

Local Caribou Availability
A Draft Report from Community Involvement
Phase 2, NSF Community Sustainability Project

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Prepared for
Sustainability of Arctic Communities Project

With funding from the National Science Foundation
(OPP-9521459)

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December 1998

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December, 1998

Objective of the Report

The purpose of this document is to report findings of the NSF Arctic Community Sustainability Project's research on community caribou availability to university-based investigators for development of the project's SYNTHESIS MODEL. Field work for the project was completed in Old Crow, Fort McPherson, Aklavik, and Arctic Village from April 1997 to April 1998 by Gary Kofinas (all communities) and Stephen R. Braund and Associates (Aklavik and Arctic Village) in collaboration with local research associates. Community research associates working with the project were Joe Tetlich (Old Crow), Billy Archie (Aklavik), Johnny Charlie, Sr. (Fort McPherson) and Sara James (Arctic Village). Findings are also informed by field work and data conducted in the MAB Sponsored Porcupine Caribou Herd (PCH) co-management research from 1993 to 1996 (Kofinas, 1998).

The report provides a brief literature review on caribou movements and distribution patterns of the Porcupine caribou herd, local knowledge propositions about caribou movements and hunting patterns, mapped range-wide zones, and values for use in the modeling effort.

The overall objective of the Sustainability Project is to improve the ability of researchers and community members to understand the implications of possible futures (i.e. climate change, ANWR 1002 oil development, and changing levels of tourism and non-local hunting) on the most important elements of life in small Arctic communities.

The findings presented in this report are focused one part of that study -- the conditions affecting *community caribou availability*. Our work focused on the following questions:

1. What are the conditions that make caribou available and unavailable to communities?
 - Conditions affecting the distribution and movements of caribou,
 - Conditions affecting hunter access to caribou.
2. How does participation in the wage economy affect locals' caribou hunting?
3. How does having access to cash affect caribou hunting?
4. What are some of the factors that affect exchange of caribou between households and communities?
5. In what conditions do locals move away from and or move back to communities?

This report is not intended to be free-standing nor exhaustive. Rather it is produced to complement the work of NSF researchers and augment their analysis of their existing data sets and construction of models. In this respect, the material documented is used to inform our study of possible futures by:

- generating variables to be considered or included in models
- dimensionalizing variables or establishing parameter values
- supplying a more holistic and complete understanding of key causal relationships incorporated in project models.

Before presenting the findings of this work, we want to articulate a proviso about cultural difference in research science and local knowledge. We want to acknowledge that by using computer simulation models as a means of understanding community sustainability, this study approaches the question of community sustainability in a manner that is foreign to the local culture of our partner communities. While researchers are commonly focus on specific quantitative relationships, community members frame their understanding in ways that are more holistic and less mechanistic that those portrayed in computer models. As locals have told us (also see Kofinas (*ibid: Chapter 4.*), Porcupine Caribou people's understanding of their ecosystem blurs the distinctions between the mystical and the material, generally locates relationships as bound to a historical context, and communicates understanding through the oral narratives of individuals. Albeit different, we also assume that the local knowledge of

caribou people shares similarities to what is commonly termed “the western scientific tradition” (Scott, 1996), and can make a meaningful contribution to the synthesis modeling effort of the project. We strive towards the co-production of knowledge with communities to reflect the problem of uncertainty in a comprehensive manner. Following Feit’s (1988) idea of “dual systems of knowledge,” we incorporate local knowledge into our study not to meld cultural perspectives, but in an attempt to improve communication among parties and resolve common problems.

In the pages below we present details about the hunting patterns of communities and providing time/distance information that serves in the basis of rules and reference tables of our SYNTHESIS MODEL. Since the work of the project has focused primarily on developing a SYNTHESIS MODEL that reflects Old Crow’s conditions, Old Crow field work is featured in this report. The report also presents a brief literature review and local knowledge on PCH movements and distribution, range-wide and community hunting zones and the input values derived from our work used in the SYNTHESIS MODEL.

Method of documenting local knowledge on caribou availability

In each of the four communities, we employed a modified “focus group” research methods (Agar, 1995; Morgan, 1988; Morgan, 1993) by conducting small workshops to address research-related questions on caribou availability. Two to eight “local experts” (Ferguson, 1997) were assembled at each meeting. Selection of local experts was made by community research associates in consultation with local organizations (e.g., the Aklavik Hunters and Trappers Committee).

At the gatherings, an overview of the project objectives was described with open questions to help direct discussion on research-related topic areas. A topographic graphic map with mylar overlays was used to facilitate data collection and general discussions. Data collection through mapping was cumulative; new overlays were added at the end of each interview for a process of building knowledge (except in Arctic Village where mylars were replaced). Mapping and discussion focused on seasonal and annual variation of caribou movements, major travel routes used by hunters, means to transportation, and conditions in which there are constraints on hunting in areas. After the first group interviews, a list of summary propositions were generated, and presented and refined at subsequent meetings as a means of “generative theory building” (Strauss, 1987; Strauss, 1990; Glaser, 1967). Because all discussion

were not easily captured as propositions (e.g., life history accounts), more general discussions allowed participants to "tell their stories" with follow-up questions and answers allowing for a semi-directive method of interviewing (Huntington, 1998). Workshops lasted 2.5 to 3 hours. Participants were provided a cash honorarium for their participation in the workshops. Additionally, individual interviews were conducted with some key local experts not participating in the discussion groups, but recommended by local organizations.

<i>Participation of local experts in focus groups.</i>		
<i>Community (population)</i>	<i>Number of discussion groups</i>	<i>Total number of people participating in all groups</i>
Aklavik, NT(~875)	5	22
Fort McPherson, NT (~975)	4	12
Old Crow, YT (~275)	4	16
Arctic Village, AK (~150)	3	14

Caribou Migration – A brief review of science-based research on movements and distribution of PCH animals

One of the tasks of this project is to develop development projects the annual and seasonal distribution of caribou across the landscape in relation to the accessibility to local hunters. Hovey *et. al.*. (1989) created a "Harvest Model" by :

- (1) describing nine migration scenarios,
- (2) formulating a probability that each scenario will occur, and
- (3) assigning a qualitative value to conditions in which there is a likelihood (low, mid, high, none) that caribou will be available to each community.

For the purpose of modeling caribou distributions with a rule-based model, the scenario method is useful as it accommodates the sequential nature of seasonal and annual caribou distributions. Probability is based both on historical use patterns and can be augmented with environmental causal factors (e.g. deep snow, foraging quantity,

human disturbance). The later, however, is not included in the Hovey *et. al.* (1989) "Harvest Model," but is important if seeking to make the model sensitive to forces for change.

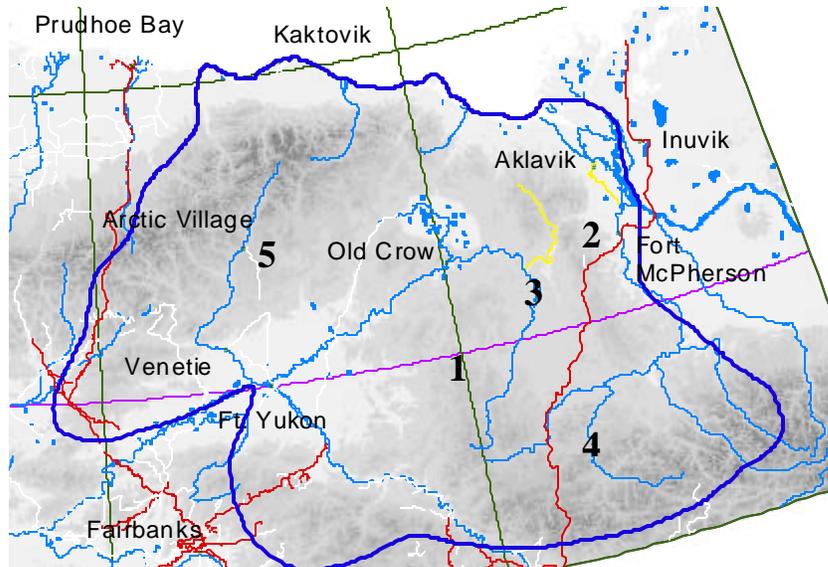
An overview of the available literature regarding the driving factors in PCH seasonal movements provides some insight worthy of inclusion in the study with locals. Most of the available literature focuses on PCH movements and distributions during the summer calving and post-calving periods. Given that these periods represent the most predictable stage of the caribou's life cycle and occur when there is little to no hunting activity, little discussion calving and post calving is presented here. Russell *et. al.*'s (1993) *Ecology of the Porcupine Caribou*, Eastland's dissertation on herd movements (Eastland, 1991), and Fancy *et. al.*'s ([Fancy, 1986) study of winter range fidelity are three documents about PCH migration patterns research that are discussed below.

Fall movements: Eastland notes that autumn migration does not follow distinct routes, but rather are "part of a continuous corridor that connects summer and winter components of the range." Eastland refers to September movements as "a form of migratory restlessness," and October movements suggesting that caribou were coordinated, and directional. Eastland identifies weather dynamics as among the driving factors influencing autumn movements with selection of over wintering habitat occurring after the rut period. He notes that weather is found to influence quality of forage and is an "ultimate" rather than a "proximate" influencing condition. He also notes that weather is independent of predation, which is assumed to be a factor in autumn movements as well.

Russell *et. al.*'s discussion of over wintering habitat notes that there is an unbroken record of PCH distributions for the period of 1970 to present (also see Russell, 1992). They write that "it appears that winter distribution of the herd is largely dictated by a combination of snow conditions and short-term traditional movements" (pg 31). They also identify "Four classic [Canadian] winter distributions reflecting snow conditions. " To these we add the Arctic Village distribution.

1. Yukon/Alaska Border Distributions: Russell *et. al.* speculate that the invasion of this southern range in the three years of their study was prompted by a late fall migration followed by heavy snowfall both north of the Porcupine River and within other wintering areas (Ogilvie/Hart). – see their monograph for explanations on seasonally transitional processes.

2. Richardson Mountains distribution – use of this area are found to coincide with “normal” to “above normal” snow levels (area characterized as having high winds during winter and un-even distribution of snow with many areas blown completely bare.)
3. Ogilvie/Heart Distribution – lowest mean snow accumulation. When herd occupied areas in Russell *et. al.* study period, overall snow conditions were above average. Caribou move to region and stayed until late spring migration.



4. Whitestone/Eagle Distribution – caribou here invariably when snow conditions here below average.
5. Arctic Village Distribution – caribou appear to be in this area in deep snow years or

when fall migrating caribou engage the “doughnut” fall movements around Old Crow.

Fancy *et. al.*'s (1988) analysis of ten years of distribution and movements data for 227 radio- and satellite collars indicate that 60% of the herd wintered in Canada each year, and were found south of the 67 degree parallel and on the axis of the Richardson Mountains. They also found that there was considerable variation of winter range; in three years 90% of the herd wintered either in Canada or Alaska. Finally, their data indicate that there is no evidence of fidelity by individual caribou to specific winter ranges. They conclude that “densities, heavy, localized harvest should not infer with the maintenance of traditional movements throughout an area, and the capture or collection of caribou in one location may provide a representative sample of the herd” (p.2).

Both Eastland and Russell *et. al.* describe spring migrations of cows as directional, with snow pack conditions a key factor in determining the timing and rate of northward

movements. As Eastland puts it, “[S]pring migration of females is driven by timing, but ... braked by snow conditions that influence traveling and foraging.” These conditions have implications to the timing of northbound movements, the rate of travel, and the energy consumed in the process.

These understanding are summarized in the following table.

Summary of general description of annual movements	
Calving	Two distributions are possible – calving in the foothills or calving within the core “1002” calving area. Historical evidence suggest that caribou will attempt to calve in the core area unless snowmelt either hinders movements or precludes use
Post-calving/ Summer	Three distributions are generalized from historical records. Selection has implications to certain communities’ harvest. They are <ul style="list-style-type: none"> • early dispersal to south of treeline • dispersal from summer aggregations above treeline • dispersal north of treeline into NWT via the Richardson Mountains
Fall	It is assumed that the route chosen in the fall influences winter distributions, and winter habitat dictates the spring route north. Winter habitat selection generally occurs after the rut period.
Winter	Caribou can be found anywhere in their entire range in the winter months, although some areas have historically been used repeatedly.
Spring	Spring movements generally occur in two waves, first pregnant cows and then dry cows and bulls. Cows follow one of several routes, including <ul style="list-style-type: none"> • the Richardson’s Route • the Old Crow Route • The Chandalar Route <p>Minor differences in routes followed annual variation can have implication to community hunting success.</p>

Local Knowledge Propositions on caribou movements and distribution

We talked with local hunters about seasonal distribution and movements of Porcupine Caribou, asking them to describe the patterns they had observed and what they believed to be the causal factors influencing movements. The propositions below represent a select summary of the propositions discussed by locals who participated in the workshops. :

Late summer/Fall to winter

- Caribou travel when temperatures are cool (i.e. at night and not when days are hot or snow is soft)
- Caribou in fall are destination oriented (i.e. “The know where they are going”), with duration of movements regularly prompted by weather events, human disturbance, and wolves;
- Late summer to fall storms influence caribou to move south earlier. More specifically, North Slope storms (bad weather as well as icing storms) prompt movement south. Icing storms anywhere can move caribou to another area;
- Human disturbance of herd’s vanguard caribou (described both as bulls and cows) may cause shift in herd and movements to another area;
- Caribou select for rutting areas and then select for wintering areas
- Caribou are less likely to move from rutting area if not disturbed during rut period;
- Movement of caribou during fall season is stimulated by presence of wolves.
- Movement of caribou during fall season is prompted by presence of fires.
- Late fall caribou are selecting habitat for high food quality (lichen rich) wintering habitat;

Winter and Spring

- After early and shallow snowfall caribou remain in lowlands (valleys)
- After deep snowfall, caribou move uphill to windswept ridge tops;
- Residence of caribou through winter will more likely if “muskrat push ups” are available. (absence of push-ups can be the result of early fall snowstorms and overflow conditions on lakes)

- Selection of winter habitat appears to be cyclical or rotational , with duration of area occurring every 3 years (several opinion), 5 to 7 years (several opinions), and 30 years (several opinions);
- A small number of caribou wintering in an area one year increases the likelihood that a greater number caribou will be in that area the following year. (Caribou scouts report to the greater herd)
- Initiation and rate of caribou cow’s northward movements will be determined by snow pack conditions, photo period, and temperature;
- Movement north of cows can occur as early as January (as was the case this year) to May.
- The warmer the temperature and deeper or more crusted the snow pack, the more likely caribou will remain south later into the winter
- When remaining south for a longer duration, caribou cows move north at a faster rate

Driving Variables by season and implications to hunter access

The following table summarizes local knowledge as a set of relationships, linking key environmental conditions with caribou behavior, and its implications to community access of hunting areas.

Late Summer to Fall Conditions		
Environmenta l Condition	Caribou Response	Implications to community access
Mosquitoes	Early season mosquitoes may influence behavior; caribou more like to be near water in hot, wind free- periods	Escape from mosquitoes to coastal areas may allow for shore-side hunting and access with boats
Icing events	Prompt movement	May decrease time caribou are in community area, or may result in caribou from another area coming to community area
Early North Slope Storms	Caribou move off calving grounds sooner and begin fall movements and increase likelihood that caribou will cross upper Porcupine early.	more likely to cross Porcupine in mid August when temps are warm and thus limit total take of community
Fires or presence of smoke	Prompts movements, may damage habitat	May decrease time caribou are in community area, or may result in caribou from another area coming to community area
High water on rivers and	May restrict crossing of rivers or streams and shape choices of	May redirect caribou away from community as well as allow for better

creeks	migrating caribou at key decision points of route (e.g., towards Chandalar vs. Richardson Mountains)	hunter access using a boat on rivers.
Presence of predators	Prompts movements	May decrease duration of caribou in an area, may shape choices of migrating caribou at key decision points of route
Human Disturbance and “deflection” of vanguard movements	Prompts movements	May decreases duration of caribou in an area; may shape choices of migrating caribou at key decision points of route
Good forage quality	Caribou more likely to linger in areas if has there is good quality forage; forage selection changes from herbaceous period to lichens through course of fall to winter period.	Good forage quality may increase duration caribou stay in area and provide greater opportunities for community hunters to harvest animals caribou.
Summer distance of Beaufort Sea ice pack from land mass is high (a consequence of warm summers)	Quality of forage in near-coastal areas is better during late-summer period in season when sea-ice is a far distance from land.	Good forage quality may increase duration caribou stay in area and provide greater opportunities for community hunters to harvest animals caribou.
Wind direction	Caribou run into the wind.	Caribou migrations may be shifted by prevailing wind direction.

Winter Conditions		
Environmental Condition	Caribou Response	Implications to community access
Ground temperature at time of first snowfall (e.g., before hard freeze of after)	Decreases the energy associated with catering for quality forage	In absence of ice storms, conditions increases likelihood caribou will remain in area for winter
Human disturbance during winter habitat selection	May redirect caribou to other area or prompt continued movement of animals for longer period	
Wolves	May redirect caribou to other area or prompt continued movement of animals for longer period	
Deep snow year	Delayed and rapid movement north of pregnant cows and bulls	Smaller window for spring hunting
Shallow snow year	Pregnant cow caribou may creep northward for longer	Longer window of time for spring hunting

	period of time	
Presence of caribou muskrat push ups	Caribou will use push up for forage	Caribou more likely stay in area for longer duration

Spring		
Environmental Condition	Caribou Response	Implications to community access
Longer photo period	Stimulates movement north	
Snow pack – crusty and or deep conditions	Slower movement north	Longer window of time for spring hunting
Timing of break up		
Quality of break up	Violent breakup may delay	
Temperature	Cooler temperatures prompts movements to lower elevations and across valley bottoms	Caribou typically on high ridge tops at that time of year will descent to become more accessible. Caribou more likely to be by river's edge)

Summer (Calving and post calving)		
Temperature - warm	More likely to be by shore side	Caribou accessible by boat
Wind – no wind	More likely to be by shore side	Caribou accessible by boat
Storm events	More likely to leave calving grounds early	May mean travel to Chandalar route more likely if calving foothills and to use Richardson route if calving in Yukon
High Forage quality	Caribou more likely to stay on north slope for longer duration	

Hovey et al.'s Model of Herd Distribution Scenarios

As a part of our work we needed to develop a model which would project seasonal and annual caribou movements. The table below provides a summary of the overall approach and structure Hovey *et al.*'s PCH harvest model, which served as our starting point.

Migration Scenarios as in Hovey *et. al.* (1989) with fall and spring divided into two sub seasons

Codes:

C= Chandalar

E= Exceptional Route (Chalkytsik, Tatonduk?)

N= North of Porcupine (Crow Flat)

O= Ogilvie

R= Richardson

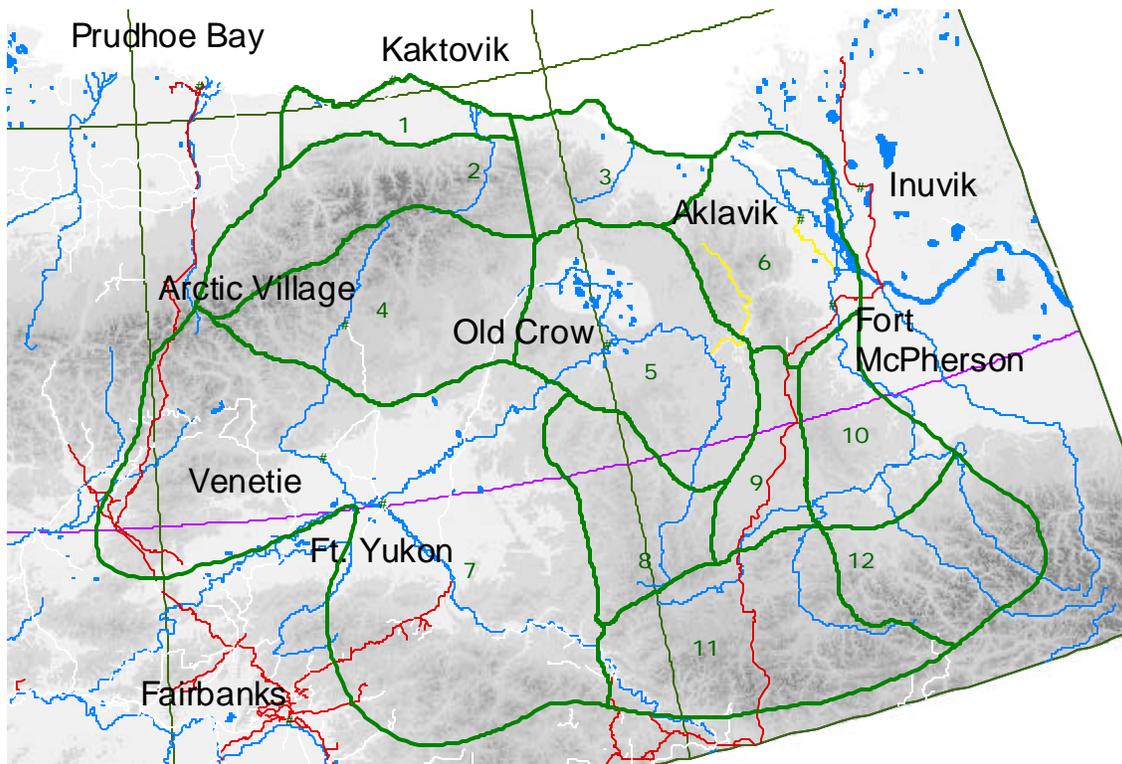
A= Arctic Village

P= Peel River (Caribou Mountain area)

<i>Scenario</i>	<i>Early Fall movements</i>	<i>Fall movements</i>	<i>Winter distribution</i>	<i>Spring migration cows</i>	<i>Spring migration bulls</i>	<i>1989-historically based frequency</i>
1.	O	O	P	O	O	3/17
1.	O/R	O/R	P/R	O/R	O/R	1/17
2.	O/C	O/C	P/A	O/C	O/C	4/17
3.	O/R/C	O/R/C	P/A	O/C	O/C	3/17
4.	O/N	O/N	P/N	O/N	O/N	1/17
5.	O/C	O/C	A/K	O/C	O/C	1/17
6.	O/R/C/E/N	O/R/C/N	P/R/A/N	O/R/C/N	O/R/C/E/N	1/17
7.	O/R/C/N	O/R/C/N	P/R/A/N	O/R/C/N	O/R/C/N	1/17
8.	C/N	N/A	N/A	N/A	C/N	2/17
9.						
10.						

Herd-wide delineation of zones for analysis of distribution

Based on a review of literature, discussions with local hunters and biologists, and an analysis of Canadian Wildlife Service data on caribou movements and distribution patterns, we delineated twelve zones to capture patterns of annual changes in distribution. (A summary of distribution data are available from Kofinas.) The map below shows the zones we used in scenarios of the SYNTHESIS MODEL.



Community Caribou hunting briefly described

Old Crow

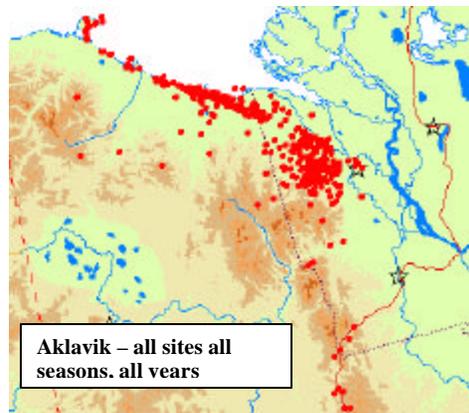
Old Crow is located on the confluence the Porcupine and Crow Rivers. Its hunters access caribou on river during ice-free periods and after sufficient snowfall via snowmobile on mountainous areas, rivers and lakes areas . Hunting during the ice-free period commonly includes taking animals at caribou crossings and while animals swimming in river (dead caribou float, which reduces wounding loss and thus wastage.) There is no road access to or from this community, although there is a 2 km road leading from community to Crow Mountain north of community with a winter trail to Crow Flat. Hunting from the Porcupine River and in Crow Flat area is facilitated with traditional family bush camps and recognized family territories located in these areas.

Fort McPherson

Fort McPherson is the only one of the study communities that has year-round access via fully maintained road. Hunting from the Dempster Highway is common. Access to caribou located in the south requires crossing the Peel River which is serviced with a ferry during ice free periods and ice bridge after freeze up, with no crossing occurring around freeze up and break up periods. There are no *de jure* restrictions for hunting along side the highway, although safety rules apply. There is a standing recommendation from the Porcupine Caribou Management Board that Native hunters take caribou at least 1 km from the highway, although it is commonly not observed. Snowmobile access directly from the community generally follows the Rat River, and towards the Richardson Mountains to the west. Alternative hunting is caribou available from the Bluenose caribou herd to the east, although locals strongly prefer taste of PCH animals.

Aklavik

Aklavik is located at the confluence of the West Channel of the Mackenzie River and the Peel River on the west side of the Mackenzie River Delta. There is a winter ice road constructed each year from Inuvik to Aklavik. There are two claimant groups (Inuvialuit and Gwich'in) in this community, with each having its own native lands holdings. It is understood that hunters of each group is to inform the other of plans to travel and hunt on their lands. Hunting areas used by Aklavik hunters spans from the central Richardson Mountains to US-Canadian Border. Inland hunting occurs during periods of sufficient snow cover. Hunting from West Channel to the coast and west occurs in ice-free periods, especially in the spring just after break up and the arrival of northbound bulls. Family bush camps are established in Richardson Mountains and at Shingle Point there is a collection of ten or more family bush cabins and tents located.



Arctic Village

Arctic Village is located on the East for of the Chandalar River, Arctic Village is situated just south of the Brook Range. Population is primarily Netsii Gwich'in. Hunting area of community is common with Venetie to the south. Caribou lookouts located up the Chandalar to the Brooks Range with bush camps and individuals trap lines extending to Burnt Mountain to the southwest and south to Fort Yukon.

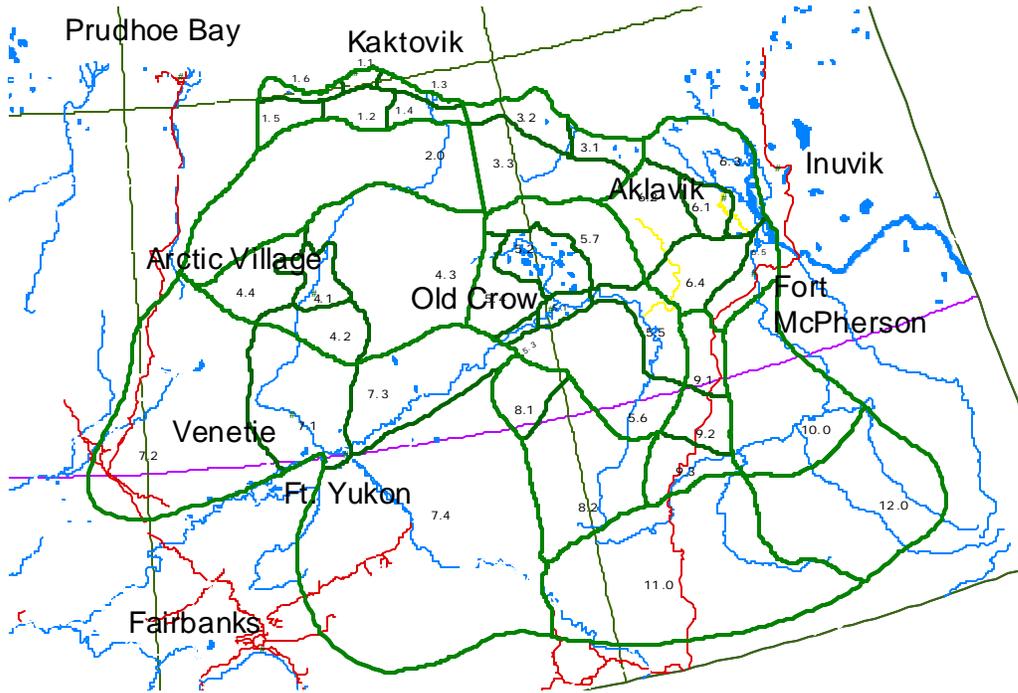
Community Hunting areas

Community Porcupine Caribou hunting areas are defined local hunting regions of each community which are delimited for the purpose of this project to illustrate how changing hunting effort can affect caribou hunting success. Hunting effort is determined by environmental conditions, hunters' available time, gear, and fuel, and. access restrictions. Delineation of a community area does not suggest that historically members of these communities have been not used additional areas. Listed effort includes the following variables:

- Environmental conditions affecting proximity of caribou to community
- Environmental conditions affecting condition of caribou
- Knowledge that caribou are available (information/perceptions of certainty of success)
- Knowledge of quality of caribou
- Knowledge/skills of hunting and travel in area
- Costs requirements to get to location
- Available time and material resources need to travel to caribou
- Hunters' preferences of geography (i.e. Hunting areas, number of people in area, kinds of people in area)
- Legal restrictions/access rights
- Need (individual, family, kin group, community, other communities, etc.)

We worked with hunters in partner communities to further delineate a set zones.

Boundaries off sub zones are nested in the larger zones and are draw with the intent of capturing both patterns of caribou distribution and movements, but also differences in hunting effort in different areas.

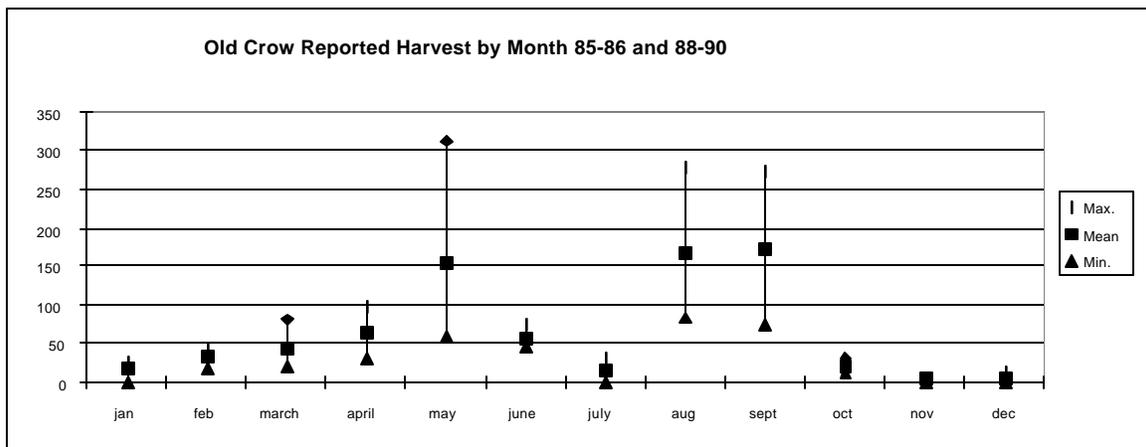


Environmental conditions limiting hunters' access

Some of the Key Environmental Variables influencing caribou movements and distributions

- North Slope storms in fall
- Temperature (includes forage quality)
- Storms (timing)
- Snow pack depth
- Snow pack density (and crusting)
- Wind conditions
- Date and duration of freeze-up and break-up period
- Water level
- Fire
- Human disturbance in early to late fall periods

Qualitative description of hunting patterns: Old Crow



From Kofinas 1998 – based on YTG reports

<p><u>Late summer to fall</u></p>	<p><i>Late summer (to August 31):</i> First arrival of caribou. Community hunters' interception of caribou in migration generally by boat at traditional river crossings. Hunting strategy includes either intercepting while cursing river or sitting at traditional caribou crossings, making a fire, and waiting. If caribou are on Crow and Second Mountains, directly behind community, access is made by foot and with four-wheeler transportation via 2 km road and trail. If there is some snow or ice, small "Elan" style skidoo used on dry tundra. Some animals accessed via boat travel up Crow River, depending on water levels. Few caribou taken at this period because of warm temperatures. Preferred take is bulls.</p> <p><i>Fall: (to Oct 8):</i> Period of greatest hunting activity. Effort defined as same as above. Forays on Porcupine River extend from Whitestone River to beyond US border. In high water may include trips up Crow River. Bush camps on river serve as base and establish <i>defacto</i> family hunting areas. Caribou hunting commonly undertaken with other activities (gathering wood, hunting for moose, taking scenic river trip).</p> <p><i>Oct 8-31</i> Hunting is generally not undertaken, unless fall caribou need has not yet been met. If this is the case, harvest is limited to female caribou or young bulls because of "stinky" and "watery" condition of caribou during rutt (i.e. local ethic of non-disturbance of animal at this time.)</p>
<p><u>Early winter</u></p>	<p><i>November 1-January :</i> Caribou's presence in community hunting areas highly variable and uncommon, depending on wintering distributions. If in the area and there was limited autumn harvest, community will hunt to meet needs. If high autumn take, then moderate to low winter harvest. Preferred take is bulls. Extreme cold and short days limit activities this time of year. . As well, open water and low snowpack conditions make travel more difficult (bumpier) and slower. Caribou sometimes found by trappers on trap lines and hunted</p>
<p><u>Winter</u></p>	<p><i>January 1 to March</i> Caribou presence in community hunting area uncommon or requiring high effort. If present, generally in small groups. Weather conditions moderate. In late winter longer days allow for longer forays to outlying areas. Hunting activity low and is sometimes associated with trapping and wood gathering activities with caribou are discovered.</p>

<p><u>Spring</u></p>	<p><i>Late Winter, 21- February - 31 April; Snow-cover peaking; longer day length; Interception of caribou during spring migration variable but common. Community interception generally via snowmobile. Access depends on snow conditions and timing of spring break up (generally occurring in May). “Candle ice” conditions can confound travel and poor snow conditions; early break-up can make caribou inaccessible. Selection for cows, especially dry cows, and young bulls because of superior body condition. Caribou hunting historically undertaken in conjunction with trapping activities at Crow Flat.</i></p> <p><i>May 1 - 19 ; Primary spring harvest period and traditional time to gather limited quantity of fresh meat. Ice flows of break-up and poor snow pack conditions may limit community access to caribou. Lakes on Crow Flat beginning to melt. Snowmobile access and possible boat access (if early break up) offer access to migrating cows and then bulls. No-cow harvest ethic means some hunters may wait till appearance of bulls before hunting, and get skunked if bulls by-pass community areas. Warm temperature is limiting factor because of meat spoilage and storage problems.</i></p> <p><i>May 20 – 31 and to late summer : Warming temperatures and household’s outdoor caches are limiting factor because of meat spoilage and storage problems. Remains a problem until colder weather returns. Typically few caribou in area.</i></p>
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<p>Near community hunting</p>	<p><u>Late summer to fall</u></p> <ul style="list-style-type: none"> • Human disturbance (hunting of vanguard, chasing animals with skidoos, noise, human smells) may deflect movements of animals from area and limit proximity and duration of time they are very near community. (Historically caribou have come right through community or been located on mountain area immediately adjacent.) • If caribou arrive early, warm temperatures will limit hunt. (waste avoidance). Locals have outdoor caches for meat storage; must wait for cool weather to take high quantities of meat. • Without snow, hunters’ access is limited to four-wheeler traffic or boar travel <p><u>Early winter</u></p> <ul style="list-style-type: none"> • Boat travel limited during freeze-up period. Travel restricted to overland, and limited because of open water and limited snowpack. <p><u>Winter</u></p> <ul style="list-style-type: none"> • caribou seldom in near-community area in winter months • Occasionally found “far” away in various winter areas • Access at this time of year limited by cold temperatures and darkness
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	<p><u>Spring</u></p> <ul style="list-style-type: none"> • caribou migrate through area, crossing river near community or floating by village site on sheets of ice. • Community has strong non-cow harvest ethic, taking some cows as well as young bulls (selecting for quality of body condition) • Travel up and down river possible prior to break up period. • Generally little travel during break up
<p>Porcupine River Corridor, far up river</p>	<p><u>Late summer to fall</u></p> <ul style="list-style-type: none"> • Commonly used harvest area fall time of year; typically bulls cross in this area first • Early storms on North Slope and movement of caribou on the Richardson route may result in early caribou crossing at this area • Low water levels increase travel times because of need to follow side channels (caused by low snow year or hot dry summer) • Hunting up river preferred to down river because it facilitates transportation of loaded boat back to community • Hunting far up river commonly undertaken in association with moose hunting. • Little to no hunting after caribou begin rutting activity (~ October 8 to 31) because of stinky meat <p><u>Early winter</u></p> <ul style="list-style-type: none"> • Darkness and cold temperatures limit hunters' access to caribou <p><u>Winter</u></p> <ul style="list-style-type: none"> • Caribou historically over winter far up river at Whitestone, Driftwood, and Bell River. Also on western slope of Richardson Mountains. • Small groups may be scattered anywhere on winter range. • Deep snows, darkness or cold temperatures, unpacked trail, or overflow water can limit access • Set trail will greatly reduce travel time and make area more accessible • High winds may obliterate set trail conditions <p><u>Spring</u></p> <ul style="list-style-type: none"> • Deep snows may delay and slow travel of cow • Selection for young bulls may delay hunt • Timing of break up may limit access
<p>Porcupine River Corridor, far down river</p>	<p><u>Late summer to fall</u></p> <ul style="list-style-type: none"> • Down river travel requires extra costs associated with bringing home meat up stream; more efficient to hunt up river. • Generally undertaken in this area because 1) area close to family bush camp or 2) few caribou pass up river in migration • Down river hunting commonly associated with doughnut migration pattern around Old Crow (when animals first cross up river and later cross northbound down river)

	<p><u>Early winter</u></p> <ul style="list-style-type: none"> • Uncommonly used in this season • May be associated with trapping
	<p><u>Winter</u></p> <ul style="list-style-type: none"> • Area uncommonly used this time of year
	<p><u>Spring</u></p> <ul style="list-style-type: none"> • Area uncommonly used, but may be site of crossing northbound caribou.
Crow Flat	<p><u>Late summer to fall</u></p> <ul style="list-style-type: none"> • Access is limited by water low water levels • Caribou sometimes taken on the Crow River when caribou are southbound through Crow Flats
	<p><u>Early winter</u></p> <ul style="list-style-type: none"> • Difficult to access area because of open water, low snow in gullies, and distances required
	<p><u>Winter</u></p> <ul style="list-style-type: none"> • Caribou do occasionally over winter on Crow Flat. • Locals see correlation of availability of “muskrat push-ups” and presence of caribou; overflow conditions may eliminate presence of push ups. • Travel to this area requires knowledge of land. • Area can be accessed in two ways, either by traveling due north of community or by going north to “little flats” off the Porcupine.
	<p><u>Spring</u></p> <ul style="list-style-type: none"> • Traditional use area that is associated with muskrat trapping. Some families travel to area and “pass spring” o the Flats. • Local policy at present provides assistance for those wishing to take family to Flats to participate in activity.
South of the Porcupine River to Lone Mountain	<p><u>Late summer to fall</u></p> <ul style="list-style-type: none"> • Difficult to access area in absence of good snow cover
	<p><u>Early winter</u></p> <ul style="list-style-type: none"> • Lots of open water limits hunters access
	<p><u>Winter</u></p> <ul style="list-style-type: none"> • Caribou were in this area during the fifties in winter and older areas and active hunters familiar with area, but has not been used recently. Locals predict return as caribou with repeat of migratory cycle • Difficult terrain to travel requiring physically fit traveler (“not for elders”) and knowledge of the land – very rough • Location of 1999 winter road • Travel in this country facilitated by cut lines (old seismic lines.)
	<p><u>Spring</u></p> <ul style="list-style-type: none"> • Area generally not used in early spring • Some travel to lakes just south of Old Crow, but not beyond Lone Mountain

Cost, Time, and Distance

Old Crow

OLD CROW HUNTING AREA					
	<i>location</i>	<i>Type of gear</i>	<i>Time ow</i>	<i>Total fuel needs</i>	<i>comments</i>
Near community	First and second mountain	By foot	1 hour	-	
		Four wheeler	30 minutes	5 g	
		Snowmobile (little to no snow)	30 minutes	5 gal	
	Slough area at Crow River	By four wheeler	20 minutes	2 gal	
	Caribou lookout	Boat/40 hp	.5 hour	10 gal	(10 miles)
	Caribou Bar Creek	Boat/40 hp	2 hour	15 gal	(3.5 hours to get back)
Porcupine River Corridor, far up river	Lord Creek and Fish Lake	Boat/40 hp	1.5	15 gal	(30 miles)
	Driftwood (Billy net Stretch)	Boat/40 hp	2.5	25 gal	(50 miles)
	Driftwood	Boat/25 hp	6 hours	20 gal	
	Driftwood	Snowmobile hrs (small machine)	2-3 hrs	20 gal	Elan is 4 gal ow. Person needs 2 to 3 days if going to Driftwood or beyond.
	Whitefish Lake	Snowmobile (newer model)	3 hours	15-20 gals	Two to three day trip. X 2 with smaller Elan machine
	To Bell River	Boat/40 hp	6-7 hrs		(
	Up Bell River to head	Boat/30	One week trip	60 to 80 gal	More an expedition than a hunting trip
Porcupine River Corridor, far down river	Bluefish Creek	Boat/40 hp			
	New Rampart House	Boat/40 hp			
	Canyon Village, AK	Boat/40 hp			
	Crow River Canyon	Boat/40 hp			(25 miles)
Crow Flat	To central Crow flats	snowmobile	2 hours if good snow cover	15 gal	Hard on old traveler
	Upper Thomas Creek	Boat/40 hp			
	Upper Blackfox Creek	Boat/40 hp			(150 miles)
	Lone Mountain	snowmobile			

South of the Porcupine River to Lone Mountain	White Snow Mountain	snowmobile	2 hrs w/ trail 2 days w/o trail		20 miles from OC. Very rough country. "Good for a young guy to travel, hard on elder."
	Bear Cave Mountain	snowmobile			
	Upper Cody Creek	snowmobile			
Extra Far and other Trips	O.C. to La Chute	Snowmobile	6 hrs with trail; 15 w/o trail	25 gall	
	O.C. to Fort McPherson	Snowmobile	As fast as 10 hours w/ trail		Generally a two to three day trip.
	Flight to Crow Flats	Chartered aircraft (207)	40 to 50 minutes	CA\$250 -400/t	O.C. harvest assistance program now pays air charter. Hunter still must have their own gear.

Gear Costs

Old Crow

	Cost	Annual Maintenance	Life of machine
Boat	CA\$3000 (used and small engine)-\$10,000 (new and state of the art)	300-400	Motor – 5 to 8 years if active hunter. Many years if occasional hunter.
Skidoo, incl freight	3000-15000	300-400	3 to 4 years if active hunter. Many years if occasional hunter.
Gas	\$1.10 / liter		

Notes on purchasing and sharing of gear

- New boat “kickers” are more efficient in fuel consumption and break down less often.
- Community organizations with Canadian land Claim settlements offer several interest free loan programs and outright grants form purchase of gear for those who spend time on the land

- Boats are sometimes loaned, skidoos more often than boats. Trucks are only occasionally loaned. All loans based on skill level and perceived judgement of hunters.

Snowmobile costs – newer model	Twin 340 cc costs \$5,000 to \$6,000 (Polaris, Arctic Cat, Yamaha, Bombadier)
Older model	Single 250 cc costs \$3,000 to \$4,000 (Bombadier Bravo)

Employment , Cash, and Hunting

Propositions generated by local hunters in focus group discussions:

- If you have a full time job and you hunt, you are likely to only hunt weekends
- If you have a full time job, you are more likely to have new gear (faster gear) and more gear
- If you have new/faster gear you have “more chances” to get caribou than those with older /slower gear.
- If you have a full-time job and you don’t hunt, you can get your caribou from another hunter through trade and bartering with other hunters
- If you have a full time job and there is another hunter living in your household (a son or younger man who is an active hunter) you are likely to supply him with family gear
- If you are a single mother you may meet your caribou needs through supply of hunting of active hunters.
- If you are the woman of the house who helps to produce caribou, dealing with caribou meat (after caribou is returned to community) may take several houses and 7 caribou a full day of work.
- If you don’t have a full time job and are hunting seasonally I Old Crow, working in the fall is the most disruptive to meeting your caribou needs.
- If you don’t have a full time job and have access to or own your own rig (skidoo or boat and motor) you can meet you caribou needs and partially support your on-the-land activities by hunting for other people

- If you don't have a job and have no rig, you are more likely not to hunt or take far trips.
- If you don't have a job and have no rig, you are dependent on borrowing from another hunter who will lend you gear in exchange for sharing your take of animals.
- If you don't have a job, the skills to have a job, nor opportunities to be employed, and you have no gear, you face the barrier of investing in the high capital costs of hunting supplies (\$5000 for a skidoo or used boat)
- If you don't have a job, you are more likely to avoid congestion of hunting area (unsafe activities of lots of people hunting at once and caribou meat that is worked from being run) by not hunt on weekends when weekend hunters are out.
- If your community has a interest free loan program (“Community harvest assistance program) which you know you may not have to repay, you may borrow money for boat or snowmobile from your First nation and invest the money in skidoo or boat.
- If you have a job, you will face a disincentive related to taxes and time constraints and may strategize by working just long enough to earn Unemployment Insurance” (EI) but not so long that it will cut into your hunting time.
- If you have a job and thus limited time for hunting, you are less likely to spend lots of time with your children teaching the skills of hunting.
- If you have a job and thus limited time for hunting, you are more likely to depend on your grandparents or other community elders to meet the function of teaching youth to hunt.

Conditions for switching Herds

- If your community is located in the central portion of the range of a caribou herd, you have limited to no opportunities to exploit adjacent caribou herds
- If your community is located near an adjacent herd, and caribou have not been in your area nor do you anticipate them being in the area soon (e.g., Aklavik hunters realizing that caribou will not be in their area during fall nor winter), then you will opt to hunt other caribou

- You will act on the option of hunting another herd if you have a partner to share a truck, the cost of driving to area, and knowledge that caribou are accessible adjacent area

Knowledge of caribou herd's location

- You are more likely to dedicate scarce resource to far caribou hunt in you have high degree of certain of being successful in hunt.
- You are likely to know where caribou are if there is steady flow of travelers (local or non local) in the area

Highway Hunting

How does highway hunting affect communities and those traditions they say they want to maintain? Highway hunting offers the project one of the most illustrative examples of changing traditions of harvesting caribou and an opportunity for locals to discuss the implications of those changes. Hunting on the Dempster and the possible construction of a road to Old Crow have and remain hot topics for locals.

Here is a set of rules which emerged from my discussion with McPherson hunters.

If you hunt from the Dempster Highway you are:

- More likely to need a truck to hunt
- Less likely to share a story with a young person while hunting
- Less likely to share in the ritual of making a fire, sitting outside, and enjoying a cup of tea
- Less likely to get use to traveling in cold weather
- Less likely to develop the patience of waiting for animals to given themselves
- Less likely to spend time observing the land and animals
- Less likely to camp when hunting
- Less likely fully to butcher and dress your meat before you get home
- More likely to store your meat without properly preparing the meat
- Less likely to learn the skills traditionally part of native community hunting.

A highway to a community is also described as increasing the likelihood that

- Alcohol will be found in the community

- Youth will leave for the weekend
- Outsiders will be in town
- Goods will be less expensive
- More likely visit with kinfolk in other regional communities
- More likely to go to regional meetings

Values for models

In the sections below, we present some of the values that function as the basis of “lookup tables” in the SYNTHESIS MODEL. These are recorded in an EXCEL spreadsheet, with most cells including a “comment” (background note on the cell) to reflect that rationale in arriving at each value.

Effort in "normal conditions" by hunting zone

d= day trip; o = overnight; w= weekend to three days; m= may take a week of travel or more.	Early winter - post freeze up without good snow cover (snowmobile, truck)	Late winter - good snow cover (snowmobile, truck)	Spring - good snow cover, long days after break up (snowmobile, boat, truck)	summer (no snow - boat, foot, truck)
time needed to harvest in average year				
Old Crow				
5.1. Near community hunting	d	d	d	d
5.2. Crow Flat	w	o	o	w
5.3. Down river to Rampart and border	o	o	d	o
5.4. Mountains North of Rampart House	w	w	w	m
5.5. Up river to Whitefish Lake and Johnson Creek	o	d	o	o
5.6. South to Lone Mountain and beyond	m	w	w	m
5.7. Northeast of Crow Flat, Driftwood basin	m	w	m	m
9 Dempster Highway Hunting	m	m	m	m

Hunting effort in differing environmental conditions

h=higher than baseline, l=lower than baseline

	Early Winter	Late Winter	Spring	Summer
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Old Crow					
1- If late summer and fall storms					
5.1. Near community hunting					
5.2 Crow Flat					l
5.3 Down river to Rampart and border					
5.4 Mountains North of Rampart House					
5.5 Up river to Whitefish Lake and Johnson Creek					
5.6 South to Lone Mountain and beyond					
5.7 Northeast of Crow Flat, Driftwood basin					l
9 Dempster Highway Hunting					
2- IF deep winter snows ("early winter")					
5.1. Near community hunting					
5.2 Crow Flat		l			
5.3 Down river to Rampart and border					
5.4 Mountains North of Rampart House			h		
5.5 Up river to Whitefish Lake and Johnson Creek					
5.6 South to Lone Mountain and beyond		h			
5.7 Northeast of Crow Flat, Driftwood basin		h			
9 Dempster Highway Hunting					
3- IF early snowmelt					
5.1. Near community hunting				l	
5.2 Crow Flat					h
5.3 Down river to Rampart and border					
5.4 Mountains North of Rampart House					
5.5 Up river to Whitefish Lake and Johnson Creek				h	
5.6 South to Lone Mountain and beyond				h	
5.7 Northeast of Crow Flat, Driftwood basin				h	
9 Dempster Highway Hunting					
human disturbance - highlighting areas where human disturbance has been a concern mentioned by locals					
5.1. Near community hunting		h	h		
5.2 Crow Flat					
5.3 Down river to Rampart and border					
5.4 Mountains North of Rampart House					

5.5 Up river to Whitefish Lake and Johnson Creek					
5.6 South to Lone Mountain and beyond					
5.7 Northeast of Crow Flat, Driftwood basin					
9 Dempster Highway Hunting		h	h		

Conditional likelihood of Caribou distributions and movements

h=high, m=medium, l=low

	EarlyWint	LateWint	Spring	Summer
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Old Crow

1- Prob. caribou in smaller area if in larger area

5.1. Near community hunting	l	l	m	l
5.2 Crow Flat	m	m	h	m
5.3 Down river to Rampart and border	l	l	h	l
5.4 Mountains North of Rampart House	m	m	h	m
5.5 Up river to Whitefish Lake and Johnson Creek	m	m	h	l
5.6 South to Lone Mountain and beyond	m	m	h	l
5.7 Northeast of Crow Flat, Driftwood basin	m	m	h	m
9 Dempster Highway Hunting	m	m	h	l

2- IF IN LARGER AREA, Probability in SMALL HUNTING area if early FALL

STORMS

5.1. Near community hunting				
5.2 Crow Flat				
5.3 Down river to Rampart and border				
5.4 Mountains North of Rampart House				
5.5 Up river to Whitefish Lake and Johnson Creek				
5.6 South to Lone Mountain and beyond				
9 Dempster Highway Hunting				

Note that with fall storms, caribou are likely to move out of coastal areas sooner. This is where timing and rate of movement comes in. I am not

3- Popability in area in DEEP SNOW

YEAR

5.1. Near community hunting				
5.2 Crow Flat				
5.3 Down river to Rampart and border		l	h	

Note: Environmental conditions are not fully captured here. The sequence of temperature and snowfall influence the probability of caribou in Crow Flat. In the absence of overflow ice conditions

5.4 Mountains North of Rampart House		h	h		
5.5 Up river to Whitefish Lake and Johnson Creek					
5.6 South to Lone Mountain and beyond		h	h		
5.7 Northeast of Crow Flat, Driftwood basin		h	h		
9 Dempster Highway Hunting		h	h		
4 -Probability in area if EARLY SNOW MELT or SHALLOW SNOW YEAR					
5.1. Near community hunting			h		
5.2 Crow Flat		h	h		
5.3 Down river to Rampart and border			l		
5.4 Mountains North of Rampart House					
5.5 Up river to Whitefish Lake and Johnson Creek		h	h		
5.6 South to Lone Mountain and beyond			l		
5.7 Northeast of Crow Flat, Driftwood basin			l		
9 Dempster Highway Hunting					
5 Likelihood caribou present IF Human disturbance in area during fall caribou migration					
5.1. Near community hunting		l	l		
5.2 Crow Flat					
5.3 Down river to Rampart and border					
5.4 Mountains North of Rampart House					
5.5 Up river to Whitefish Lake and Johnson Creek					
5.6 South to Lone Mountain and beyond					
5.7 Northeast of Crow Flat, Driftwood basin					
9 Dempster Highway Hunting		l	l		