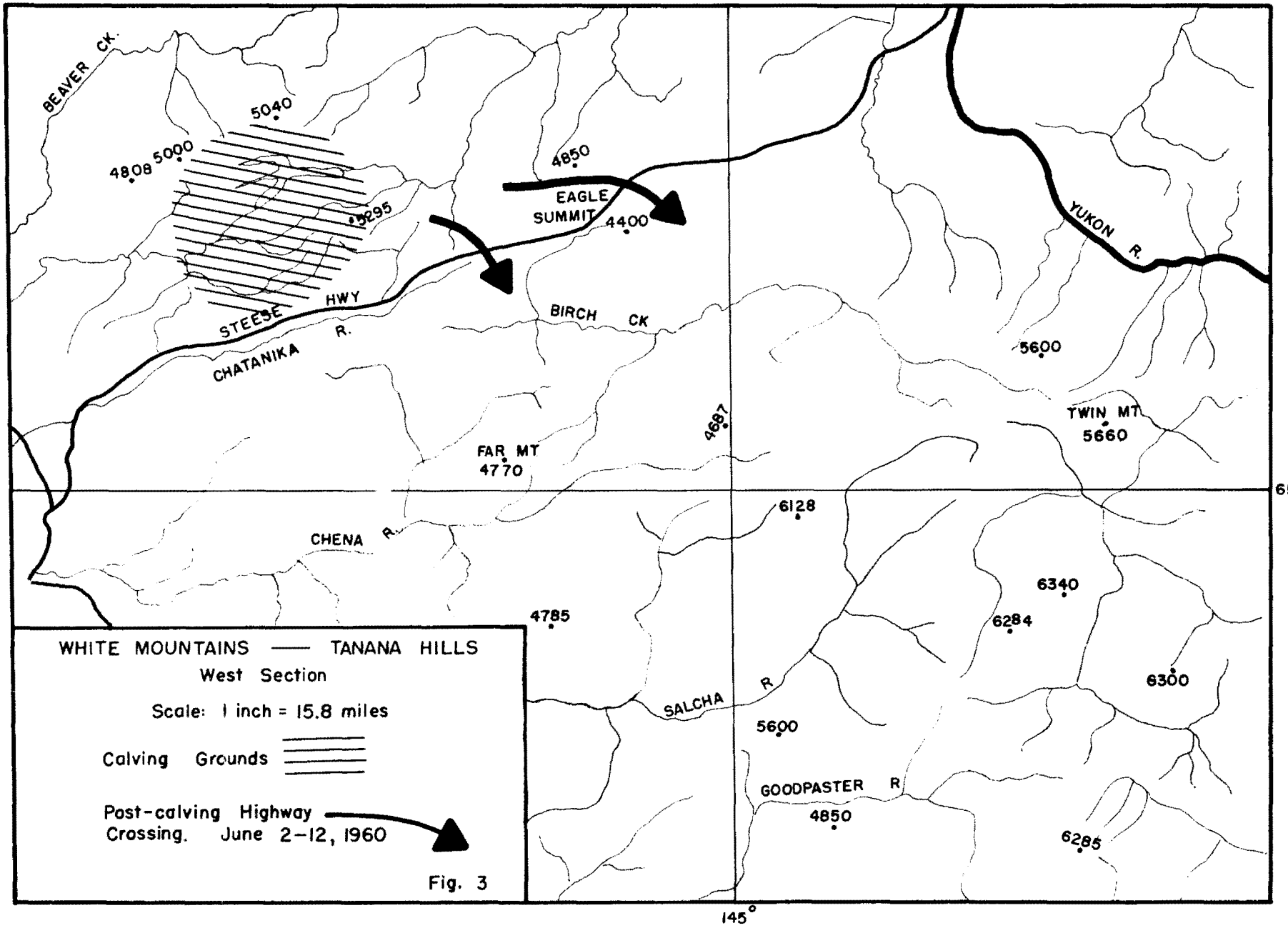


WHITE MOUNTAINS — TANANA HILLS
West Section

Scale: 1 inch = 15.8 miles

Spring Movement and
Calving Area, 1960

Fig. 2



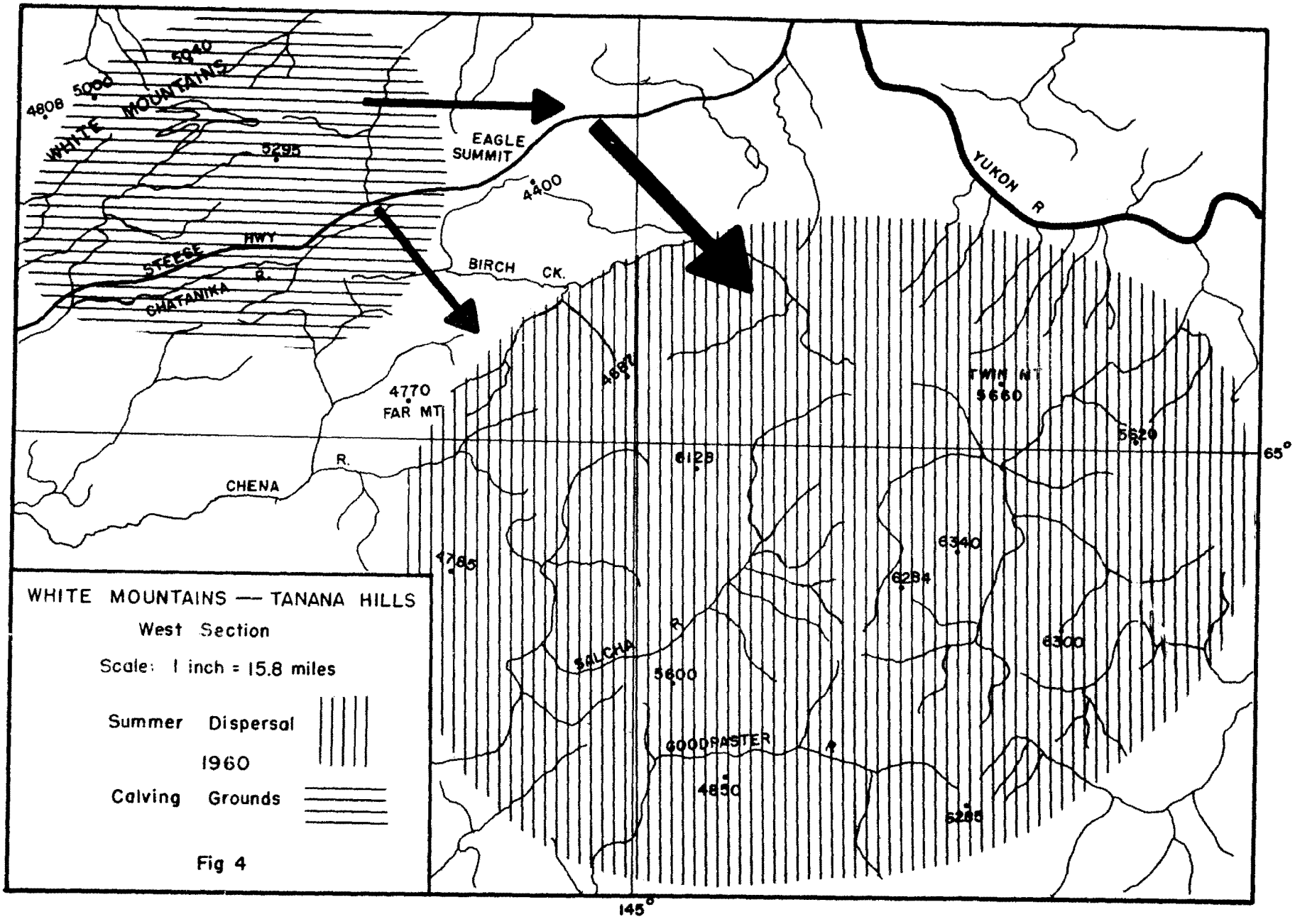
WHITE MOUNTAINS —— TANANA HILLS
West Section

Scale: 1 inch = 15.8 miles

Calving Grounds

Post-calving Highway Crossing. June 2–12, 1960

Fig. 3


5940
5000
4808
WHITE MOUNTAINS
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EAGLE SUMMIT
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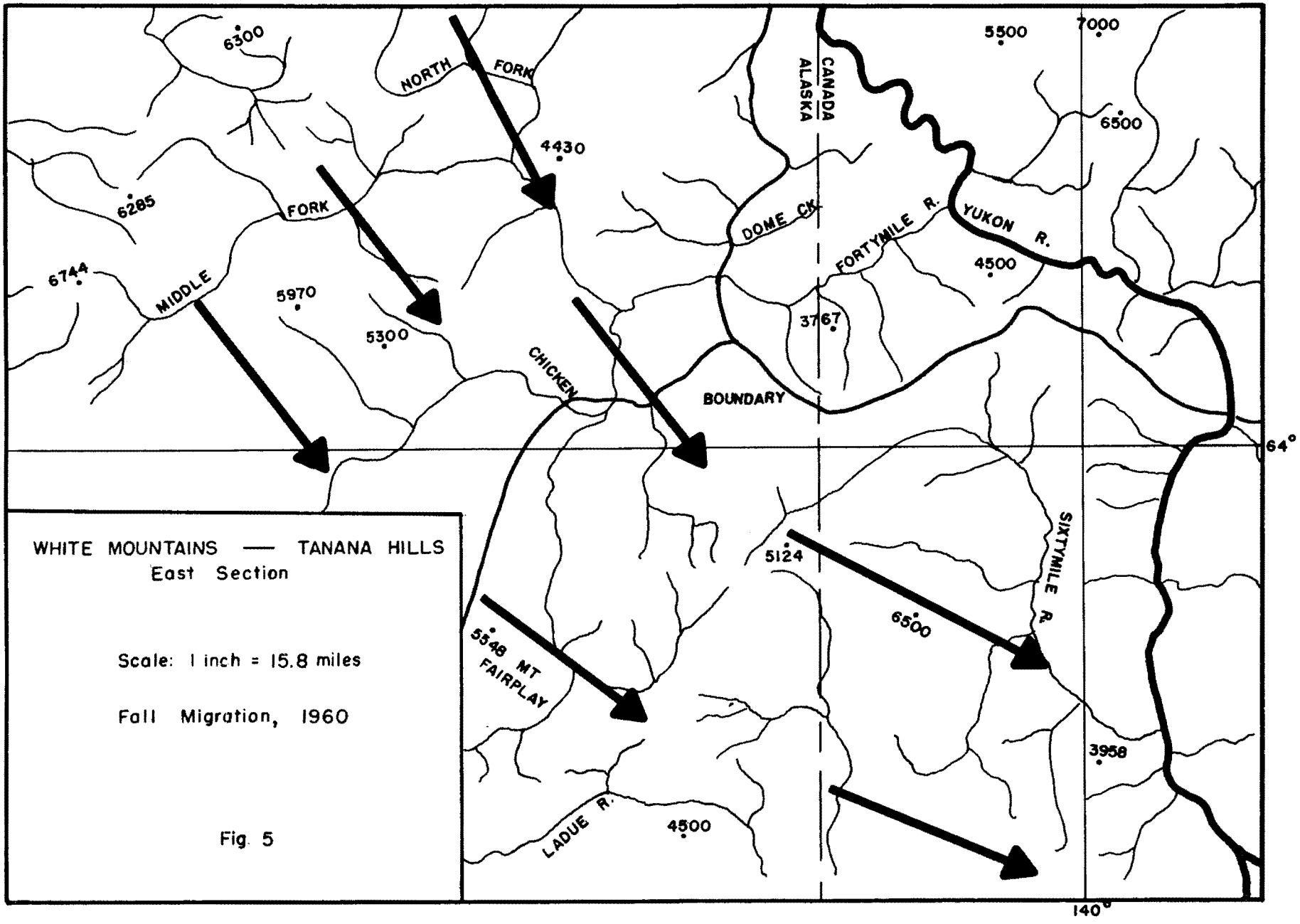
YUKON R
STEESE HWY
CHATANIKA R.
BIRCH CK.
4770
FAR MT
4687
TWIN MT
5660
5620
65°
R.
CHENA
6128
6340
6284
6300
5600
SALCHA R
GOODPASTER R
4850
5285
145°
WHITE MOUNTAINS — TANANA HILLS
West Section
Scale: 1 inch = 15.8 miles
Summer Dispersal 1960
Calving Grounds

Fig 4


6300
NORTH FORK
4430
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7000
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ALASKA
6500
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FORK
DOME CK
FORTYMILE R.
YUKON R.
4500
6744
MIDDLE
5970
5300
3767
CHICKEN
BOUNDARY
64°
WHITE MOUNTAINS — TANANA HILLS
East Section
Scale: 1 inch = 15.8 miles
Fall Migration, 1960
Fig. 5
5124
SIXTYMILE R.
6500
5548 MT FAIRPLAY
3958
LADUE R.
4500
140°

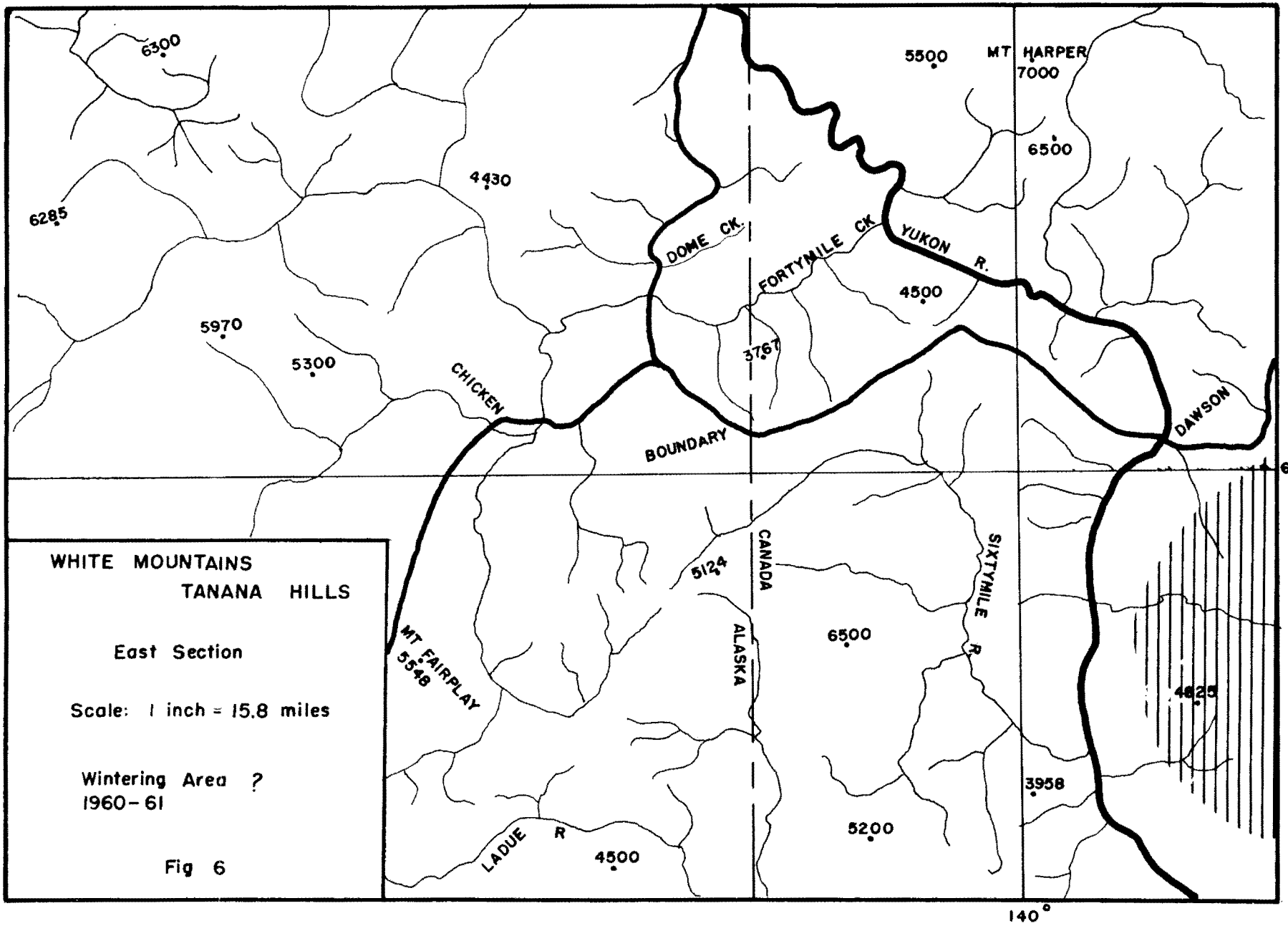
south and east of Dawson (Figure 6). A small number of animals were reported along the Ladue River and on the upper Tanana drainage during the winter, and by late March a sizeable group was found along the South Fork and Main Birch Creek. They were also in the hills south of Circle Hot Springs. In addition, small groups were reported along the Seventymile River.

Numbers

During the year no opportunity to determine total numbers arose. However, from the information available, obtained from the calving counts, estimates can be calculated. The calving group contained a counted 23,361 animals and a close estimation of 6000 more that could not be counted. We found from those counts that the calving group contained 50.3 per cent adult cows (two years old or older) and less than one per cent bulls. If we assume the Steese-Fortymile herd contains approximately the same ratio of cows to bulls as does the Nelchina herd, 76 bulls to 100 cows; then there are approximately 11,516 bulls in the herd. This gives a total herd of 41,000 animals including yearlings and calves of the year. This figure does not take into account that portion of the herd that we know calved south of the Steese Highway; therefore, I feel that a fair estimation of the size of the herd would be in the proximity of 50,000 animals.

RECOMMENDATIONS:

The tracing of herd movements should be continued with particular emphasis on following the fall migration through to its destination. The extent and location of wintering areas in Canada should be determined and the effects of contact with Canadian caribou herds.


6300
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CHICKEN
BOUNDARY
DAWSON
64°
CANADA
5124
SIXTYMILE R.
ALASKA
6500
MT FAIRPLAY
5548
4825
3958
5200
LADUE R
4500
140°
WHITE MOUNTAINS
TANANA HILLS
East Section
Scale: 1 inch = 15.8 miles
Wintering Area ?
1960-61
Fig 6

SUBMITTED BY:

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October 26, 1961

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Volume 2 Report No. C-3c

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 3-c Title: Herd Composition Surveys Steese-Fortymile Herd

PERIOD COVERED: May 1, 1960 to April 30, 1961

ABSTRACT:

Periodic counts made during the year provided information on calf survival to the yearling age and the composition of the herd. Sixty per cent of the calves survived to become yearlings, a higher percentage than that found for the past three years. The sex ratio was 54 per cent bulls, 46 per cent cows or 117 bulls:100 cows as taken from the hunter kill records. Not enough specimens were collected to ascertain the age structure of the herd.

OBJECTIVES:

To determine sex and age ratios in order to ascertain calf survival and herd composition as an index to the current population status of the herd.

TECHNIQUES:

Periodic segregation counts were made during the year to determine herd composition and calf survival. Ground counts were made during the post-calving migration, June 2

through June 12, 1960, at Eagle Summit on the Steese Highway. Aerial and ground counts were made during October along the Taylor Highway, and aerial counts were made during April along the South Fork of Birch Creek. A Piper PA-18 was used for the aerial counts, and the ground counts were made on foot and from Department vehicles. In addition, sex composition was obtained from hunter kill records as recorded at the checking stations maintained at mile 6, Taylor Highway and at Fox, Steese Highway.

FINDINGS:

Composition counts were made during June along the Steese Highway, from Twelvemile Summit to and including Eagle Summit, during the southward migration of the calving segment of the herd from the calving grounds in the White Mountains. A complete breakdown was obtained on 8,524 animals of the 23,361 counted crossing the highway. The figures for this count are presented in Table 1.

Table 1. Composition of calving herd as they crossed the Steese Highway, June 1960.

Class	Number	Per Cent
Cows	4,290	50.3
Calves	3,360	39.4
Yearlings	830	9.7
Bulls	44	.6
TOTAL ANIMALS	8,524	100.0

Calf:Adult ratio	65:100
Calf:Cow ratio	78:100
Yearling:Cow ratio	19:100

Aerial and ground counts were obtained along the Taylor Highway during October to ascertain calf survival during the first five months of life and to obtain sex ratios and total composition. Since this movement occurred after all components of the herd were no longer together, the sex ratio was obtained from the hunter kill, as secured from the checking station records. This sample is likely biased as hunters do not take game at random, but are selective in

choice of animals they kill. The aerial counts indicate 23 per cent bulls, but for comparison these bulls are disregarded as the June and April counts contain almost no bulls. Tables 2 and 3 present these data.

Table 2. Summary of Steese-Fortymile caribou counts, 1960-61 survey.

Date	Survey Method	Total	Adults	Calves	Calf:Adult Ratio
June 2-12, 1960	Ground	8,524	5,164	3,360	65:100
Oct. 19-29, 1960	Aerial & Ground	901	577	324	56:100
April 20-21, 1961	Aerial	349	243	106	43:100

Table 3. Calf survival during 1960-61 as shown by calf counts taken in June 1960, October 1960, and April 1961.

Date and Age	Calf:Adult Ratio	Per Cent Calf Mortality	Per Cent Calf Survival
June 2, 1960 Initial productivity	71:100		
June 12, 1960 Age 1/2 month	65:100	8	92
October, 1960 Age 5 months	56:100	21	79
April, 1961 Age 11 months	43:100	40	60

These figures do not take into consideration adult

mortality during the year; therefore, they indicate a greater survival of calves than actually occurred. Survival to the short yearling age was very good this year, and Table 4 presents calf:adult ratios for the past three years as a comparison.

Table 4. Calf:adult ratio for 1960-61 as compared to 1958-59 and 1959-60.

Date Count Taken	Calf:Adult Ratio
June 15, 1958	57:100
August 19, 1958	33:100
March 29, 1959	19:100
June 16, 1959	41:100
October 9, 1959	38:100
April 10, 1960	37:100
June 12, 1960	65:100
October 29, 1960	56:100
April 21, 1961	43:100

The sex ratio of the Steese-Fortymile kill is shown in Table 5. The early part of the hunt produced bulls and cows in approximately an even ratio. More cows than bulls were taken during the middle portion of the hunt, and more bulls than cows at the last of the crossing.

Table 5. Sex composition of 1960 kill.

	Steese Highway		Taylor Highway		Total	
Sex	Number	Per Cent	Number	Per Cent	Number	Per Cent
♂	20	44	650	55	670	54
♀	26	56	538	45	564	46
TOTALS	46		1,188		1,234	

Personnel at the checking station collected only 53 jaws; therefore, no conclusions as to age structure of the herd can be drawn, but the information is presented in Table 6.

Table 6. Age distribution of caribou jaws collected at the Taylor Highway checking station, October 1960.

Age	Number Female	Number Male	Number Sex Unknown	Total Number	Total Per Cent
Calf	1	3	5	9	17
Yearling		1	4	5	9
2 years	3	1	1	5	9
3 years	3	4	4	11	22
4-6 years	4	5	4	13	25
7-9 years	2	1	3	6	11
10+ years	1	1	2	4	7
TOTALS	16	14	23	53	100

RECOMMENDATIONS:

Ground composition counts should be made during late September and early October when all components of the herd are together in order to secure more complete sex ratio data. In addition, an adequate sample of lower jaws should be collected to determine the age structure of this herd.

Submitted by:

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February 14, 1962

Approved by:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Volume 2 Report No. C-3d

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Studies

Job No: 3-d Title: Productivity of the Steese-Fortymile Herd

PERIOD COVERED: May 1, 1960 to April 30, 1961

ABSTRACT:

Antlered, or pregnant, cows comprised 69 per cent of the total adult cows moving to the calving grounds. New calves were first observed on May 15. The post calving calf:adult ratio was 71:100 and the calf:cow ratio was 91:100; the highest recorded for this herd.

There were 23,361 caribou counted as they crossed the Steese Highway from June 2 to June 12, and an estimated 6,000 that were not counted. Complete counts were obtained on 8,524 animals with the following breakdown: 4,290 cows or 50.3 per cent; 3,360 calves or 39.4 per cent; 830 yearlings or 9.7 per cent; 44 bulls or 0.6 per cent. The calf:cow ratio of 78:100 is the highest recorded since 1953.

Calf mortality, as computed between the initial calf:cow ratio on the calving grounds and the calf:cow ratio when the caribou recrossed the Steese Highway, was 14 per cent, and we found that 60 per cent of the calves born reached the age of 11 months or the short yearling stage.

Herd increment was approximately 4,100 animals this year.

OBJECTIVES:

To obtain quantitative data regarding breeding, fertility rates, parturition, and survival to yearling age; and to determine the factors affecting these elements of productivity.

TECHNIQUES:

During mid-May ground counts were obtained on small samples as the animals crossed the Steese Highway going to the calving grounds. Only the latter portion of this movement was observed as the Highway was not usable early enough to record the main movement. Aerial counts were made of the progression of calving on the calving grounds, and ground counts were made as the calving groups returned across the Highway in the vicinity of Eagle Summit after calving. Survival of the calves was determined by aerial counts during October and again in April.

Movements and Distribution

The Steese-Fortymile caribou herd moved out of the Canadian wintering areas and arrived at the calving grounds in the White Mountains in late April and early May. After calving was over, the calving groups returned across the Steese Highway and dispersed throughout the Tanana Hills southeast of the Steese Highway and northwest of the Taylor Highway. Detailed descriptions of these movements are presented in Completion Report Job No: C-3b "Movements, Distribution, and Numbers."

Pre-calving

Other investigators have shown the percentage of antlered adult cows of the calving herd closely approximates the initial calf:cow ratio; therefore, an attempt was made to secure composition counts on the calving groups as they crossed the Steese Highway en route to the calving grounds. These counts were hampered by the Highway being unusable during the peak of this movement, but a small sample was obtained as the last groups of animals crossed.

Composition counts were made on 31 small bands of caribou as they crossed the Steese Highway between Mile 67 and Mile 94 en route to the White Mountains calving area during May. A total of 405 caribou was tallied, of which 296 were adult cows, 89 yearlings, 6 bulls, 1 calf, and 13 unidentified. Antlered cows comprised 69 per cent of the total adult cows or 56 per cent of the the total animals counted. I believe the proportion of antlered cows in these groups was lower than normal since this sample was obtained from the tail-end of the migration and these fringe groups contain more non-antlered or unpregnant cows, bulls, and yearlings than does the main portion of the herd. Expected fertility rate would be approximately 69 per cent if this was a representative sample.

All calving did not occur north of the Highway as one calf was observed crossing from the south with its mother on May 17, and aerial flights revealed that several hundreds of cows remained south of the Highway.

Calving

The first calves were observed on May 15 when a sample of 402 animals containing 8 calves and 394 adults (98 per cent) was tallied. Therefore, it is believed that calving began on May 15 or possibly May 14. The data obtained on progression of calving are presented in Table 1.

Table 1. Progression of calving obtained by aerial counts.

Date	Total count	No. adults	No. calves	Per cent calves
May 15, 1960	402	394	8	2
May 20, 1960	375	291	84	22
May 23, 1960	467	319	148	30
May 27, 1960	446	291	155	35
June 2, 1960	323	184	139	43

The initial calf:adult ratio was determined by the aerial count on June 2 to be 75 calves:100 adults.

Post-calving composition counts at Eagle Summit showed that 90 per cent of the caribou coming from the calving grounds, excluding calves, were cows (two years old or older), 9.7 per cent were yearlings, and 0.6 per cent bulls. If we substitute the percentage of adult cows for the overall adult percentage obtained on the calving grounds, the initial calf:cow ratio would be 91:100 or extremely high as compared to previous years. The initial calf:cow ratios (for the past 7 years) are presented in Table 2.

Table 2. Comparison of initial calf:cow ratios obtained on the calving grounds.

1954	1955	1956	1957	1958	1959	1960
75.0	72.0	75.0	Unknown	74.0	Unknown	91.0

This initial calf:cow ratio is probably a little high as the sample was taken from the midst of the calving groups; this ratio would have been somewhat lower if the sample had included some of the fringe groups.

All pre-calving and calving data show that the fertility rate and initial productivity of the Steese-Fortymile caribou is more than ample to sustain this herd at the present time.

Post Calving - Highway Crossing at Eagle Summit

Between June 2 and June 12, 23,361 caribou, including calves, were counted as they crossed the Highway. An estimated 5,000-6,000 more crossed that were not counted.

This crossing was in two main groups, with large bands crossing on June 6 and June 7 and larger bands crossing on June 10 and June 11. Undoubtedly some caribou crossed undetected despite the constant surveillance of ground crews

As mentioned earlier, some caribou (apparently several hundred) calved south of the Highway, but no exact estimate of size or extent of this group could be made.

Herd Composition

It was not possible in every instance to obtain complete composition of the crossing groups, but complete figures were obtained on 8,524 animals. These figures are presented in Table 3.

Table 3. Composition of the crossing groups.

Class	Number	Per cent
Cows	4,290	50.3
Calves	3,360	39.4
Yearlings	830	9.7
Bulls	44	0.6
Total Animals	8,524	100.0

Calf:Adult ratio	65:100
Calf:Cow ratio	78:100
Yearling:Cow ratio	19:100

Based on the above figures, the composition for the total calving groups, as counted across the Steese Highway, including the 5,000 estimated, are presented in Table 4 and a comparison to previous years is shown in Table 5.

Table 4. Composition of total animals

Class	Number	Per cent
Cows	14,265	50.3
Calves	11,174	39.4
Yearlings	2,751	9.7
Bulls	171	0.6
Total Animals	28,361	100.0

Table 4. (Continued) Composition of total animals.

Calf:Adult ratio	65:100
Calf:Cow ratio	78:100
Yearling:Cow ratio	19:100

Table 5. Per cent composition of caribou herds calving in the White Mountains, 1954-1960.

Class	1954	1955	1956	1957	1958	1959	1960
Calves	37	30	32	26	36	33	39
Yearlings	11	7	11	3	4	9	10
Cows	51	63	59	70	60	57	50
Bulls	1	T	T	1	T	T	1
Calf:Cow ratio	73:100	55:100	54:100	38:100	62:100	58:100	78:100
Yrlg:Cow ratio	21:100	12:100	16:100	4:100	9:100	17:100	19:100

As will be noted from the above figures, both productivity and survival are excellent. The productivity figure, 78:100, is the highest on record and the yearling:cow ratio, 19:100, is the highest recorded since 1954.

Calf Mortality

A comparison of the initial calf:cow ratio on the calving grounds to the calf:cow ratio two weeks later as the groups cross Eagle Summit reveals a good index to early calf mortality. Since the actual fertility rate is not known (the percentage of pregnant adult cows before parturition), the observed initial calf:cow ratio must be used as a basis for calf mortality during the following year.

The initial calf:cow ratio was 91:100 as found on the calving grounds on June 2, 1960. This figure is extremely high and perhaps not a significant sample as it was taken from the midst of the calving groups; however, the calf:cow ratio two weeks later was 78:100 and was on a sample of better than 8,000 animals. This would be significant using a confidence interval of 95 per cent. The difference in these two ratios would indicate that a 14 per cent mortality

had occurred during the two-week period which compares closely with previous years.

The weather during the calving period was generally warm and from June 2 to June 13 was good with scattered rain showers and should not have contributed greatly to early mortality. In addition, the summer was followed by a warm, mild winter with little snow.

The effect of predation cannot be estimated during the calving period but during the Highway crossing several predators were observed in attempts to take caribou. Twice golden eagles were seen in attacks on calves without success; a grizzly was observed chasing one band of caribou without success; and two wolves were seen following a band, but in this instance, no assault was made.

Calf Survival to the Yearling Stage

Aerial counts were conducted in October 1960, and in April 1961, to ascertain calf survival during the first year of life. In the October counts, bulls were interspersed within the herd and constituted 23 per cent of the herd. The April counts contained very few bulls and were comparable to the previous June counts in that respect. If we remove the bulls from the October counts, we can compare the figures for the year on a calf:adult basis, as presented in Table 6. As these figures do not take into consideration adult mortality during the year they indicate a greater survival of calves than actually occurred; however, as we have no method of determining adult mortality these figures will be used as indices to calf survival.

The October counts were conducted along the East Fork of the Fortymile and Ladue Rivers. A composition count was obtained on 1,177 animals containing 753 adults (of which 276 were bulls) and 324 calves. The calf:adult ratio was 56 per cent, not counting the bulls.

In April, composition counts on 349 caribou were obtained. Of the caribou counted, 106 were calves and 243 were adults, giving a calf:adult ratio of 43 per cent, but as previously stated, the April counts contained very few bulls.

Table 6. Calf survival during 1960-1961 as shown by calf counts taken in June 1960, October 1960, and April 1961.

Date and Age	Calf:Adult Ratio	Per Cent Calf Mortality	Per Cent of Calves Surviving
June 2, 1960 Initial productivity	71:100	-	-
June 12, 1960 Age 1/2 month	65:100	8	92
October, 1960 Age 5 months	56:100	21	79
April, 1961 Age 11 months	43:100	40	60

Calf mortality based on the above ratios from June 2 to October was 21 per cent. By the following April, 19 per cent more had died for a total loss during the year of 40 per cent or 60 per cent of the original calf crop survived to be short yearlings.

This rather high survival is probably due to a low wolf population, a very mild winter with little snow, and low hunter calf-kill.

Herd Increment

By the middle of June, a total of 11,174 calves had been added to the herd, of these 60 per cent survived to the yearling age or an increment of 6,690 yearlings. Other caribou mortality during the year is estimated at 2,500 animals; so the resulting figure for herd increment would be approximately 4,100 animals.

RECOMMENDATIONS:

Investigations should be continued on the breeding behavior during the rut, fertility rates and factors

affecting them, evaluation of initial productivity, and those factors affecting mortality of calves during the first year of life.

Submitted by:

Franklin F. Jones
Game Biologist
February 9, 1962

Approved by:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Volume 2 Report No. C-3e

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 3-e Title: Characteristics of the Hunter Harvest, Steese-Fortymile Area

PERIOD COVERED: August 20, 1960 to December 31, 1960

ABSTRACT:

The 1960 hunting season for hunters of the Steese-Fortymile caribou herd was better than the preceding seasons. The kill data for the 1960 caribou season from the Steese-Fortymile is summarized as follows:

(1) About 1470 animals were taken by 1800 hunters.

(2) About 55 per cent of the animals killed were males.

(3) About 96 per cent of the hunters were residents.

(4) Military personnel comprised 20 per cent of the hunters.

(5) Sixty-four per cent of the hunters were from the Fairbanks area.

(6) Most of the caribou were taken between Mile 91 and 111 along the Taylor Highway.

(7) Crippling loss was an estimated 5 per cent.

(8) Caribou kill was still inadequate relative to herd productivity.

OBJECTIVES:

To determine the chronology, areal distribution, magnitude and composition of the hunter harvest.

PROCEDURE:

Two methods were employed during the hunting season to gain estimates of the magnitude and characteristics of the kill. The primary method was the operation of two hunter checking stations. One at Fox, at the junction of the Steese and Elliott Highways, was maintained from August 20 to September 6; and the other at approximately Mile 6 on the Taylor Highway from August 20 to October 25. At each station the following data were recorded for each hunting party: area hunted, total hunters, number of resident hunters, number of non-resident hunters, days hunted, kill, and objective of the hunters. The other method was field contacts with hunters by Protection Officers and Game Biologists. At every opportunity, biological information and specimens were obtained through collecting lower jaws, weighing and measuring animals, and examining carcasses for injuries, disease, and parasites.

FINDINGS:

Hunter success is wholly dependent on the movements and distribution of the animals during the hunting season, August 20 to December 31, and the condition of the Steese and the Taylor Highways from which access to the animals can be obtained. Few animals are taken by river boat due to the small amount of navigable water in relation to caribou distribution, and only a minor number are taken by means of aircraft as there are relatively few areas suitable for landings; therefore the bulk of the animals are taken when they are adjacent to and crossing the highways.

Steese Highway Area

This year caribou were not available from the Steese Highway in large numbers at any time during the season, though occasional small wandering bands and stragglers provided some hunting. The checking station maintained at Fox for the first 17 days of the season recorded a harvest of 46 caribou, and it is believed that an additional 20 animals were actually taken. Table 1 gives a summary of game checked through the Fox station.

Taylor Highway Area

Relatively light hunting pressure early in the season along the Taylor Highway, and few caribou resulted in but 9 animals being taken until October 7 when the main herd started its crossing. This crossing continued until October 25; thereafter only a few stragglers crossed. The early season hunters were mainly in pursuit of moose and lesser game. Table 2 gives a summary of game checked through the Taylor station.

Hunter Success

Two thousand sixty-three (2063) man-days of hunting produced twelve hundred thirty-one (1231) caribou or .59 caribou/man day as compared to .46 during the peak years of 1955 and 1956 and .23 in 1957. In short, less time and effort was expended per caribou taken than in previous years.

Hunter success measured in number of caribou taken per hunter (total hunters) was .87 and bag limits of caribou (3) were taken by 127 hunters or .09 of the total hunters. This is not an accurate percentage since other hunters undoubtedly took three over the season on successive trips which would show as separate hunters with partial limits.

A review of Table 3 will show that the largest proportion of the hunting pressure this year involved hunters from the Fairbanks area, including the military bases of Ladd and Eielson. Hunters from Tok, Tanacross, Northway, Delta, and Tetlin provided most of the remaining pressure, with very few from the Anchorage-Palmer area because the Nelchina herd was available at the same time. Two hunters came from as far as

Table 1. Summary of hunter kill data obtained at the Fox checking station, August 20 through September 6, 1960.

Game taken by species			
black bear	15		
caribou	46		
ducks	55		
ruffed grouse	116		
spruce grouse	194		
sharp-tailed grouse	8		
goose	1		
moose	24		
ptarmigan	100		
rabbits (hare)	42		
red squirrel	1		
wolf	1		
Total number of hunters		682	
Total number of caribou hunters[1]		188	
number resident		172	
number non-resident[2]		16	(9%)
Total man-days of hunting for caribou		394	
number days per hunter		2.1	
Total caribou checked through station		46	
males		20	(44%)
females		26	(56%)

[1] All caribou taken on the Steese Highway.

[2] Sixteen non-resident hunters (9%) killed 4 caribou or 9 per cent.

Table 2. Summary of hunter kill data obtained at the Taylor checking station, August 20 through October 25, 1960.

Game taken by species			
black bear	4		
caribou	1231		
ducks	3		
grouse	377		
moose	78		
ptarmigan	32		
rabbits (hare)	108		
wolf	3		
Total number of hunters		1874	
Total number of caribou hunters		1404	
number resident		1354	
number non-resident		50	(4%)
Total man-days of hunting for caribou		2063	
number days per hunter		1.5	
Total caribou checked through station		1231	
total sexed		1188	
males		650	(54.9%)
females		538	(45.1%)

Table 3. Residence of hunters passing through checking station, Taylor Highway, October 1 to 25, 1960.

Area	Number	Total	Per Cent
Fairbanks	612		
Ladd Air Force Base	132		
Eielson Air Force Base	101		
		845	64.0
Big Delta	65		
Fort Greely	35		
		100	7.7
Anchorage	14		
Cordova	2		
		16	1.5
Tok	169		
Tanacross	71		
Northway	43		
Tetlin	28		
Dot Lake	15		
Mentasta	3		
		329	25.0
Kotzebue	2		
		2	.1
Haines-Skagway-Juneau	14		
		14	1.5
Chicken	7		
		7	.3
TOTAL		1313	100.0
Civilian	1045		80.0
Military	268		20.0

Table 4. Total kill by area for the Steese-Fortymile during the 1960 season.

Area	Known Kill Number	Total Est. Kill Number[1]	Per cent
Steese Highway	46	64	4.4
Taylor Highway	1231	1338	91.0
Dawson, Yukon Territory	48	68	4.6
TOTAL	1325	1470	100.0

[1] Estimated total take includes additional kill not accounted for at the checking station, and 5 per cent crippling loss.

Table 5. Sex composition of 1960 kill.

Sex	Steese Hwy.		Taylor Hwy.		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Male	20	44	650	55	670	54
Female	26	56	538	45	564	46
TOTAL	46	100	1188	100	1234	100

Kotzebue to try their luck. Twenty per cent of the hunters were military personnel.

Highway Crossing

Caribou crossed this year from Mile 10 to Mile 150 with the greatest concentrations between Mile 50 and Mile 110, and as would be expected the majority of the kills were in this area. The area between Mile 91 and 100 produced 40 per cent, Mile 101 and 110 produced 20 per cent, and Mile 51 to 60 produced 11 per cent. Figure 1 shows the distribution of the kill on the Taylor Highway by 10-mile intervals.

Crippling Losses

Crippling losses were comparatively small this year, in the writer's opinion; however, under present circumstances these losses are almost impossible to assess accurately. Only 36 animals were found by ground parties and only 3 by airplanes when flying the adjacent areas for composition counts and looking for cripples or dead animals. This would represent but 3 per cent and it seems unlikely that the total loss would run more than 5 per cent for the current season.

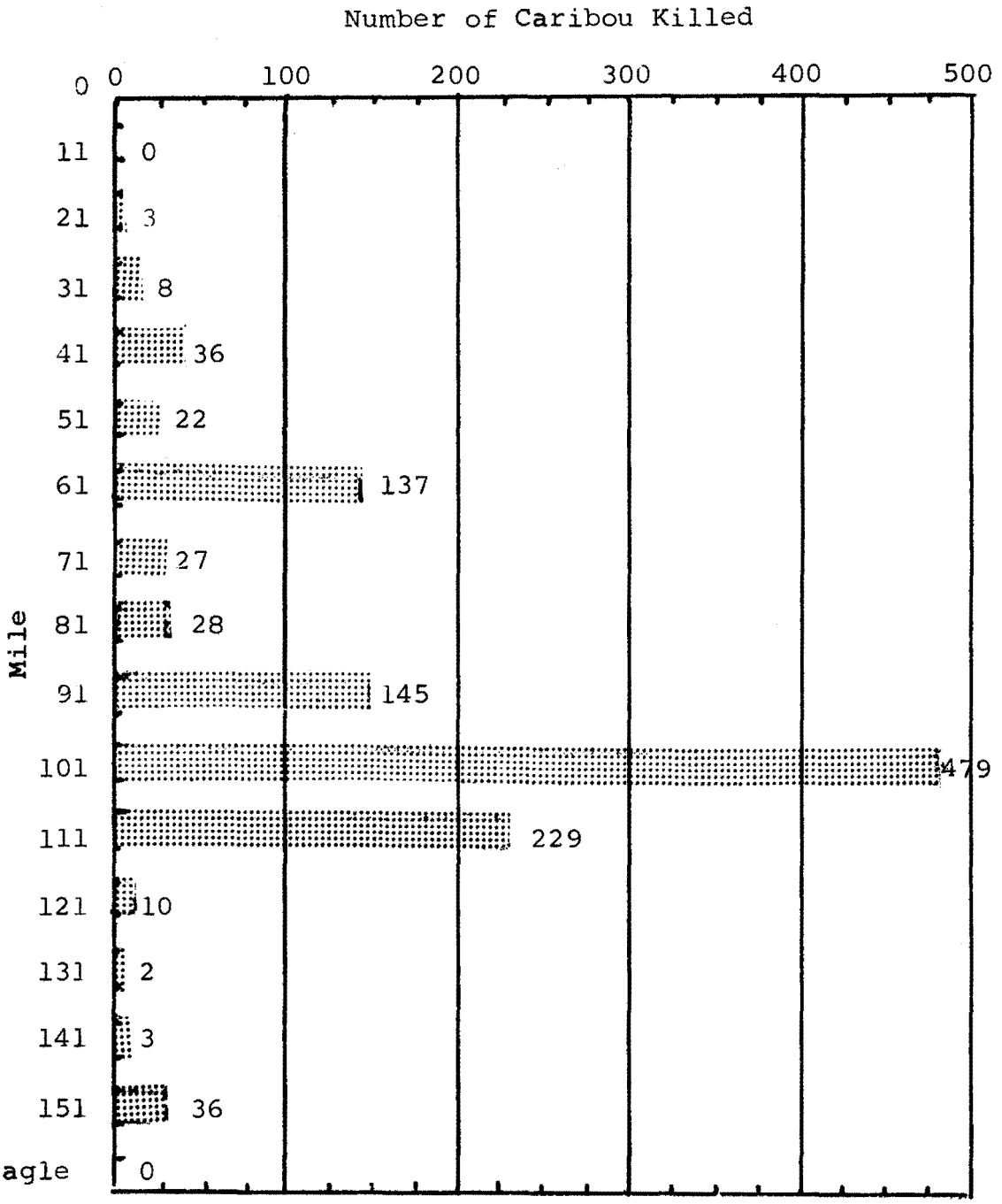
Two factors contributed to this low crippling loss; 1) a great deal of the hunting occurred in open sub-alpine areas where shooting and observing conditions were optimal, and 2) intensive patrol activities by Departmental personnel discouraged abandonment of wounded or downed game.

Size and Structure of Total Kill

The total kill of caribou from the Steese-Fortymile caribou herd was 1470 animals. This includes both the Steese and Taylor Highway area plus an estimated five per cent crippling loss and a reported total of 48 animals from the Dawson area of the Yukon Territory. Ninety-two per cent of the kill occurred on the Taylor Highway and eight per cent on the Steese Highway and in Canada. Table 4 gives the breakdown of the total kill by area.

The sex ratio of the entire kill is shown in Table 5. During the first part of the Taylor Highway crossing the

Figure 1. Caribou kill by mile on the Taylor Highway (Sample of 1185 caribou)



ratio of bulls taken to cows was about even while more cows than bulls were taken during the heavy part of the crossing, indicating some selectivity for cows on the part of the hunters who were primarily after meat. The last of the crossing resulted in more bulls than cows being taken due to greater availability; after the rut the bulls lag behind in the migration.

Fifty-three jaws were collected, but of these 23 were not marked as to sex. Table 6 gives the sex and age ratio for these but no conclusions are possible due to the small size of the sample.

Discussion

The past season has pointed out again that two main factors influence or regulate the kill: movements, and distribution. The 1960 kill was too small for this increasing herd, but methods and means of increasing this kill are not at present available. Few people would take or could utilize more than three animals and lengthening the season would not help as weather and road conditions preclude hunting during the winter months.

RECOMMENDATIONS:

To obtain adequate data relative to sex and age composition.

SUBMITTED BY:

Franklin F. Jones
Game Biologist
November 20, 1961

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Table 6. Age distribution of caribou jaws collected at Taylor Highway checking station, October, 1960.

Age	Male Number	Female Number	Sex Unk. Number	Total Number	Total Per cent
Calf	3	1	5	9	17
Yearlings	1		4	5	9
2 yrs.	1	3	1	5	9
3 yrs.	4	3	4	11	22
4 to 6 yrs.	5	4	4	13	25
7 to 9 yrs.	1	2	3	6	11
10 + yrs.	1	1	2	4	7
Total	16	14	23	53	100

Volume 2 Report No. C-4

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: C Caribou Management Investigations

Job No: 4 Title: Status of Caribou and Feral Reindeer on the Seward Peninsula

PERIOD COVERED: August 1, 1960 to April 30, 1961

ABSTRACT:

The project was inactive during this period.

OBJECTIVES:

To obtain information about the number and location of caribou and/or feral reindeer populations on the Seward Peninsula and adjacent areas; and to determine the size, composition and identity of the caribou or reindeer herd existing near the headwaters of the Inglutalik, Ungalik and Kateel Rivers.

FINDINGS:

Adverse climatic conditions and the needs of other projects caused this project to remain inactive.

RECOMMENDATIONS:

The objectives of this study should be accomplished as soon as feasible.

SUBMITTED BY:

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APPROVED BY:

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