The Finlayson Caribou Management Project
A Summary of Current Information
From 1982 to 1985

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Government of Yukon

Yukon
Renewable Resources

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Finlayson Caribou Management Project

INTRODUCTION:

The purpose of this paper is to provide an overview of the Finlayson caribou herd (FCH) project. We shall describe the problem found with the FCH in context of Yukon's total woodland caribou population and harvesting pattern. Further, the specific rationale considered to implement the adopted management strategy and objectives will be presented. Preliminary results from three years of management are interpreted and correlated to the parameters used to gauge the success of the project.

The status of woodland caribou is determined through systematic inventory procedures on a herd basis. Employing radio-telemetry techniques and surveys, population size, and recruitment information is used in comparison with harvest statistics to assess population status using the simple formula:

$$Recruitment = Adult\ Mortality$$

Populations are stable when recruitment and adult mortality are equal, increasing if recruitment exceeds adult mortality, and decreasing when recruitment is less than adult mortality. A need to actively manage a caribou population may or may not arise from this status assessment.

The FCH project is both a biological and sociological excercise to manage a caribou herd. Within this project the development of expertise in three main areas is expected.

1) To advance population estimate techniques for large woodland caribou herds (to higher precision and accuracy).
2) To gain a better understanding of the predator-prey relationship by examining the influence of wolf predation on woodland caribou calf recruitment and adult natural mortality.
3) To establish communication and build a rapport with native subsistance users for the purpose of influencing harvest practices, monitoring the kill, and developing cooperative conservation measures.

In addition to the goals stated in this paper, the advancement of knowledge and expertise in these areas will benefit woodland caribou management in Yukon.

THE PROBLEM

The FCH is a major woodland caribou population occupying an area of approximately 19,000 km^2 (7,300 mi^2) east of Ross River (Fig. 1, Pg. 2) with a core winter range in the Pelly and Ross River lowlands. Spring migration finds the FCH moving off this winter range in a 180° arc to three relatively distinct core summer ranges in the Upper Ross, Logan Mountain, and St. Cyr. Mountain areas.

Figure 1

Home Range of the
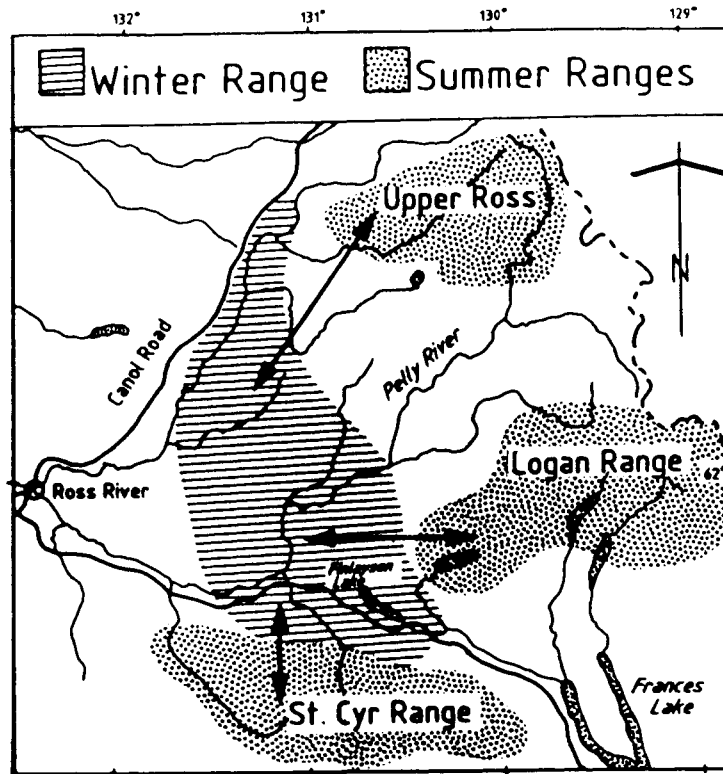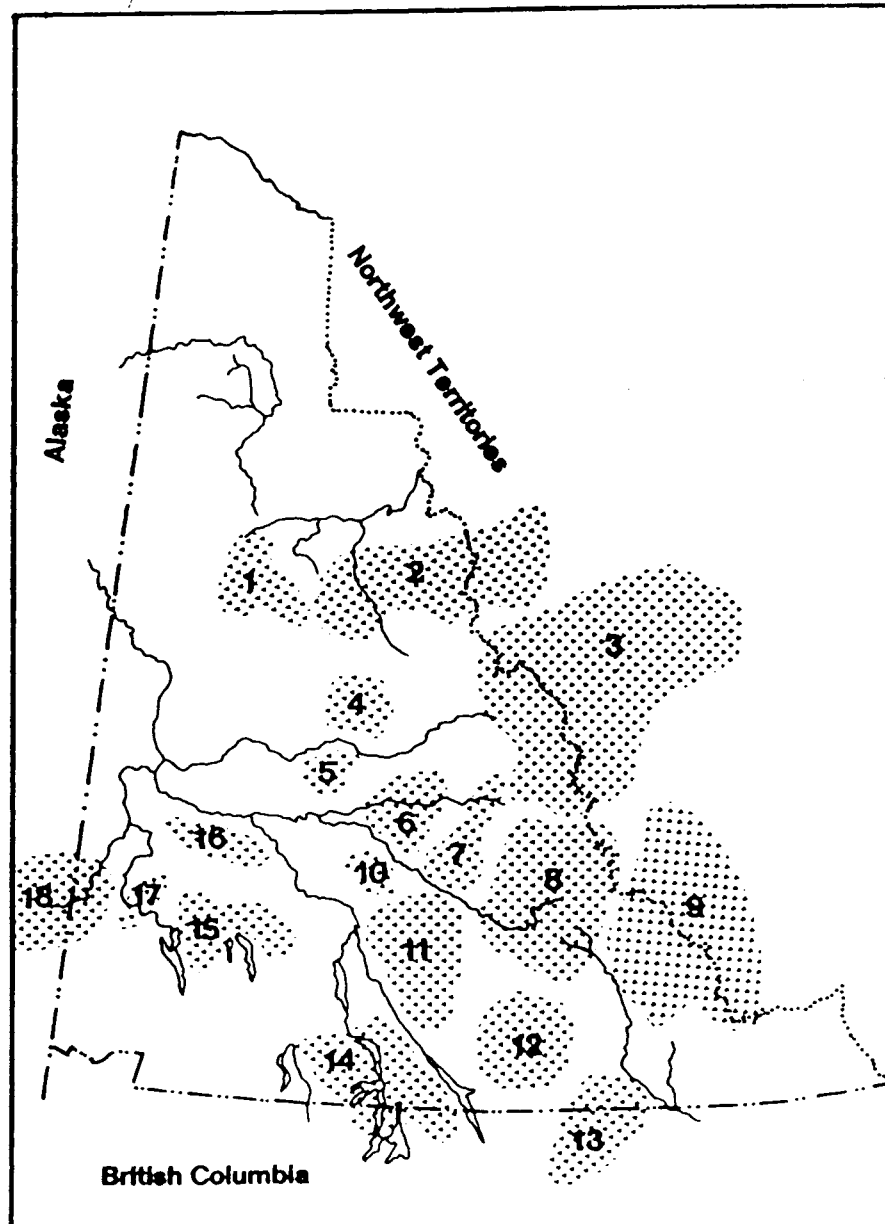Finlayson Caribou Herd.

Figure 2

Distribution of woodland
caribou herds in the
Yukon.

Between March and November 1982 caribou distribution and inventory studies suggested a population size of 2000 to 2500. The mean calf percentage in fall, a major index of recruitment, was low at 9.8%. The annual adult natural mortality rate, based on a sample of mostly radio-instrumented females (5/18), was extremely high at 27.7%. Wolf predation was established to be the cause of death in four cases; the fifth mortality was by an unknown predator. In contrast, Bergerud (1979), determined that where predators are undisturbed, the annual adult natural mortality of caribou is probably 10%.

Currently, the main use of the Finlayson herd is hunting. Annual harvest of the FCH was between 200 and 250 caribou in 1982; 8 to 13% of the herd. Analysis of the harvest pattern indicated that licenced sport hunters annually took between 30 and 60 caribou during the regular hunting season, and native subsistence hunters from Ross River, Watson Lake, Carmacks, Pelly Crossing, and Mayo, took approximately 200 (mostly female) caribou annually. The native harvest was centered near the Robert Campbell Highway where caribou traditionally wintered (Fig. 1).

Based on harvest data and anecdotal information, our status assessment suggested that a decline in the FCH was taking place. Using only conservative statistics, from Bergerud's (1979) adult natural mortality (10%), and harvest rates (11%), the recruitment rate (9.8%) could not offset mortality and implied that under these circumstances the herd was unstable, declining at about 11% annually. This assumption was substantiated by the general impressions of the people living in the area, who indicated that there were fewer caribou than in years past, and that numbers were declining.

An assessment of caribou range carrying capacity support these impressions. In areas of North America where the predator-prey equilibrium is relatively undisturbed and hunting is light, caribou densities often occur at one per 0.39 km^2 (1 per mi^2), (Bergerud 1983). On St. Matthew Island, Alaska, in the absence of predators, caribou numbers increased to 18.0 caribou per km^2 (46.7 per mi^2) before available range was "saturated" and starvation occurred (Klein 1968). The FCH estimated density was 0.13 caribou per km^2 (0.34 per mi^2), below the expected standard or potential upper density limit of range carrying capacity.

In the context of Yukon's entire woodland caribou population, the FCH stands out as a very important herd. Systematic inventory procedures since 1978 have examined 10 of perhaps 22 woodland caribou herds that range wholly, or partially, within the territory (Fig. 2, Pg. 2). Based on assessments ranging in accuracy from total counts to "ball park estimates", we estimate that approximately 25,000 woodland caribou are in Yukon (Table 1, Pg. 4). The total annual harvest estimate, allowing for what we feel may be the native hunter take and including the pre-1983 kill from the FCH, ranges from 485 to 585 caribou. The FCH probably comprises between

Table 1   SUMMARY OF WOODLAND CARIBOU POPULATIONS   A - Total Count
B - Extrapolation
C - Guess

	Herd	Population Estimate	Year Surveyed	Method	Status	Yukon[2] Harvest
1.	Hart River	1,200	1978	B	Stable	10
2.	Bonnet Plume	5,000	1982	C	Increasing	15-20
3.	Redstone	5,000-10,000	1982	C	Unknown	45-50
4.	Mayo	?	-	-	Unknown	0
5.	Ethel Lake	200	1977	B	Unknown	5
6.	Anvil Lake	300	1982	C	Unknown	15
7.	Tay Lake	300	1982	C	Unknown	5-10
8.	Finlayson	2,000-2,500	1984	B	Increasing	250
9.	Nahanni	2,000	1981	C	Unknown	25-70
10.	Glenlyon Range	350	1977	A	Unknown	5
11.	Pelly Herds	1,000	1977	C	Unknown	10-15
12.	Wolf Lake	250	1984	A	Decreasing	5-10
13.	Little Rancheria	450	1978	B	Stable	20-25
14.	Carcross Herds[1] (5 herds)	600	1980	A	Stable	10-15
15.	Aishihik	1,500	1981	A	Stable	35-45
16.	Dawson Range	250	1985	C	Stable	5-10
17.	Burwash	400	1982	A	Stable	15-20
18.	Chisana	1,000	1980	B	Unknown	10

TOTAL POPULATION   21,800 to 27,300   485 to 585
ESTIMATED   (25,000)

[1] Carcross herds refers to all of the caribou comprising the Ibex (100) Montana (80-100), Nares (80-100), Jubilee (50-70) and Squanga (200-300).

[2] Yukon harvest is determined from a five year average of the hunter questionnaire analysis with an allowance for what we know about local native hunting patterns by herd. This is presented as a harvest range from minimum to maximum numbers that could be taken in a year.

8% to 10% of Yukon woodland caribou, but supports 43% to 52% of the Yukon harvest. The indication of a FCH decline was believed to be caused by the heavy hunting of adults combined with poor survival of young.

RATIONALE

A decision was made to enhance the FCH. The rationale for this decision is drawn from four assumptions.

1. Hunter demand and economic benefit

    The FCH was supporting the highest level of exploitation of any Yukon woodland caribou population. Native subsistence hunters from five communities were deriving benefit from this harvest. The population size was still large enough that enhancement measures could feasibly increase the herd to meet this demand within a reasonable time frame and expenditure of resources

2. Range Considerations

    Indications from people in the area are that the herd may have been larger at one time. We suggest that range carrying capacity could support over twice the present number of caribou.

3. FCH Ranges Entirely Within Yukon

    Other jurisdictions need not be involved in FCH management activities as the population ranges entirely within Yukon. Measures taken to enhance the herd would be directed under one agency and therefore implementation would be less complex.

4. Short-Term Management Implications

    In view of the option available to enhance the herd, the management strategy used to achieve this objective had to deal with the most likely variables that would initiate a response. While limiting factors such as habitat carrying capacity (starvation), snow conditions on winter range, windchill during the calving period, disease and parasites, have all been identified as playing significant roles on caribou population regulation, there is little a wildlife manager can do to manipulate these factors.

    Excessive harvest and natural predation appeared to be the most likely factors limiting the FCH in 1982. In short, hunters and predators were competing for a common resource. Overharvest in conjunction with high predation rates has been shown to cause dramatic declines in caribou populations in Alberta, (Edmonds 1984), B.C. (Bergerud 1987a), and Alaska (Davis, et. al., 1985, 1978, 1979). Wolf predation has been shown to have a singularly

large influence on woodland caribou calf recruitment, and adult mortality, (Gauthier 1984, Elliot 1984, Page in prep.). It is fundamental that human harvest and wolf predation be addressed in devising an effective, short term recovery strategy for the FCH.

MANAGEMENT STRATEGY

Three management actions were adopted to enhance the FCH:

1. Restrict the sport hunter harvest to bulls only in Game Management Subzones within the home range of the FCH.

2. Encourage native subsistence hunters to reduce their harvest of FCH caribou and select for bulls.

3. Using aerial hunting techniques reduce the regional wolf population to below 30% of the pre-reduction level for a period of five years.

These measures would be applied and monitored for a five year period. It was felt that the herd could increase to a size (5000 caribou) that could sustain the previous level of exploitation (250 caribou), at a higher predator-prey equilibrium. Concurrently population parameters would be monitored to gauge herd response and post-recovery status. In summary, wolf reduction was initiated to reduce calf and adult natural mortality, and harvest restrictions were instituted to reduce a presumed overharvest of caribou.

RESULTS

This section presents the updated results from the application of three management actions designed to influence two parameters, (1) harvest reduction and (2) wolf reduction. Five parameters were used to gauge the FCH response to these actions: (1) population size, (2) post-calving composition, (3) rut composition, (4) late winter composition, and (5) the adult natural mortality rate. These results shall be put into context by explaining the reasons why we measure the parameter, the procedures used to collect the information with an assessment of the value of the data, and an interpretation of what the result indicates. While it would be desirable to have the full complement of data for a definitive analysis of the FCH response, the record is incomplete. Because the information presented here represents the third year of a five year program, and demographic trends take several years of observation to be conclusive, the data is preliminary, and therefore should be treated as such. We do feel, however, that a qualitative analysis in relative terms can be made from the present record. Because data are incomplete, precise population growth rate trends cannot be predicted.

Management Actions

1. Harvest Reduction

    Detailed and accurate estimates are needed to assess the
impact of the harvest restrictions. The annual hunter take
within the range of the FCH have been tallied by a direct-count
method. Conservation Officers have monitored the activities of
sport hunters and recorded kills since fall 1983. Prior to this
time, sport hunter take was estimated from an average derived
from the hunter questionnaire analysis. The native subsistence
harvest prior to 1983 was determined from interviews. The
current estimates are determined by intensive monitoring over
the key harvest periods (spring break-March, and Easter
holiday-April). The estimate also entails the presence of a
staff member on the FCH range throughout winter. Highway
patrols and aerial reconnaissance are likewise used to derive
the native harvest estimate. The harvest pattern on the FCH
require that the period used be August 1, when sport hunting
season begins, to April 30, when the native subsistance harvest
is finished. Data is available for harvest periods beginning
1982-83, representing a pattern of the three year average prior
to harvest restrictions, with 1983-84, and 1984-85 (Fig. 3, Pg.
8). The sport hunter take in the fall 1985 season is also
given.

    The annual harvest of FCH caribou has decreased from 254 in
1982-83, to 35 in 1983-84, and 90 in 1984-85. Sport hunter take
in fall decreased from 56 in 1982 to 10 in 1983, 19 in 1984, and
22 in 1985. This decrease was likely caused by the bull only
hunting regulation set in 1983. The mine closure at Faro and
the subsequent departure of most residents partially accounts
for the sport hunter harvest reduction. The native subsistance
harvest since 1982-83 (200) declined in 1983-84 (25) and
increased slightly in 1984-85 (71). The recent increase in
native harvest levels may be because the FCH wintered in close
proximity to Ross River (<16 km) for the first time in 10 years.
The dramatic 1983-84 reduction in native harvest is attributed
to a willingness of the user groups involved to cooperate in
this conservation measure.

2. Wolf Reduction

    The need to monitor the level of wolf reduction is critical
to assess how decreased wolf numbers correlate with survivorship
trends of caribou calves and adults. Estimates of the wolf
population size in the FCH management area were made by repeated
aerial reconnaissance during late winter. This estimate was
supported by observations from ground personnel stationed in the
area over the winter period. We attempted to remove entire
packs by shooting them from a helicopter. Wolves were
retrieved and pelts were skinned, stretched, dried and sold on
the open fur market. Carcasses were necropsied for an analysis
of age and sex distribution, condition indices, reproductive
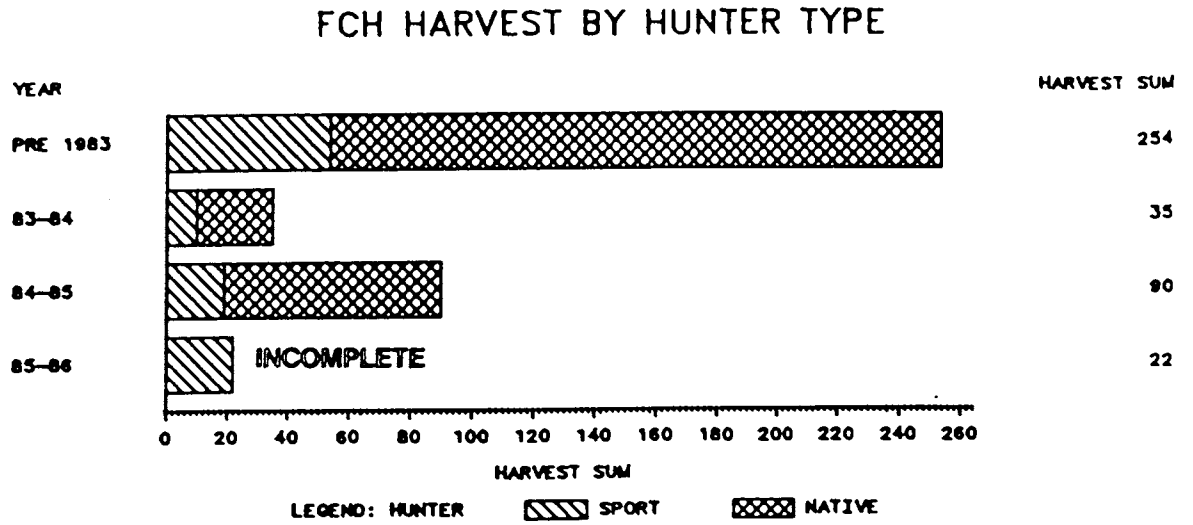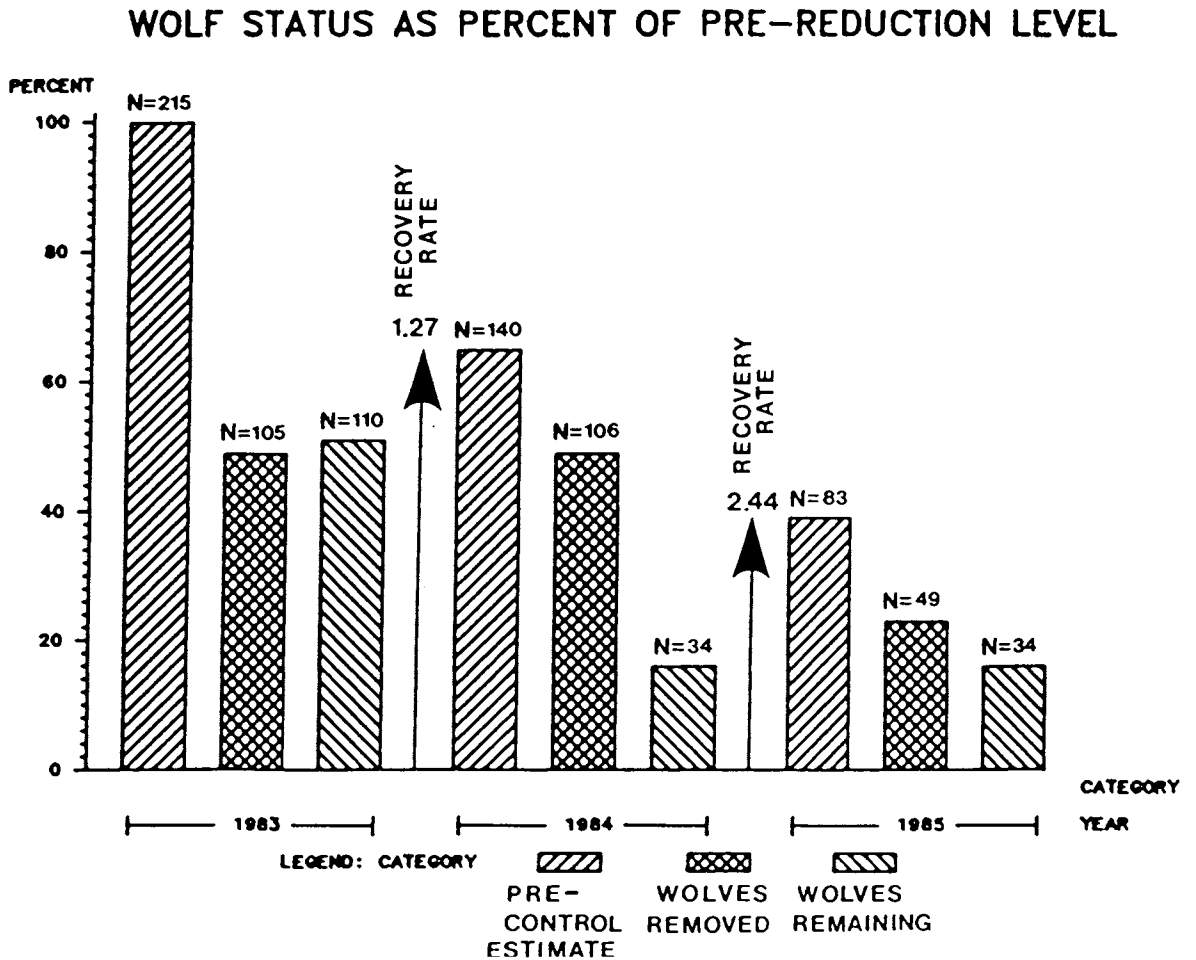history, and food habits (Hayes and Farnell, 1985a, 1985b).

Figure 3

FCH HARVEST BY HUNTER TYPE

YEAR		HARVEST SUM
PRE 1983		254
83—84		35
84—85		90
85—86	INCOMPLETE	22

HARVEST SUM

0 20 40 60 80 100 120 140 160 180 200 220 240 260

LEGEND: HUNTER SPORT NATIVE

Figure 4

WOLF STATUS AS PERCENT OF PRE-REDUCTION LEVEL

PERCENT

N=215
N=105
N=110
RECOVERY RATE 1.27 N=140
N=106
N=34
RECOVERY RATE 2.44 N=83
N=49
N=34

1983 ——— 1984 ——— 1985 ——— YEAR

CATEGORY

LEGEND: CATEGORY
PRE-CONTROL ESTIMATE   WOLVES REMOVED   WOLVES REMAINING

The estimates of wolf numbers are considered minimum but reasonably accurate. Aerial control techniques were successful at reducing numbers. Repeated resurveying into early spring produced no new evidence that significant number of wolves were missed. Likewise, hunter and trapper observations indicated that there were markedly fewer wolves after removal efforts. Wolves were removed during late February and March since 1983. The wolf population within the FCH management area was estimated at 215 wolves in March 1983 (Fig. 4, Pg.8). Control efforts removed 105 (49%) wolves leaving 110 (51%) in the area. The population recovered to 140 wolves by 1984. Subsequent control efforts removed 106 wolves leaving 34 wolves; 16% of the pre-reduction level. The remnant population recovered to 83 wolves by 1985, with ingress undoubtedly playing a major role. Control efforts removed 49 wolves in 1985 leaving 34 wolves; 16% of the pre-reduction level.

The 1983 reduction achieved large scale removals in the northern portion of the management area. Wolves to the southern portion were left relatively undisturbed. The 1983 reduction also fell short of the goal to remove >70% of wolves in the entire area. While all years of wolf reduction appear to have produced a positive response in FCH recruitment and natural mortality, the most significant responses were in 1984 and 1985. To maintain wolf numbers below 70% of the pre-reduction numbers, we predict that a maximum of 30 to 40 will need to be removed annually.

Caribou Population Response

1. Population Size Estimate

The population size estimates of the FCH are critical in determining herd status. Subsequent estimates of the FCH will be necessary to determine the ultimate success of the program. The dispersed nature of woodland caribou range use behavior make population size estimates difficult. An incidental objective of this project is to develop a high precision technique to count caribou. Initially the population size of the FCH was determined through a rut count in October 1982. The method entails a complete survey of the FCH rutting distribution and incorporates large correction factors for efficiency and observability in finding caribou. We are confident that these counts represent at least the upper magnitude of population size.

A liberal estimate of the 1982 population size was between 2000 and 2500 caribou. This method is imprecise when weather delays increase the count period and significant movements are detected, as was the case in the 1984 population estimate when seven of sixteen radio-collars were found moving between rutting grounds. We feel that by 1984 the population size of the FCH was somewhere between 1500 to 2700 caribou and management measures in 1983 and 1984 probably had only served to check the

decline and stabilize the herd around 2000 animals. The herd probably decreased further in 1983 and may now be increasing slowly. A count during winter, when the herd is most concentrated, is planned for March 1986. This method may have greater precision (+ 20%), and could be adopted as a more acceptable population estimate procedure for woodland caribou herds.

2. Post-Calving Composition Counts

Significant mortality occurs during and shortly after calving in June. The post-calving counts in mid-July provide a measure of initial calf recruitment to 1.5 months. The procedure requires counting a sample of >10% of the population across the herd distribution. Because of the disparity in age and sex class distribution at this time of year, (i.e. maternal females are grouped, bulls, barren females, and yearlings are either dispersed or in other portions of the range), the post-calving count expressed as calf/cow ratio, provides a good measure of early calf mortality trends between years but not between life cycle periods.

Post-calving counts were not conducted prior to wolf control. Data is presented for 1983, 1984, and 1985, (Fig. 5, Pg. 11). Calf recruitment increased dramatically between 1983 (29/100) and 1984 (48/100), after two years of wolf control. It has remained at a high level in 1985 (50/100) with a sustained supression of wolves to 16% of their pre-reduction level. The 1984 and 85 wolf reductions did appear to substantially increase post-calving recruitment.
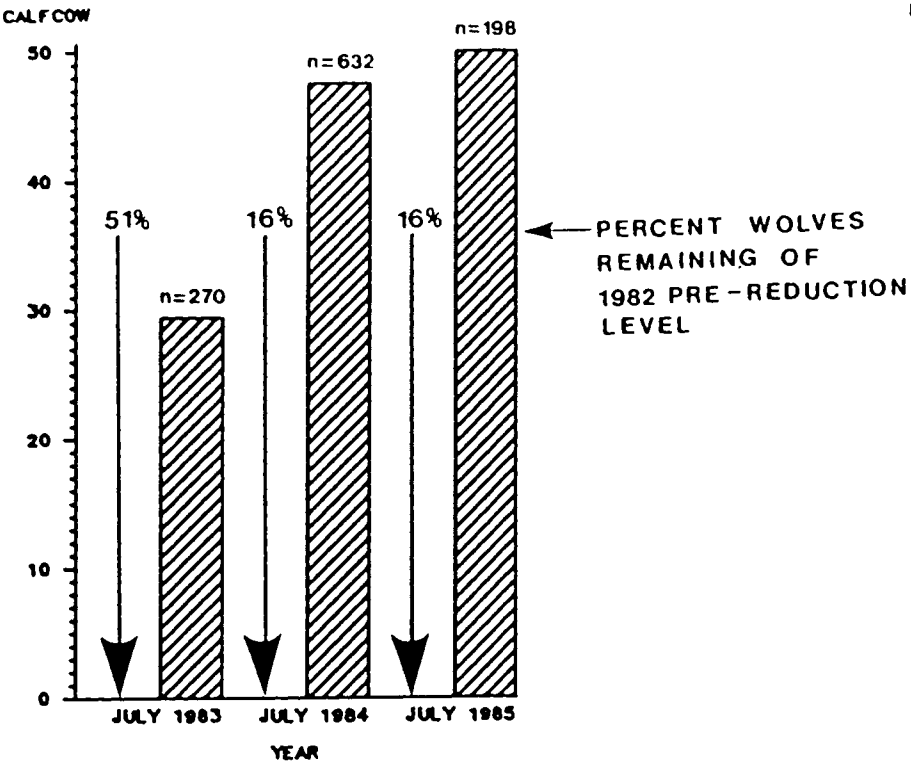
3. Rut Composition Counts

Because caribou composition is mixed during the breeding period, and there is little or no disparity in class distribution, the rut count provides a high resolution indicator of the age and sex composition of a herd. The count is made in early October and is composed of a sample of >30% over the entire rut distribution. The mean percent of calves at 4.5 months is the most important recruitment statistic to come from this count. An irregularity that consistently arises is that yearlings are often counted as adult females. This tends to produce a conservative calf/cow ratio and underestimates yearling recruitment. However this error is consistent and fall ratios are comparable between years.

Rut counts have been conducted for 1982, 1983, 1984, and 1985. After initial wolf control, the mean percent of calves in the FCH increased from 9.8% in 1982 to 14.9% in 1983, (Fig. 6, Pg. 11). After more intensive and sustained wolf supression the calf percentage rose to 20.9% in 1984 and maintained a relatively high precentage of 19.9% in 1985. The mean percent of calves has stabilized in 1985 probably due to an expected influx of yearlings into the herd from the 1984 cohort. This assumption is born out in the fact that the fall calf/cow ratio

Figure 5

FCH POST CALVING COMPOSITION
CALVES PER 100 ADULT COWS

CALF COW

n=198

n=632

51%

16%

16%

n=270

◄— PERCENT WOLVES
REMAINING OF
1982 PRE-REDUCTION
LEVEL

JULY 1983   JULY 1984   JULY 1985

YEAR

Figure 6

FCH RUT COMPOSITION
PERCENT CALVES

PCTCALF

51%

16%

16%

n=1272

n=658

n=759

n=1231

OCT 1982   OCT 1983   OCT 1984   OCT 1985

YEAR
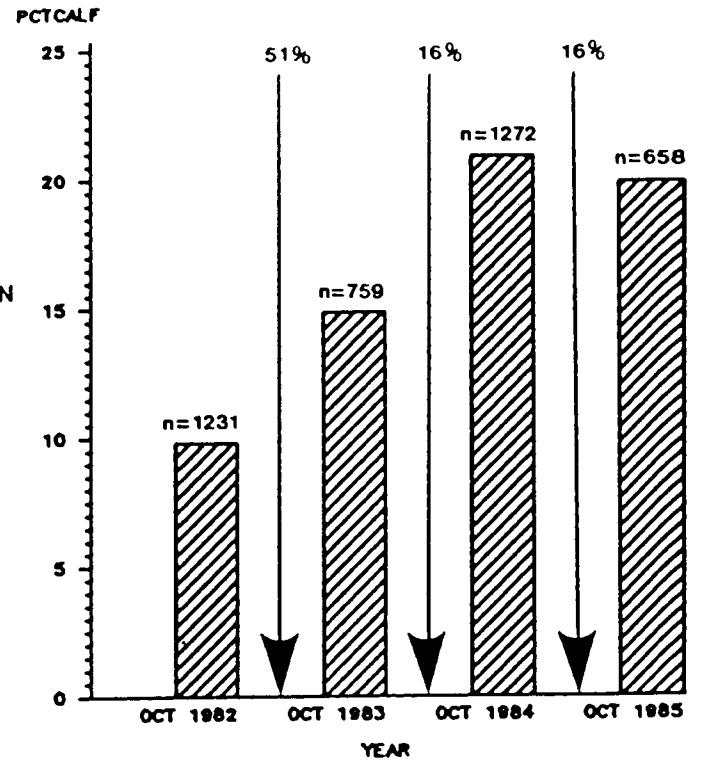
Figure 7

FCH RUT COMPOSITION
CALVES PER 100 ADULT COWS

ALF COW

n=658

51%

16%

16%

n=1272

n=759

n=1231

OCT 1982   OCT 1983   OCT 1984   OCT 1985

YEAR
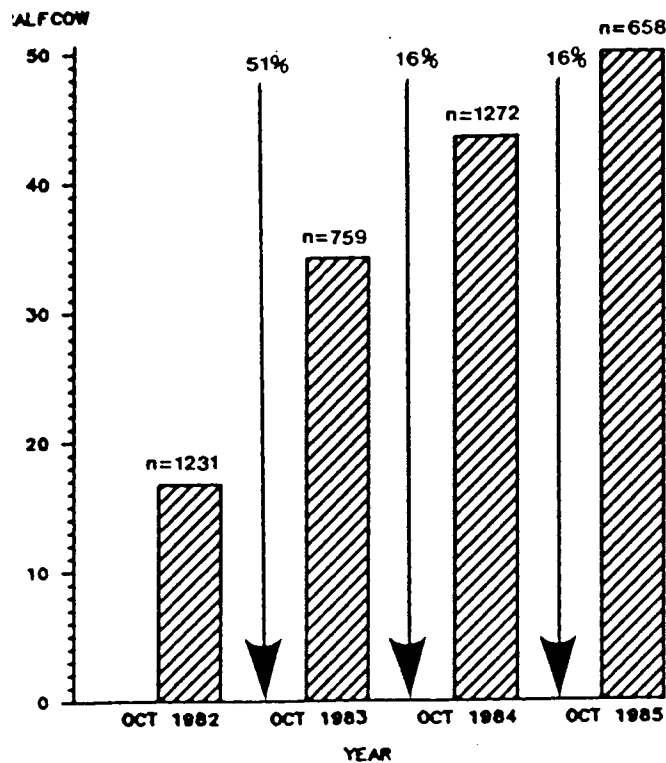
Figure 8

FCH LATE WINTER COMPOSITION
CALVES PER 100 ADULT COWS

CALF COW

51%

16%

n=363

n=374

n=326

n=304

MARCH 1982   MARCH 1983   MARCH 1984   MARCH 1985

YEAR
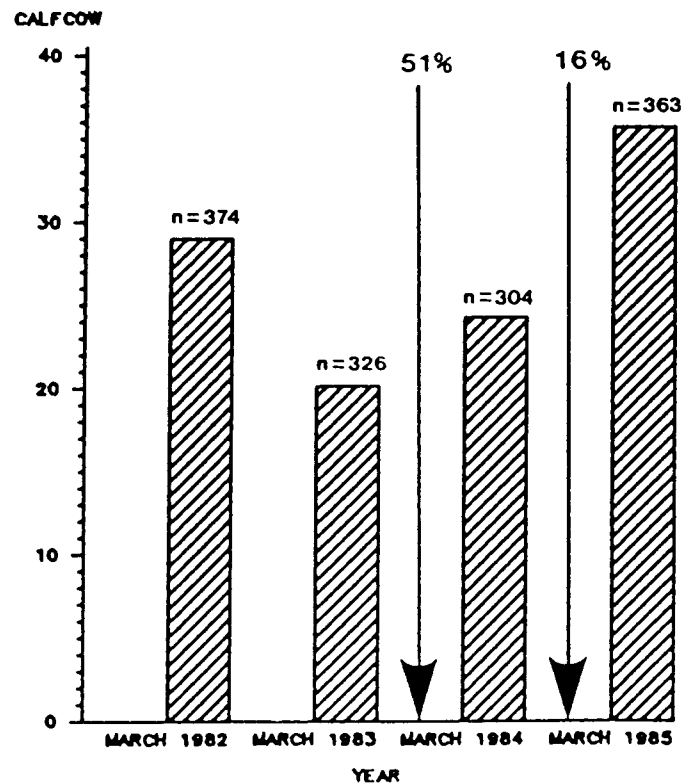
has risen steadily since wolf control was initiated (Fig. 7, Pg. 11). The fall calf/cow ratio rose from 16/100 in 1982, to 34/100 in 1983, to 43/100 in 1984 and continued to rise to 50/100 in 1985. We feel the upper limit of calf recruitment has not yet been reached for calf/cow ratios as high as 54/100 have been documented in other Yukon woodland caribou herds as late in the year as April (Farnell and Russell, 1984). In summary wolf reduction has had a significant (P>.05) positive correlation with gradual increase in calf survivorship to fall.

4. Late Winter Composition Count

   The late winter count provides an estimate of over-winter calf survivorship to 10 months. The March count is composed of a sample of >10% of the population surveyed across the entire winter distribution. Calf survivorship is expressed as the calf/cow ratio, not as a percentage of the population. Weakened maternal bonds at this time of year cause some calves to separate from their mothers and therefore tends to produce a conservative recruitment statistic. If collected with consistent and uniform procedures, the late winter composition count may provide trend information for year to year comparison but probably does not reflect an absolute recruitment level.

   Late winter counts were conducted for 1982, 1983, 1984 and 1985 (Fig. 8, Pg. 11). The calf/cow ratio showed low values prior to wolf control in 1982 (29/100) and 1983 (20/100). After initial wolf control in March 1983, the subsequent late winter calf/cow ratio in 1984 (24/100) showed a minor increase. The ratio increased to the highest level yet recorded 36/100 in 1985 and we anticipate that the March 1986 count should show a further increase correllated to the 1985 wolf reduction.

5. Adult Natural Mortality Rate

   The annual adult natural mortality rate is another key component to determining FCH status. Similar to recruitment indices, it should reflect the influence of wolf predation on adult caribou by correlating with wolf reduction. The natural mortality rate of caribou older than calves is estimated by determining the natural mortality rate of adult female radio-collared caribou, and is calculated using a formula derived by W. Gasaway (1983). The formula is thought to underestimate mortality rates when there is a seasonal peak in mortality and radio transmitters fail during the observation period. The information gathered by this procedure is biased in favor of adult females and to survivorship within the radio-collar sample. Repeated radio-collaring of new caribou is necessary for reducing the survivorship bias. The method in all probability does not reflect true mortality rates but does reflect trends. Other than very expensive census extrapolation techniques, it is the only means at our disposal for measuring this parameter.

Since 1982 42 radio-collars were placed on caribou during March (Fig. 9, Pg. 14). The annual adult natural mortality rate from March 1982 to 83 was estimated at 27.7%. Wolves were implicated in four deaths and one was an undetermined predator. After removal of wolves to 51% of their pre-reduction level the adult natural mortality for 1983-84 decreased slightly to 24.2%. Bears were implicated in two deaths and one was an undetermined predator. After the intensive wolf control in 1984 to 16% of their pre-reduction level, the adult natural mortality rate for 1984-85 decreased dramatically to 9.7%. Wolves were thought to be the cause in these two deaths. Continued wolf suppression to 16% of the pre-reduction level has produced an adult natural mortality rate of 8.5% over seven months (March-October) in 1985. A substantial decrease in the adult natural mortality rate has been detected since 1984 when intensive wolf removal was established.

CONCLUSIONS

The FCH management strategy appears to be working. A substantial decrease in harvest has been observed. The importance of FCH caribou to subsistence users has been shown by their willingness to reduce caribou harvest from historical levels. Lowered harvest rates, particularly of adult females, should help accelerate population recovery. The wolf reduction component of the management scheme appears to have reduced calf mortality ($r=.99$, $P>.05$). A dramatic response has been observed in both improved calf survival and reduced adult natural mortality. Both marked improvements are correlated with wolf reduction, while all other potential limiting factors probably remained the same. The FCH probably continued to decline between fall 1982 and 1983, when the population stabilized and began to increase slowly.

The present information is inadequate to answer the important question: when will the objective be reached? Only very speculative growth rates can be predicted. The most optimistic scenario uses the maximum possible rate of increase (35%) calculated by Bergurud (1978b). That would predict a population increase from the 1984 level of 2000 to 6,643 caribou by 1988, if no caribou are harvested. While it is unrealistic to presume that this rate of increase can be achieved, it does demonstrate the earliest possible time frame. A more realistic scenario draws from a comparable management strategy on Alaska's Delta caribou herd. The herd increased at a rate of 20% annually from 2,200 in 1976 to 6,500 by 1982 with similar hunting restraints and wolf reduction as a management strategy (Davis, 1983). If a similar caribou response could be created, the FCH would increase from 2,000 in 1984 to 4,973 in 1989, if no caribou are harvested. The Delta herd response demonstrates a possibility for the FCH, if only a 10% growth rate can be achieved then it would take 10 years to reach our goal. Because the declining population trend in the FCH was probably not reversed until after 1984, we believe the objective to increase the herd to 5000 caribou within five years of management cannot be

Figure 9

FCH ADULT MORTALITY RATE
USING RADIO COLLARS
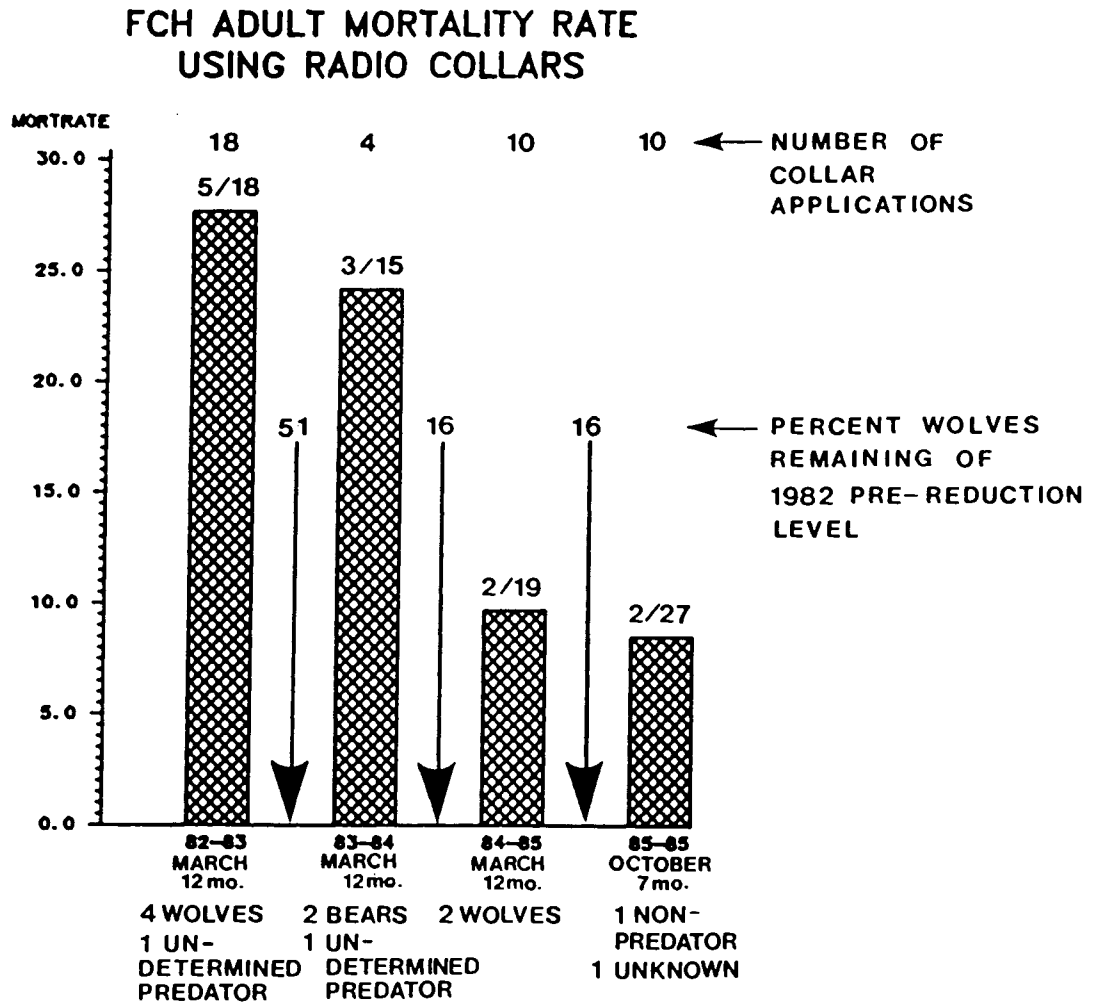
realized. A reasonable time frame to enhance the FCH will require that a growth rate of>10% be achieved. The growth rate after intensive sustained wolf reduction, from 1984 to 1986 will be determined with accuracy after the March 1986 population estimate. This estimate will be verified and consistent parameters evaluated with continued monitoring and a second population estimate in October 1986.

When considering the options available to direct this project we should consider that as the larger calf cohorts become adults, the herd will begin to grow exponentially. The FCH may initially be recovering slowly but will likely increase rapidly within a few years. If the aim to increase the herd to 5000 caribou is an acceptable goal, then the established management strategy should continue until that goal is reached. Any management changes that reduce the influences of decreased harvest and wolf predation on population growth will only serve to retard results and lengthen the time frame needed. The decision to proceed, alter or discontinue the FCH management project will have implications beyond management of just this herd. It will direct woodland caribou management for all of Yukon.

The real problem identified with the FCH - overhunting in the absence of sufficient recruitment - repeatedly arises due to a failure of wildlife managers to recognize that a fine balance exists between predators and prey and little surplus is available to be hunted. The well known caribou ecologist A.T. Bergurud described this chronic problem (1978b):

> ...."population declines are difficult to halt. The law of diminishing returns works neither for men nor wolves, at least initially. Hunters can still find caribou because of the open terrain and their conspicuous habits. Wolf numbers are adjusted slowly to reduced caribou herds (called predator lag); thus the same number of wolves hunt a smaller supply of game for a time."

Over harvest in the presence of high predation rates produces "the lower equalibrium", the point when the population stabilizes at lower numbers, and probably explains why we repeatedly find small woodland caribou populations occupying vast areas of suitable unused habitat. The FCH management project, if allowed to run its term, may provide a valuable experiment by driving the herd into a "higher equalibrium", when the desired level of harvest can be taken without disrupting the predator-prey density relationship.

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