

CHANGES IN SUBSISTENCE HARVEST OF ALASKA'S
WESTERN ARCTIC CARIBOU HERD, 1940-1984

by

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Abstract: We compared the harvest levels and trends of subsistence hunting of the Western Arctic Caribou Herd in northwest Alaska during 3 periods of contrasting caribou abundance and harvest regulations. From 1940-75, caribou were abundant (ca. 250,000), but abundance declined rapidly after 1970; pre-1960 regulations were loosely enforced, effectively a *de facto* year-round season with no bag limit; post-1959 regulations explicitly allowed year-round, no-limit hunting. From 1976-80, caribou abundance was reduced to 25-50% of the previous level (ca. 75,000-130,000), and regulations permitted a limited harvest of bulls only. By 1981-84, the herd had increased (ca. 145,000-200,000) and harvest regulations were liberalized to approach year-round, no-limit hunting. Estimates of mean annual harvest during the 3 periods discussed were ca. 25,000, ca. 3,000, and ca. 6,000 respectively. Some harvest characteristics (e.g., mean number of caribou harvested/ hunter), from 1 period to the next, showed variation equalling or exceeding the magnitude of change in harvest levels. The observed changes in harvest are discussed in relation to accompanying socio-economic change.

Résumé: Nous comparons les niveaux d'exploitation et les tendances de la chasse de subsistance du troupeau de caribou 'Western Arctic', dans le nord-ouest de l'Alaska. L'étude couvre trois périodes où l'abondance du caribou et les règlements en contrôlant l'exploitation font contraste. De 1940 à 1975, les caribous abondaient (env. 250 000), mais cette abondance diminua rapidement après 1970; avant 1960, les règlements n'étaient que vaguement observés, créant de fait une saison de chasse à l'année longue, sans limite de capture; après 1959, les règlements ont permis de façon explicite la chasse à l'année longue, sans limites. De 1976 à 1980, le nombre de caribous tomba à 25-50% des niveaux précédents (soit env. 75 000 - 130 000), et les règlements n'autorisèrent qu'une exploitation limitée des taureaux seulement. En 1981-1984, le troupeau s'était accru suffisamment (env. 145 000 - 200 000) pour que les

reglements soient relâchés, approchant la chasse à l'année longue et sans limites. Au cours de ces trois périodes, les estimés de l'exploitation moyenne annuelle se situent à environ 25 000, 3000 et 6000, respectivement. D'une période à l'autre, certaines des caractéristiques de l'exploitation (tel que le nombre moyen de caribous pris, par chasseur) ont connu une variation égale ou dépassant la magnitude des changements dans le niveau d'exploitation. Les changements observés dans l'exploitation sont discutés en relation aux changements socio-économiques qui les accompagnent.

INTRODUCTION

The levels and patterns of caribou harvest by humans has and will continue to be of interest to wildlife managers and to social scientists. The literature shows that harvest levels and patterns have changed in the past, and we have noted dramatic changes in both harvest levels and harvest patterns of Alaska's Western Arctic Caribou Herd (WACH) since 1975. We discuss these changes and contributing factors. In this paper, we consider all human use of the WACH to be subsistence use.

We acknowledge that the data contained herein on caribou population, harvest, and socio-economic factors are not rigorously quantitative, but we are confident that the trends and orders of magnitude are accurate.

The 3 time periods discussed in the paper, 1940-75, 1976-80, and 1981-84, are arbitrary categories based on intervals in which the relative abundance of caribou, effective hunting regulations, and/or socio-economic conditions were dissimilar to the other periods.

STUDY AREA

Range of the WACH encompasses the northwest quarter of Alaska, approximately 362,600 km², and extends from 65°N to 71°N and from 148°W to 166°30'W (Fig. 1). Vegetation varies from boreal forest in the south to wet coastal tundra in the north. The area is bisected into north and south sections by the western part of the Brooks Mountain Range. The environment has been previously discussed in detail (Spetzman 1959, Lent 1966, Skoog 1968, Hemming 1971).

The distribution of human settlements is depicted in Fig. 1.

METHODS

The Caribou Population

Pre-1975 data were obtained from the literature and the unpublished reports and files of the Alaska Department of Fish and Game (ADF&G). Herd size estimates since 1975 were obtained from calving ground count-extrapolation censuses and aerial photo-direct count-extrapolation (APDCE) censuses (Davis and

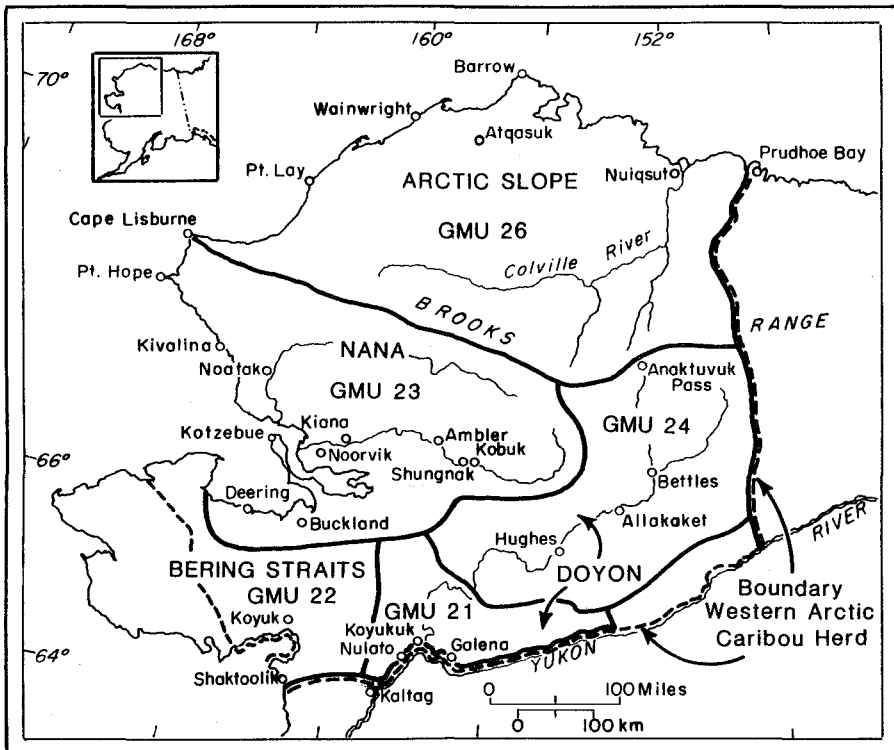


Fig. 1. Distribution of villages, Regional Native Corporations, and Game Management Units in the range of the Western Arctic Caribou Herd.

Valkenburg 1978). The ADF&G censused the herd using a refined APDCE procedure (Davis *et al.* 1979) in 1978, 1980, and 1982. The 1983 and 1984 herd size estimates have been projected from the 1982 photocensus estimate.

Harvest Levels and Trends

Pre-1975 data were obtained from the literature and ADF&G files. During 1975-76, paid village data recorders collected information on harvest in 9 of the 30 villages in the greater range of the WACH (Fig. 1). In 21 other villages, biologists obtained estimates of harvest by personal observation, interviews, and information from village councils. During 1975-76 the commercial use of caribou was estimated by interviewing the known major buyers. Crippling loss and waste can be difficult to distinguish and were lumped together for extrapolations regarding herd population dynamics. From a social view, lumping crippling loss and waste overestimates 'waste.' Crippling loss/waste was evaluated by personal observation, aerial and ground surveys, interviews, pilot reports, complaints from villagers and others, and through public meetings.

To determine harvest in 1976-77, in each village a resident was contracted by ADF&G to issue the village's quota of 3,000 total permits and collect the mandatory harvest reports. We assessed crippling loss/waste incidental to other objectives which included helicopter and fixed-wing surveys and observations from the ground. The assessment was not quantitative but rather subjective relative to 1975-76 and preceding years.

For the 1977-78 through 1979-80 regulatory years, hunting was by registration permits where an unlimited number of permits were available and hunters were required to submit a postcard harvest report. Permits were issued by ADF&G personnel in selected villages or available by mail or in person at the ADF&G offices in Fairbanks, Kotzebue, and Nome. Observations by ADF&G Area Biologists stationed at Barrow, Nome, and Kotzebue augmented total harvest estimates from the harvest report cards.

Mandatory harvest reports of several varieties have been used to record harvest from 1981-84. These also were augmented by qualitative observations of ADF&G field staff.

RESULTS

The Caribou Population

The WACH would have numbered 238,000 in 1950 when censused for the 1st time by aircraft (Scott *et al.* 1950) if Skoog's (1968) adjustment ratio is incorporated. Lent (1966) censused the WACH between 1959 and 1962 using a method similar to the APDCE technique and concluded that the herd numbered between 175,000 and 200,000. In 1964 Skoog (1968:250) estimated the population to be 300,000 animals. Hemming (1972) next censused the herd in 1970 and estimated the total population in 1970 to be 242,000 caribou. In 1975 Davis and Valkenburg (1978) estimated

the herd to number 102,704. In 1976 the herd reached its recent level of 75,000 (Davis and Valkenburg 1978). For 1977 Davis and Valkenburg (1978) calculated estimates of 77,000 to 82,000. Davis *et al.* (1979) generated a 1978 estimate of ca. 102,000, exclusive of 4,000 in the recently recognized Teshekpuk Herd (Davis 1978, 1980). Extrapolation from a calving ground census in 1979 (Davis *et al.* 1980) produced a 1979 herd estimate of 113,000+. Modified APDCE censuses in 1980 and 1982 resulted in population estimates of 140,000 and 175,000, respectively (ADF&G files).

Harvest Levels

1940-75:

Few data are available about WACH harvest prior to the late 1950's, although seasons and bag limits were established in 1952. Harvest levels and seasons and bag limits from 1952 through 1984 are summarized in Table 1. For the years prior to 1975-76, the estimated harvest in Table 1 included only the retrieved harvest and not necessarily the sometimes substantial loss to wounding/waste (Davis and Valkenburg 1978, Doerr 1979). An estimated 95% of the annual harvest was taken by rural residents, mostly Native Alaskan subsistence hunters.

We concluded that the 1975-76 total annual harvest equalled or exceeded 25,000 (Davis and Valkenburg 1978; Doerr 1979, 1980). Our surveys during fall 1975 and spring 1976 as well as reports and complaints by village residents and others led us to believe that crippling loss/waste of caribou was substantial and widespread. Therefore, we documented waste by flying aerial surveys and conducting searches from the ground in May and June 1976, after it was no longer feasible to retrieve carcasses by snow machine and most carcasses had been scavenged to some degree. The object of these surveys was not to establish the number of caribou crippled/wasted but to show that crippling/waste was unacceptably high and widespread. More than 1,000 crippling loss/wasted carcasses were counted in the areas surveyed, and the total number in the herd's entire range was probably several times larger (Davis and Valkenburg 1978, Doerr 1979).

1976-84:

Seasons, bag limits, and harvest from 1976 through 1984 are summarized in Table 1. Harvest ranged from an estimated low of 2,700-3,500 in 1976-77 to 5,000-12,000 in 1983-84. 5sp 2

Patterns of Caribou Harvest

1940-75:

Few detailed accounts of harvest of the WACH by individuals and villages are available for the 1940-75 period. Available information shows that major variation is normal for a host of reasons such as availability of caribou, alternate subsistence resources such as fish, birds, and sea mammals--and even cash. Saario and Kessel (1966) and Foote and Williamson (1966) obtained

Table 1. Estimated human harvest of the Western Arctic Caribou Herd, hunting seasons, and bag limits, 1952-1984.^a

Regulatory year	Season	Bag limit (no. caribou)	Approximate harvest	
			reported	estimated
1984-85	1 Jul-30 Apr	5/day; only 5 can be transported south of the Yukon River (no bag limit)	n.a.	n.a.
1983-84	1 Jul-30 Apr	5; more may be taken by registration permit (no bag limit)	1,249	5,000-12,000
1982-83	1 Jul-30 Apr	5; more may be taken by registration permit (no bag limit)	1,509	n.a.
1981-82	1 Jul-31 Mar	4; female caribou may be taken 15 Sep-15 Apr and 2 caribou may be transported from Game Management Units (no total seasonal quota)	906	more than 3,000
1980-81	10 Aug-15 Oct for different areas: 1 Dec-15 Apr 15 Feb-15 Apr	3 bulls (no total seasonal quota)	458	3,000
1979-80	10 Aug-15 Oct 15 Feb-15 Apr	3 bulls by registration permit. Only 1 may be taken from 10 Aug-15 Oct (5,000 bulls = season quota)	852	3,000
1978-79	10 Aug-15 Oct 15 Feb-15 Apr	2 bulls by registration permit. Only 1 may be taken from 10 Aug-15 Oct (5,000 bulls = season quota)	1,151	3,600
1977-78	1 Sep-5 Oct 15 Mar-15 Apr	1 bull by registration permit (3,000 bulls = season quota)	672	3,000
1976-77	25 Sep-31 Mar	Bull caribou by permit only. 1 caribou per permit. 3,000 permits allocated by local governing bodies.	1,100	2,700-3,500
1975-76	No closed season	No limit		more than 25,000
1974-75	No closed season	No limit		less than 25,000

Table 1. Continued.

Regulatory year	Season	Bag limit (no. caribou)	Approximate harvest	
			reported	estimated
1973-74	No closed season	No limit		more than 25,000
1972-73	No closed season	No limit		more than 25,000
1971-72	No closed season	No limit		more than 25,000
1970-71	No closed season	No limit		25,000
1969-70	No closed season	No limit		less than 25,000
1968-69	No closed season	No limit		27,000
1967-68	No closed season	No limit		26,000
1966-67	No closed season	No limit		24,000
1965-66	No closed season	No limit		29,000
1964-65	No closed season	No limit		25,000
1963-64	No closed season	No limit		20,000
1962 to 1959	No closed season ^b			n.a.
1958	20 Aug-31 Dec ^b	3 caribou either sex		n.a.
1957	No closed season ^b	No limit		n.a.
1956	20 Aug-28 Feb ^b	No limit		n.a.
1955	20 Aug-28 Feb ^b	5 caribou either sex, no calves		n.a.
1954	20 Aug-28 Feb ^b	5 caribou either sex, no calves		n.a.
1953	20 Aug-28 Feb ^b	3 caribou either sex, no calves		n.a.
1952	20 Aug-28 Feb ^b	3 caribou bulls only, forked horn or larger		n.a.

^a References for all harvest data prior to 1979-80 are cited in Davis and Valkenburg (1978); all harvest data after 1979-80 are from Alaska Department of Fish and Game, Annual Survey and Inventory Reports, Juneau. All details of seasons and bag limits not included (e.g., in some years emergency regulations modified or superseded existing regulations such as in 1976-77 and 1977-78).

^b North of the Arctic Circle.

estimates of some harvest patterns from Kivalina, Noatak, and Pt. Hope from 1959 to 1961. Gubser (1965) offered the following summary about the harvest at Anaktuvuk Pass:

'Among the Nunamiut at Anaktuvuk Pass in 1960, there were 32 hunters who provided for 96 mouths (including their own) and about 200 dogs. Of the 32, only 20 were the major hunters of their households. As well as I could determine from questioning hunters and spending a year among these Eskimos, in a normal year the hunters account for about 1,000 caribou of all ages and both sexes. Seven or eight of the best hunters account for between 70 and 100 caribou apiece, while the remaining 24 hunters shoot between 5 and 70 caribou apiece.'

Our 1975-76 harvest data constitute the most comprehensive data set we are aware of pertaining to harvest in a specific year throughout the range of the WACH. This data set is the only one available from the 1970-76 period. For these reasons, the data are of value not only to wildlife managers, but to anthropologists and other social scientists. The data are available by village (Davis and Valkenburg 1978) but are summarized by Game Management Unit (GMU) only in this paper.

Total retrieved harvest for GMU 23 was estimated to be in excess of 13,540-17,540. The mean number of caribou harvested per successful hunter (\pm SD) in GMU 23 villages is summarized in Fig. 2.

The total harvest estimate for GMU 24 was 1,000. The mean number of caribou harvested per successful hunter (\pm SD) from Anaktuvuk Pass is summarized in Fig. 2.

The ADF&G estimated that 2,700-2,950 caribou were taken prior to February 1976 in GMU 26. No less than 1,000 additional animals were taken after January in the Unit, making a total of 3,700-3,950 for the year. However, the Barrow harvest estimate may have been a gross underestimate as J. Doerr (pers. commun.) estimated that the harvest at Barrow must have been much larger than at Noorvik or Kotzebue in GMU 23. His estimates were based on the human population size and the amount of dead caribou he found in meat cellars and sheds in the respective villages while collecting jaws in late winter 1976. It is probable that the Barrow harvest totaled 4,000 or more.

No rigorous accounting of harvest for GMU's 21 and 22 was accomplished, but residents of Unit 22 were estimated to have taken 500 caribou between January and April. The harvest of WACH caribou by residents of GMU 21 was not well documented but likely numbered several hundred.

Hunters residing outside the range of the WACH likely harvested 200-400 caribou in 1975-76. Most harvest occurred along the middle portion of the Noatak River during September and on the Kanuti Flats near Bettles.

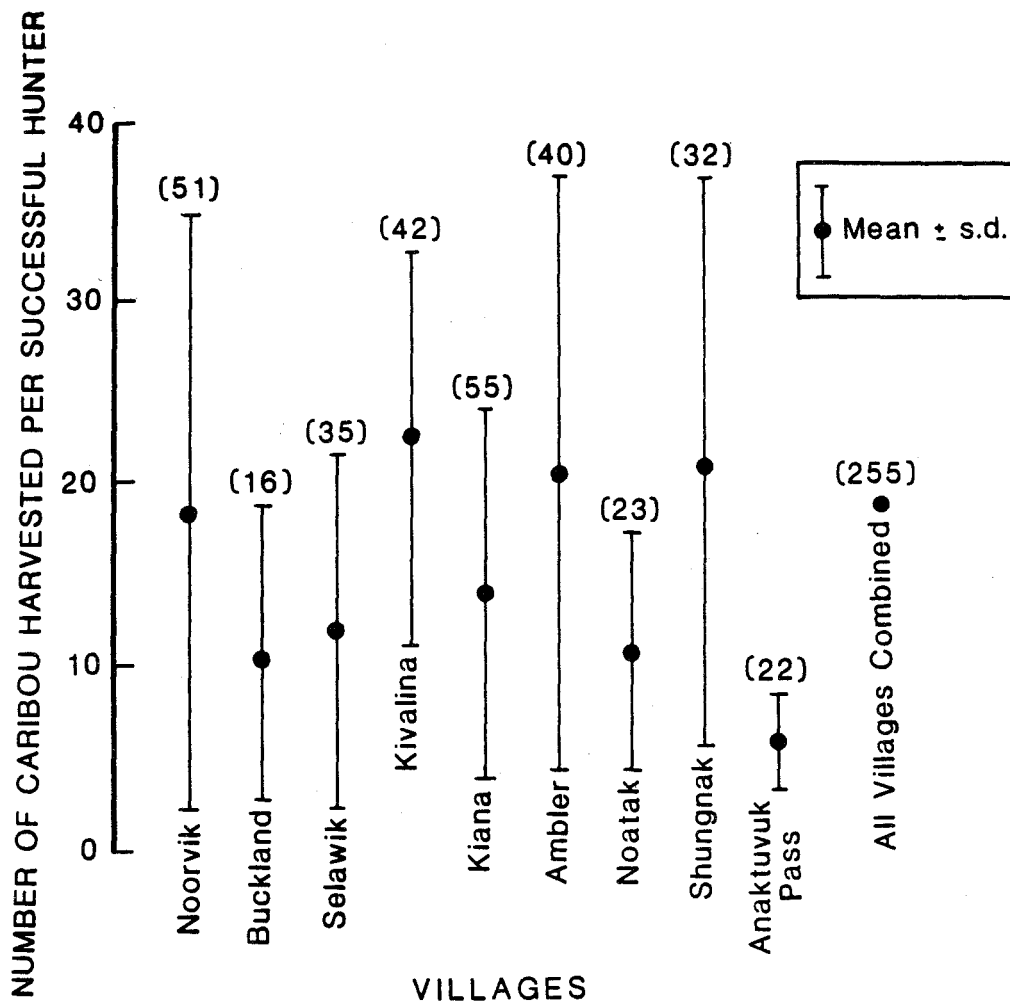


Fig. 2. Mean \pm s.d. number of caribou taken per successful hunter from villages in Game Management Unit 23 and Anaktuvuk Pass; (n) = number of successful hunters reporting.

1976-80:

Harvest characteristics during this period can be considered artifacts of the restrictive regulations in force during this period. For the first time since about 1960 there were regulations restricting the hunting season and bag limit. The mean number of caribou taken and the maximum number taken were obviously influenced by regulatory restrictions (assuming general compliance).

1981-84:

Though seasons and bag limits have been liberalized since 1980 to approach the pre-1975 situation of no closed season and no bag limit, the apparent pre-1975 harvest levels and characteristics have not returned. Harvest level appears less than 50% of earlier harvest levels, at most, in spite of an increased human population. Also, harvest characteristics such as mean and maximum number of caribou per hunter have remained much lower, based on harvest reports. For example, in 1982-83 the mean number of caribou harvested per successful hunter reporting was 3, compared to 20 in 1975-76.

Commercial Use of Caribou

Although commercial use of caribou was legal between 1963 and 1976, there was little documentation of the use. We estimated that about 150 caribou were sold to the Lab between May 1974 and September 1975. It is unlikely that commercial harvest of the WACH exceeded 1,000 caribou per year.

Socio-Economic Change

Clearly, major socio-economic change has occurred in recent decades among the human inhabitants of the WACH's range. Human population has more than doubled since 1950. The average number of years of education among North Slope Eskimos more than doubled from 1960 to 1977 (Kruse *et al.* 1961). The mean financial status of residents of the WACH range has progressively increased since the 1940's. For example, on the North Slope area between 1960 and 1977 the median family income increased 261% (in constant 1960 dollars) from \$3,438 to \$8,982 (Kruse *et al.* 1981). It follows and evidence suggests that the availability of modern technology and its employment in subsistence harvesting (Kruse *et al.* 1981, Burch 1984) of the WACH has paralleled the increased incomes and should allow more efficient (i.e., greater) harvesting of caribou.

DISCUSSION

The widespread use of dogs for transportation ended in the late 1960's, which led most biologists and social scientists to predict that caribou harvest would decline because caribou would not be needed for dog food. But harvest of caribou continued at high levels until restrictions were imposed after 1975. Caribou

harvest characteristics and levels from 1976-80 were largely dictated by restrictive regulations and decreased availability of caribou to many villages. Seasons and bag limits were progressively liberalized from 1979-84 concurrent with continuing growth of the WACH. Despite this, the harvest is less than 50% as large as before, and it seems that social and economic changes are at least partly responsible.

Social change (e.g., increased human population) and economic change (e.g., increased buying power for advanced technology) suggest that the demand and ability to harvest caribou should be greater post-1980 than pre-1975. Therefore, could it be that harvest has not increased because caribou have been adversely distributed to allow greater harvest? Based on the WACH's movements and distribution (unpublished data, ADF&G) after 1980, we conclude that caribou availability for harvest cannot solely account for the reduced harvest level.

So, what evidence exists that socio-economic factors could reduce the caribou harvest? Kruse (1982) interviewed 282 individuals in 6 North Slope villages to determine what effect 1977 caribou harvest regulations had. The results were that 53% of the people bought more meat, 15% ate less meat, 8% substituted other fish/game, 7% bought more/ate less, 5% substituted/bought more, 1% substituted/ate less, and 11% were not affected. It appears there was an economic option to buy more in time of need. That condition has surely continued or improved since 1977. Kruse's (1982) interviews also showed 10% of Eskimo adults believed they got less fish and game because they worked more in 1977 than they had in 1970.

We believe the following social factor may largely account for the current relatively low harvest level. In the late 1960's and early 1970's, biologists believed the WACH was so large that it could cause long-term habitat damage through forage overuse and fostered a setting where the human populace was encouraged to take a large harvest without emphasis on most efficient use. Subsequently, the herd declined dramatically in the mid-1970's and the general theme for human use of the WACH became very conservative and conscientious use of the caribou. We suggest that 'time lag' and continuing conservative hunting attitudes among many hunters persist today.

CONCLUSION

Despite liberalized hunting seasons and bag limits post-1980, subsistence harvest of the WACH has not returned to pre-1975 levels, but rather is about 50% lower. The reasons for this major difference are undoubtedly complex and are not easily identifiable, but we believe the following factors have contributed: (1) a dramatic reduction in dog teams reduced demand for caribou meat because there was no need to feed caribou to the dogs; (2) increases in transportation facilities and in real buying power lead to a higher consumption of non-Native store-bought foods; (3) increased employment reduced leisure time available for hunting; (4) access to television, other recreational activities (e.g., gymnasiums), and increased

educational alternatives competed with hunting opportunities; and (5) a campaign by the State of Alaska and Native leaders to harvest only the number of caribou needed for human consumption resulted in a reduction in 'stockpiling' practices and better compliance with hunting regulations. Conservative hunting attitudes among some hunters still persist today, in part because of a higher profile and increased ADF&G presence in the villages.

We do not imply that the harvest of the WACH will necessarily remain at or below the present level. On the contrary, given the continuing increases in Native and non-Native population, increased access and improvement of technology and equipment, continued interest and emphasis by Natives and others to maintain and enhance the subsistence lifestyle, and the dominating importance caribou have played in the lives of subsistence hunters over the years, we believe that harvest will escalate.

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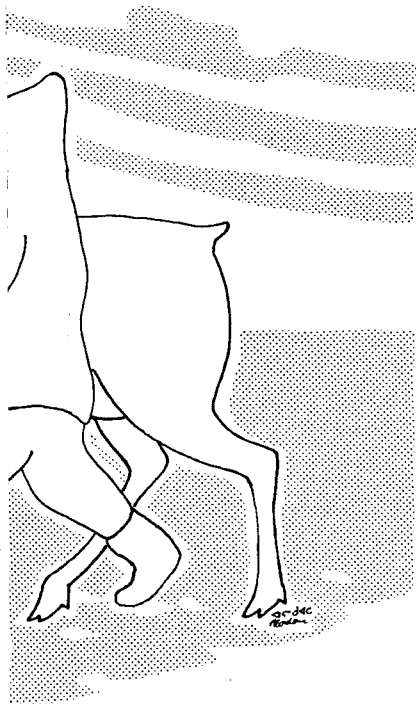
**CARIBOU
MANAGEMENT**



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**STATUS
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