Through the eyes of hunters:
How hunters see caribou reacting to hunters, traffic, and snow machines near the Dempster Highway, Yukon

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Through the eyes of hunters: How hunters see caribou reacting to hunters, traffic, and snow machines near the Dempster Highway, Yukon.

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Summary

The Porcupine Caribou Management Board keeps asking, “Is the herd harmed by hunting, traffic, and snow machine uses near the Dempster Highway?” Caribou population declines concern elders and hunters in many communities. Porcupine caribou rarely use winter ranges east of the highway.

We thought about how to answer this question. Field studies that measure how our activities change the behaviour of caribou are difficult: the caribou in this setting are migrating, hunted, and only a few have radio collars. So we used another approach, a focus group technique. This allowed us to learn from the experience of hunters and wildlife viewers with tens of thousands of interactions with Porcupine Caribou on the Dempster Highway. This way of using traditional and local knowledge provided some of the answers that the Board has been asking.

We selected 39 hunters in 3 communities for the 10 focus groups. A professional facilitator asked them to predict the initial caribou reaction to a prepared situation or scenario. All the scenarios were real places known to the hunters. Different effects were then introduced individually and hunters were asked to predict how the caribou reactions would change under these new circumstances. For example we might ask, “What if there were 100 instead of 20 caribou in the group?”, or “What if the snow was 2 feet instead of 8 inches deep?” By asking questions this way, we could separately consider how group size or snow depth influenced how caribou react. Each focus group looked at 1 or 2 of 6 prepared scenarios. Later on we listed relevant quotes by scenario and factor from transcripts of these sessions, and looked for patterns in caribou reactions. We wanted to see how perceptions of caribou reactions changed with each effect we introduced under the different situations in the scenarios.

From these patterns, we concluded that hunters understand that 1) previous hunting experienced by the caribou, 2) snow machine use, and 3) “taking the leader” are important factors in predicting caribou reactions. These 3 factors increase how far away caribou get nervous, how soon and how fast they flee, how far and, in some cases, where they go. In almost every situation hunters asked for details on how the caribou group had been hunted in the past few weeks before they would predict how the group would react. They know that the *bush* or *wild* caribou that are tame, curious, and approachable, soon learn to be *spooked* or *disrupted* when exposed to intensive concentrated hunting. Caribou learn this quickly (1 to 3 days) under heavy hunting pressure but this spooked condition fades after hunting activity eases and probably needs to be relearned the next year.

The hunters predict that caribou react more intensely, sooner and longer to hunting situations involving snow machines, especially if they have previously been chased by and hunted from snow machines. Caribou watch, but seem to know that they are not being hunted, when machines are used

only to haul carcasses back to the highway. Caribou groups move a short distance away following slow, steady, direct, and visible approaches, or if 1 or 2 animals are shot from a distance. Groups fragment into smaller groups after they are chased and shot at (particularly if several animals fall) and after repeated chases. The same reaction happens if a group is herded towards hidden shooters. Caribou run in large circles in flat open areas when there are several machines and much rifle fire. Multiple shooting and concentrated snow machine use can deflect migrating waves of *bush* caribou from an intended highway crossing and even 2 machines approaching can deflect *spooked* groups.

Hunters know that taking the lead animal from a group is extremely disruptive until a new leader emerges and leads the group to safety. Hunters describe leaders in different ways. Some leaders are migrating groups at the front of the migration, others are individual caribou that watch for danger, lead the group on trails, or lead the group away from danger.

Hunters predicted that caribou:

- Feel safer in larger groups.
- Use trails to flee when snow is over 60 cm (2 feet) deep.
- Seek sheltered areas from strong winds.
- Are much easier to approach in trees.
- Feel safer when they can see and keep hunters in sight at a distance.
- Feel safer when they go over a ridge, especially during the day when roadside activities and hunting become more intense.
- Do not use trees or gullies to hide from hunters.
- React less when a hunter takes an animal travelling at the rear of a line or on the edge of a resting group.
- Show little reaction to traffic when animals are lightly hunted.

Hunters expressed many opinions about how to manage hunting along the Dempster to reduce disturbance to the herd. Many opinions involved changes in the way some hunters use snow machines to gather 1 or 2 dozen animals at one time. Their opinions are expressed in their quotes in a section of the report.

Did we answer the Porcupine Caribou Management Board's question about harm to the herd? No. We found some evidence that some of the caribou in the highway vicinity are behaving in ways that suggest that they are avoiding the highway. There was also agreement among the northern hunters in these focus groups that substantial deflection was already occurring, and this was resulting in much less than desired (and historical) use of the winter range in the Peel Basin to the east of the highway. The point is that deflection is a

response to a cumulative suite of stimuli and that it is occurring already with current levels and combinations of stimuli. The patterns of deflection and the combinations of stimuli that lead to deflection need urgent attention.

Finally, this process has helped us decide on what the important questions are:

- How can people use snow machines for hunting so that surviving animals cross the highway and use habitats near the highway?
- How can we spread out hunting so groups near the highway are not fragmented, repeatedly approached, and pushed away from the highway?
- Is the actual kill by hunters, that is the number of recovered and unrecovered animals shot from the herd each year, too high?
- How can we allow caribou hunting before the ice in the Peel River prevents hunting by Delta hunters and still ensure that the caribou groups leading the fall migration can cross the highway?
- What happens to a migrating caribou group in the days and weeks after it is deflected from the road by intensive hunting?
- What are we learning about caribou migration during the week-long no hunting periods designed to “let the leaders pass”?

Is this a reasonable way to gather and present the understandings of expert hunters? We feel it is. We hope that readers will honour the hunters by reading their words in this report.

We learned a lot about this research method. Expert hunters and biologists are interested in short, participatory, group approaches that build on story telling and realistic scenarios. This approach can accommodate the structure needed to look at complex systems, to earn the respect of scientists, and to write reports. Scientists and government people appreciate the long quote-filled report. The busy community members on the Boards and Councils wanted verbal briefings, pictures with long captions and plain language summaries. However, the approach can be misused if participants are asked to comment on situations or effects for which they have no, or limited, direct personal experience.

We extend our sincere thanks to the 39 hunters, statistician Jim Tousignant, facilitator Nansi Cunningham, conservation officers, and to the many people who helped with this study.

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Introduction

This paper is about hunters' views on how caribou respond to hunters, traffic, and snow machines near the Dempster Highway. It summarizes the predictions of 39 experienced Dempster caribou hunters in 10 focus groups from 3 communities. These expert hunters considered how caribou would react to different situations in 6 scenarios, through a research process we call a *local knowledge focus group*. Through a series of *what if* questions, groups were able to look at which of a dozen factors best explained the variation in how caribou react to hunters, traffic, and snow machines. The detail in this paper should allow others to apply the approach to their own situation.

Background: concerns

Caribou herds generally fare poorly when highways cross important winter ranges and migration routes. The Dempster Highway, constructed between the late 1950s and 1978, links Dawson City, Yukon, and Inuvik, Northwest Territories, in Northwest Canada. It passes through the winter range and migration routes used most years in the spring and fall by the 129,000 barrenground caribou in the Porcupine herd, and through the annual range of the 1,200 woodland caribou of the Hart River herd. Following a decade when the Porcupine herd was increasing, people are now concerned that the population is declining:

- The herd has declined by 50,000 animals since 1989.
- There are no harvest records from several communities.
- Industrial activity and road traffic are increasing.
- Wounding losses are suspected to be high.

Recommendations by the Porcupine Caribou Management Board[1*] (PCMB) were implemented in 1999 to increase hunter safety, reduce damage to the tundra, and minimize harvest of bulls with meat tainted by breeding (Fig. 1). The PCMB's long-standing request for an assessment of the impact of human activities on caribou has not been addressed. This study attempts to look at hunting, snow machines, and traffic near the Dempster Highway. Caribou responses to industrial developments and other stimuli are reviewed elsewhere. Two reports on traditional knowledge studies give useful information about this area and the caribou.[2]

Experimental and observational studies to allow this assessment are particularly challenging with this herd.[3] We worked with the Yukon Government's Bureau of Statistics and an experienced focus group facilitator in the fall of 1999 to develop an understanding of patterns that hunters saw in how caribou reacted to various situations near the Dempster Highway.

[*] Notes begin on page 66.

Figure 1. Highway signs explaining new hunting regulations were installed at both ends of the Yukon portion of the highway in 1999. (K. Gustafson photo)

Background: caribou movements

During the summer, the Porcupine caribou herd usually remains scattered north of treeline.[4] Timing, duration, and direction of their fall migration are quite variable. The caribou usually start fast-paced, purposeful movements toward the wintering grounds following severe weather events such as low temperatures or snowstorms.

Migration routes depend on where the groups are in late August or early September when the bad weather usually hits. If the weather improves, caribou will slow, halt, or reverse their migration. There are 4 very general migration routes documented, 3 of which will often bring the caribou to the Dempster Highway.

- The *Old Crow route* often leads caribou west of the Dempster Highway but some animals may break off and cross the highway in the Ogilvie Mountains to winter in the Hart and Peel River watersheds. These caribou show up on the lower Dempster in October.
- The *Richardsons' route* runs along the west side of the Richardson Mountains and brings caribou to the Dempster Highway between the Peel River and the Arctic Circle, often in late August or early September. Caribou using this route will often winter in the rivers feeding the Peel River from the south (Hart, Wind, Bonnet Plume, and Snake). Satellite-instrumented caribou have been seen to move directly down the Dempster Highway corridor from the Northwest Territories border to the Ogilvie River.
- The *Western route* follows the international border west of Old Crow. Many caribou will winter in the Ogilvie or Tatonduk River areas but some caribou may also swing east to cross the Dempster Highway and winter

in the Ogilvie or Hart River basins. Again, these caribou often arrive on the Dempster in October.

Large migratory movements usually end in mid November. In some winters there are considerable local movements due to extensive unfavorable conditions; in winters with generally favorable conditions (low snow depths) local movements are small.

The spring migration is initiated by pregnant cows that begin to drift northward. These movements can start as early as January but are usually most apparent in April and May. Bulls and juveniles start later and use different routes.

The Hart River herd of woodland caribou number about 1200 and range in and east of Tombstone Park throughout the year (Fig. 2).

Figure 2. Bull caribou in the Ogilvie Mountain portion of the Dempster Highway. Woodland caribou here are larger and being rutting earlier than the barrenground caribou of the Porcupine Herd. Based on the antler configuration, breeding colouration, and lack of snow, these are probably woodland caribou of the Hart River Herd. (YTG photo)

Background: caribou hunting

There are many people in northern towns and villages that depend on the caribou for sustenance (Fig. 3). The Dempster Highway provides important access to the herd; about 71% of the total reported Canadian harvest occurs along the highway. Caribou harvest peaks in October and November. The hunting season for licensed Yukon resident and non-resident hunters is 1 August to 31 January. About 2/3 of the fall harvest is bulls. There is another

peak of hunting in March and April by first nation hunters. Often these hunters are selecting for cows.

In the words of an elder from Ft. McPherson

> *Like you said before, there's lots of change in the migration route, wintering grounds, everything like that is happening. We notice that caribou is not crossing the road as much as before, they're not grazing anywhere, they just keep going right past Eagle Plains and way out towards the Ogilvie area… Before, there was always caribou on the highway. It ranges along the mountains and in the trees, if you go up there now you probably never see caribou until March.* [I1332] (note the "I" refers to the focus group session and the "1332" refers to the line number)

Figure 3. A Fort McPherson home. About 910 of the 6300 Mackenzie River Delta and Tuktoyaktuk residents live here. Fort McPherson families take 150–1,400 caribou each year along the Dempster Highway. Eight of every 10 caribou taken on the Yukon portion of the Dempster highway go to a Delta household.

Background: focus groups

Focus groups are a well-used research tool in the social sciences.[5] Typically, an experienced facilitator probes the understandings in groups of 4–10 individuals selected for the session based on particular criteria. If these criteria are similar within the group, but vary between groups, comparisons can be made. Probing by the facilitator encourages discussion, explores underlying reasons behind differences in ideas and ensures that all individuals

are heard. *How* and *why* questions are common. Participants must concentrate and work hard during a 1–2 hour session (Fig. 4). Often computers are used to analyze the 1,000– 2,500 lines of text in the transcript of the audio tape of a session to look at how specific words and phrases are used. We did not look for differences between our groups and we did the analysis by studying the transcripts ourselves.

Figure 4. Facilitator Nansi Cunningham describing the Arctic Circle scenario to a Fort McPherson focus group. Biologist Dorothy Cooley operated the tape recorder, took notes, and prepared questions to clarify what she heard. The maps on the wall illustrate winter ranges used over the past 22 years.

This was a new process for us and we were guided by Jim Tousignant, the senior statistician with the Yukon Government's Bureau of Statistics.[6] We called our approach a *local knowledge focus group*. We used scenarios and a complete-the-story structure to probe how the "system" of caribou, hunters, and the road worked. Scientists could also see that this allowed us to develop a model and to "partition the variation". It also made the process a lot more fun for the participants. It is important to distinguish this approach from a group interview or a workshop approach. Group interviews ask a series of questions and the probing may not be as intense. Participation and procedures at workshops vary a great deal depending on goals, methods, and facilitation styles.

Objectives

The first objective of this project was to try to use expert local knowledge to develop an understanding of patterns hunters saw in how caribou reacted to various situations involving traffic, hunters, and snow machines. The second objective was to develop and test a method that would provide credible information to the individuals involved in managing wildlife near the Dempster

Highway. Three reports have been prepared. This paper covers Objective 1. A second paper details the local knowledge focus group method to meet Objective 2. A third paper describes the perspectives and behaviours of 18 types of Dempster caribou hunters[7] to provide background to the diversity of uses and users of Dempster caribou in relation to Objective 1 and ongoing management.

The results of these focus groups will:

- help land and wildlife co-managers and other hunters understand how people hunt Porcupine caribou in the Dempster region,
- help managers understand how hunters see human actions affecting the caribou, and
- help us develop field tests to further investigate how Porcupine caribou use the Dempster Highway region, and in particular how they react to different ways of hunting.

Methods

We begin this section with an overview of the approach, followed by more detail on selecting participants, factors, and scenarios. We then cover analysis and writing.

The local knowledge focus group approach

Ten focus group sessions were held in 3 communities in the fall of 1999, each with 2 to 7 carefully selected local experts. There were 2 parts to each session (Fig. 5). The first part was 90 minutes and considered a specific scenario. The facilitator described a caribou-hunting situation during a particular week and at a specific site near the highway, and hunters were asked to predict how the caribou would respond. This prediction was important (we were not asking the hunters to recall specific examples or to tell hunting stories): they had to reflect back on their many observations and their *mental model* and then make a prediction. To examine the effect of a particular factor, subsequent questions examined *what if* the situation differed in one specific way, and if the caribou would respond differently to each change. Hunters reflected on the situation, and often responded with qualifiers or *but if*s that raised additional factors that hunters felt were important in particular situations and might change how the caribou responded (Fig. 6).

The second part of the session was an informal discussion (no taping) of issues and questions raised by participants. Participants appreciated the opportunity to ask questions and this portion of the session probably aided in the success of the first segment. Hunters answered our questions with the commitment that we would answer theirs.

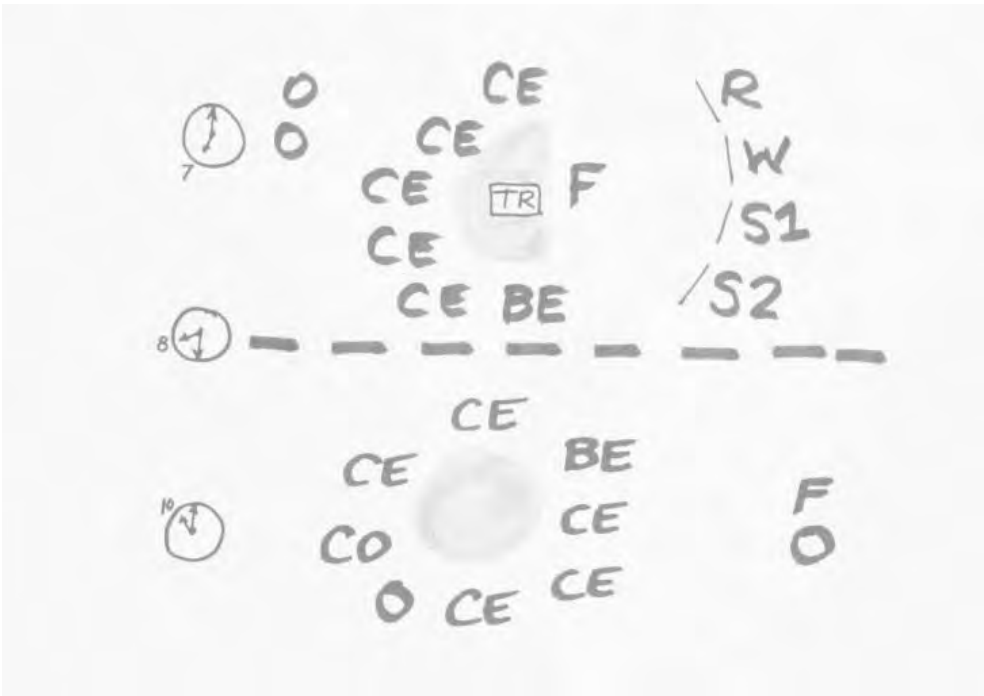


Figure 5. Room layout diagram showing the 2 parts of each focus group session. From 7:00 PM until 8:30 PM, local caribou experts (CE) faced the facilitator (F). The process (R), words chosen by the group to describe caribou postures (W), and scenarios (S1, S2) were outlined on flipcharts. Observers (O) sat behind the group. The biologist (BE) occasionally spoke to clarify the scenario and asked questions of clarification, at the invitation of the facilitator. After the break, facilitators and tape recorder were not part of the discussion. Local caribou experts usually questioned biologists and the conservation officer (CO). Meetings generally ended at 10:00 PM.

Figure 6. Room layout details. The pictures on the wall show caribou postures; other pages describe the process. The towel under the microphone minimized sounds of coffee cups on the table. Much care was needed to ensure that tapes could be fully transcribed, that only 1 person spoke at a time, and that other background sounds were minimized.

Selecting participants

Individuals were selected in a 2-stage process (Fig. 7). For licensed hunters, harvest records were used to identify hunters with experience harvesting these caribou in different areas, in different years, and during different months. They were then phoned and asked questions to determine how they hunted and what their range of experience was with different situations such as snow depths, snow machine use, and caribou group sizes. Conservation officers examined hunter contact records and helped identify suitable individuals. Participants were grouped by the hunting strategies they used.[8] First Nation participants in Fort McPherson were identified and assigned by the secretary of the local Renewable Resources Council to one of 3 groups based on their extended family. Individuals received a voucher for gasoline as a thank-you for participating.[9] They were not asked to sign informed consent forms, but were told the reason for the focus group and that anonymous quotes would be used in the final report.

Selecting factors to be considered

We compiled a list of factors that might influence how caribou would react in a particular situation based on other studies; conversations with hunters, conservation officers and researchers; and from our understanding of predator/prey systems. As the project proceeded we dropped some factors that hunters saw as having little effect, and looked more intensively at other factors that seemed to be frequently raised as having a strong influence on caribou reactions.

Most of the factors involved changes in the way that caribou and hunters behaved, in how snow machines were used, and in factors external to each situation such as time of day, week, or weather. We did not ask hunters to consider changes in the landscape, such as forest fires or industrial disturbance, because these would have been beyond their experience in the scenario.[10]

There was a myriad of factors embedded in the hunters' understanding of the physical aspects of particular scenarios that we could not account for. Hunters had very clear mental images of the setting in particular scenarios, and discussed how the terrain and other features influenced how they would plan a caribou hunt, and how the caribou might respond to approaches.

We were careful to ask about factors that the hunter might have experienced, seen, or come to understand from actual hunting trips along the highway. Hence, the caribou reactions we sought were short term and visible from the highway. We were careful to separate these reactions from those predicted by hunters about caribou behaviour after dark, away from the highway, or in the days before or after the interaction. For example, consider this hunter's understanding constructed from variations in caribou groups seen over time along the same stretch of highway:

Figure 7. Peter Nagano, Tr'ondek Hwech'in First Nation member, hunting guide, highway maintenance worker, and trapper with a bull caribou taken on the Dempster Highway. Participants in local knowledge focus groups do not need to be elderly. They must meet screening criteria related to their lived experience that are relevant to the questions they are to be asked.

…when the hoards of hunters descend upon those few caribou and they're easily attainable, those caribou do not remain very long. You know, I've never seen that there where they hang around a lot. They may take off and come back perhaps, but a day or two later. I just – unless it's another group coming through, I don't know, I really don't. It's pretty hard to sort of conceptualize the whole herd, where they're going, what's happening and all the rest of it. But, just in my little spot, I've never. If we've gone out and shot a caribou, if you look the next day, you don't see the same caribou around. You don't see them hanging around. [C890]

Creating scenarios

The 6 scenarios described specific stretches of the Dempster Highway where caribou and caribou hunting were common (Fig. 8, Table 1, Appendix 1).[11] We initially held constant:

- the number of trucks (1),
- number of hunters (2),
- time of day (10:00 am),
- weather (sunny),
- the caribou group size (15 to 20, mostly cows),
- starting behaviour of caribou (mostly bedded down), and
- the recent history of the herd (the first time these animals had reached the road— not previously hunted that season near the highway).

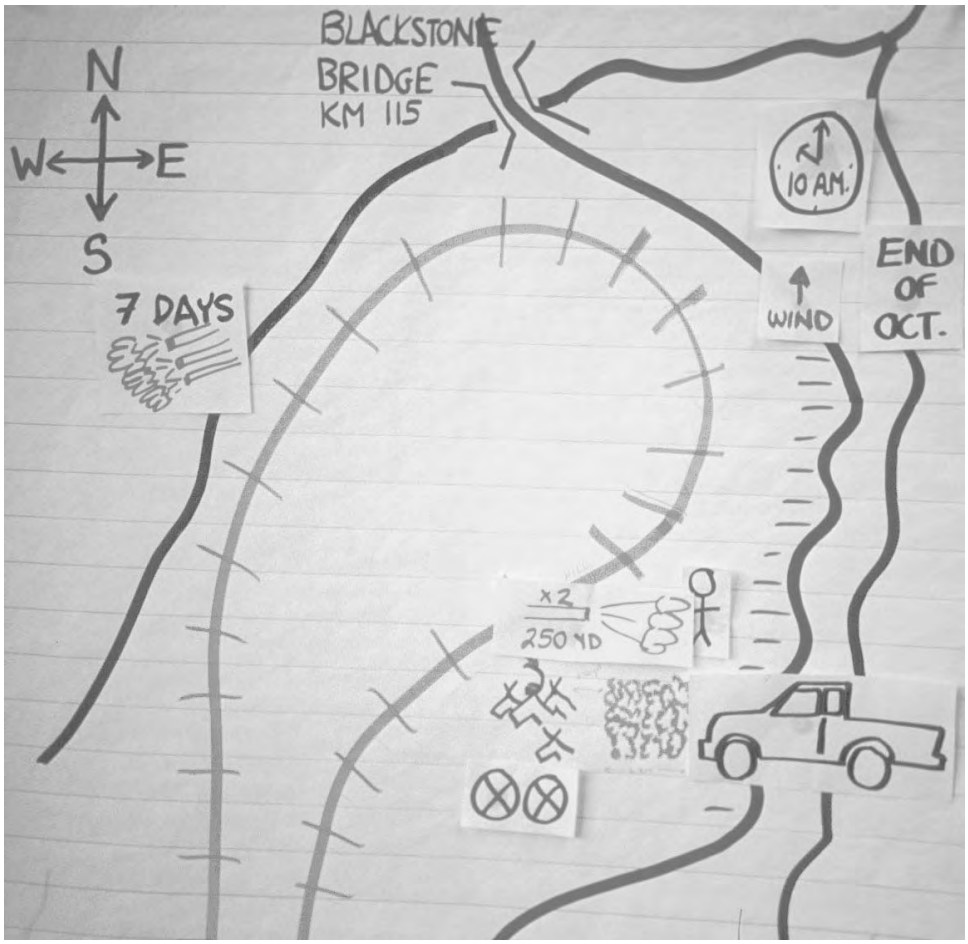


Figure 8. Flipchart map with stickers to emphasize key points in the scenario. In this case, the site is west of km 110 on a flat slope at 10 AM at the end of October. The caribou group has been hunted from the highway for the previous 7 days. One hunter parks the truck, walks in behind willows to stay out of sight, shoots twice at 250 yards, killing 2 caribou. Each time a scenario condition changed a new sticker would replace one of these.

Table 1. Scenarios used in focus groups. See Appendix 1 for locations.

Location (km)	Period	Initial caribou behaviour	Hunter behaviour	Other significant aspects
Blackstone Uplands (Km 110)	Mid-November	• half are bedded down and half are feeding • group has just reached this location from the west • haven't encountered hunters in their migration	• two hunters • drive up in a truck and spot the group from the curve of the road • drive further north to the pull-off and park the truck • use snow machines to skirt the willow and approach the group • can be seen and heard • stop their machines and shoot from 250 yards • take 2 caribou (a cow and a bull) at the edge of the group with 2 shots • immediately get on their machines to go to the kill site	• 10 AM • open tundra • wind from the south
Arctic Circle east (Km 410)	Early October	• group is 1 km off the road to the east	• two hunters • drive up in a truck and spot the group from the road • drive further north and park the truck. • take snow machine out towards the group and shoot	• 10 AM • hills to the east, open flats • snow 8 inches deep • wind from the east
Eagle airstrip ridge to north (Km 390)	Early October	• caribou are walking in a line toward the highway along the ridge, 1 km to the east.	• one hunter walks out of sight just in the trees toward caribou • caribou don't see or smell him • hunter hides behind a tree and waits for them to walk by • shoots a small bull at the end of the line • stays out of sight after the shot	• wind direction does not allow caribou to smell hunter.[12]
Horseshoe Curve (Km 262)	First week in November	• group is lying down near the crest of the south side hill at the north end of the horseshoe	• one hunter • truck parks out of sight of the caribou • takes snow machine behind the caribou and stalks on foot to the ridge top • wind is blowing from the caribou to hunter • not detected by caribou • shoots the cow on the left end of the group, • stays hidden	• open hilltop with road along the spine of the ridge • snow about a foot deep
Ogilvie River (Km 220)	Early October	• caribou are crossing the road. • some caribou already on the other side of the river, on the river, on the road and still coming to the highway.	• one hunter • truck stops quickly, • steps off into the ditch and shoots 1 caribou on the river.	• tall trees • river is frozen, • snow 6 inches deep • wind from the north, from the caribou to the hunter.
Engineer Creek (Km 160)	Mid November	• group has just reached this location from the west • haven't encountered hunters in their migration. • walking in a line from the west on an established trail	• two hunters • drive up in a truck and spot the group from the road • drive further north and park the truck • shoot from 250 yards • take 2 caribou (a cow and a bull) at the edge of the group with 2 shots	• hills, open flat near frozen river • scattered trees • snow 12 inches deep • wind from the south.

A typical session

By the last 5 of the 10 sessions we had developed a smooth interplay of roles and activities. Room set-up took about 10 minutes (see Figs. 4, 5, and 6). We greeted participants, introduced ourselves and showed participants to their seats. We asked conservation officers (not in uniform) and other observers to sit back and not speak unless invited by the facilitator. The facilitator invited participants to look at posters on the wall that explained the purpose of the project and session, the agenda, and the rules. She explained why she needed to be able to interrupt people to keep the session on track and she clarified the two halves of the session. We introduced the tape recorder and the needs of the "invisible transcript writer". Some sessions began with a prayer. It usually took about 20 minutes to ensure that participants were comfortable with the process, understood why the project was being done and for whom, and knew how the evening would unfold.

The facilitator reviewed the flipcharts and invited individuals to talk about how the Dempster Highway and the caribou were important to them. She drew their attention to the information on the posters. Then she introduced the scenario. We spent some time explaining exactly where the place was and what the details of the weather were. By this time people were leaning forward and listening attentively. She then described the activities of the hunters, and asked how the caribou would react. Often she repeated the description of the snow, wind, time, weather, what the caribou were doing, and then paused and asked "What do you think the caribou would do?" We made a point of describing how long the caribou had been hunted near the Dempster. After the facilitator went around the group to learn all the opinions, she replaced one of the stickers on the flipchart (Fig. 8) with another and described how one factor in the original scenario was different. For example, there were now 75 instead of 15 caribou in the group. She asked if the reaction would differ, often asking a specific individual to ensure that everyone had a chance to speak. Where there was disagreement, she would describe the difference and ask why. At the end of the scenario she would ask the biologist if she had a question or point she would like to raise.

Occasionally there was time for a second scenario. This part of the session had a definite close followed by informal discussions with the conservation officer, biologist, and others. Tea, coffee and juice were served. We gave out the envelopes with the gas voucher, as people were ready to leave.

Analyzing transcripts and factors

To analyze the results we created a wall-sized data table with 28 horizontal rows for effects, and 16 vertical columns for treatment of a scenario by a focus group (Fig. 9). In each transcript 3 people[13] independently looked for patterns related to each factor in the hunters' comments. We discussed these and selected ones to put into each cell in the table, noting the line numbers from the transcript so we could look up the exact quotes later.

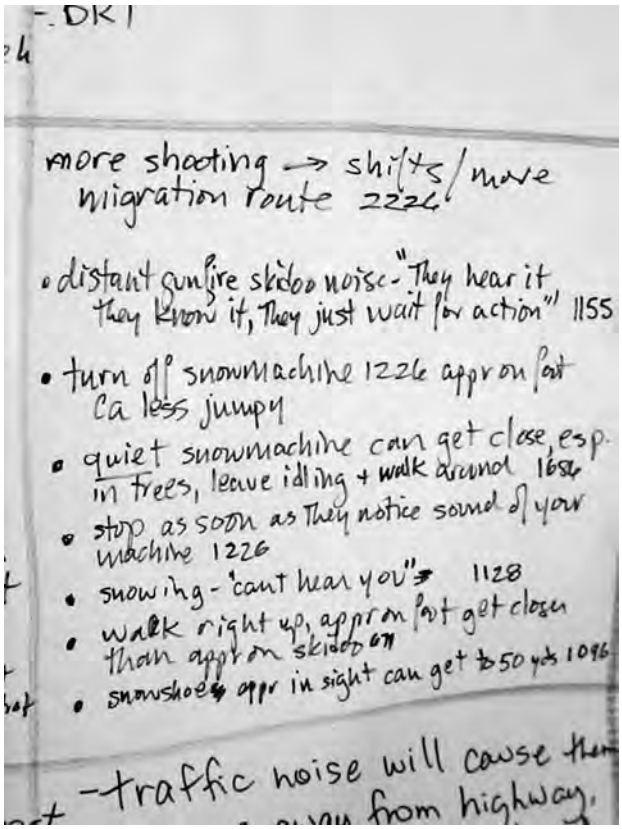


Figure 9. A box in the wall-sized analysis table or "matrix" used to organize, display, and analyze the focus group results. This cell looked at snow machine approach quotes for 1 scenario from 1 focus group session. The numbers refer to transcript line numbers. There were several focus groups for each scenario. We used 3 "don't know" codes. DK1 meant they were not asked, DK2 meant they were asked but said they did not know, and DK3 meant they were asked but there was nothing in the transcript that looked like an answer.

We then scanned the table asking 5 questions:

- What are the common patterns in caribou responses across all the columns or situations for each effect? *(e.g. How did caribou respond when the size of the group being hunted increased from 15 to 100 across all the situations?)*
- Can any variation in the predicted responses be explained by differences among the scenarios? (e.g. *In the scenarios that were forested, did caribou respond any differently when it was windy compared to scenarios that were open?*)
- Did hunters' comments that were not related to a particular scenario suggest similar or different patterns in responses? (e.g. *What was happening in the particular situation where caribou were observed fleeing when they saw approaching truck headlights?*)
- Were the hunters making any assumptions about the caribou in particular situations? (*Were these hunters assuming that the "spooked" caribou here*

had been previously hunted by people on foot or by people using snow machines to pursue the caribou?)

- Are we making correct assumptions about what hunters meant when they said certain things? (e.g. "*The caribou would take off". "They'd move off". "Man, they'd be outta there". "They'd go back, especially if they had been...*")

We did not design the sessions to allow comparisons between predictions of younger and older hunters, hunters of first nation and other ancestry, trophy and meat hunters, snow machine users compared to others, or men and women. Some of these differences are noted in a separate report that profiles various groups of Dempster caribou hunters.[14]

We read the transcripts many times as we wrote this report, looking for patterns and selecting quotes. We learned more about the process[15] and the participants' understandings by having several individuals read the transcripts several times.

Writing up

We had to develop rules about selecting quotes for this report. The quotes fell into 5 groups, each of which needed to be handled differently (Table 2). Quotes contain information and can evoke strong feelings in readers. Including only a few evocative quotes in a report like this would make it difficult for readers. Readers may think that the quotes are the opinion of the writers, that they reflect the opinions of all the people in the focus groups or the communities, or that the purpose of the study was to study people's feelings on the topic. To honour the hunters, we needed to convey what they said, but we have been careful to separate their feelings about the hunt from the findings of the study of caribou reactions. We also needed to separate the caribou reactions they predicted in the scenario from the reactions they had seen in other areas or at other times.

Often the biologist sought clarification on these related examples (quote type 3 or 4, Table 2) at the end of each scenario discussion. The feelings about practices (quote type 5) were discussed again at the end of the session, just before the break, and often during the discussion later on.[16]

We occasionally skipped some words in the quotes (using ellipses to indicate gaps) to make the quotes less difficult to follow, and added words in square brackets, usually to explain what the pronouns meant.

We included all the relevant quotes in the draft sent to reviewers, and asked them to suggest which quotes to include or delete. Interestingly, reviewers chose different quotes to include and in the end only a few were omitted, mainly those that were ambiguous, insulting, or repeated points more clearly expressed in other quotes. This made the report longer, but the quotes speak to readers differently, and this needed to be respected.

Transcripts for the Fort McPherson sessions were provided to Gwich'in Renewable Resources Board biologists; the full set is available to PCMB members.

Table 2. Types of quotes encountered in the study and how they were handled in the report.

Type of quote	Example	Use in analysis	Use in text
1. Comments from the first person chosen by the facilitator to predict how the caribou would react in the particular situation in the scenario. These quotes often lacked context information.	*They'd keep moving to the east.*	Included in the analysis table	Occasional use of a quote in text for illustrative purposes where the quote included enough context.
2. As the facilitator checked with other members in the group on whether they agreed with this prediction.	*I agree.*	Included in the analysis table	Included in text as "Most hunters felt…"
3. Stories or examples related to the situation that participants thought were relevant to the site	*In this location hunters would not do that, they would park here and head this way. If there were…*	Included in a separate row (effect) in the analysis table	Included in text and sometimes used if the information was unusual or added a more complete understanding
4. Stories or examples related to a different site but were related to the effect.	*One time in 1992 the snow was really deep in the ___ area. The caribou were really ...*	Included in a separate column (different site) in the analysis table	(as above)
5.Comments related to feelings about practices or situations	*It was totally disrespectful…*	Not included in results section	Included as quote in the recommendations from the hunters' section of report

To improve the quality of the study we

- collected background information by reading and talking to researchers;
- clearly laid out the purpose and intent of the investigation;
- structured the discussion using realistic scenarios and situations based on conversations with people who knew how these places were hunted;
- only involved experts with the required experience in relation to the scenarios and questions;
- only involved researchers who valued and respected lived experience;
- had a professional focus group facilitator guide the discussion;
- standardized words used to describe reactions;
- described prior exposure to people and accurately described relevant physical conditions (e.g. wind direction and speed);

- looked for different reactions by changing only 1 factor at a time;
- had researchers observe and ask clarification questions later;
- used different scenarios where animals had different choices in relation to terrain and between threats (e.g. choose between highway and hunter);
- changed the questions as we learned what worked (why) and what didn't (why not);
- had several people, including a community interpreter, analyze the transcripts separately and discuss interpretations;
- used quotes in the final report; and
- had people who would use the ideas sit as observers in a session.

Hunters' views on the approach

Hunters told us that they liked these short, intensive, expert-to-expert processes.[17] They found the "you complete the story" approach novel and felt that it was like a game when they were asked to predict behaviours. As the scenario was described, hunters' body language revealed if they were skeptical (leaning back, arms and legs crossed) or engaged (leaning forward, attentive; see Fig. 7). In all the focus groups, hunters confirmed that they found the scenarios realistic, but in a few cases they insisted on corrections ("the ice would not be frozen then", "the snow would not be deep enough to use a machine then"). In some cases the facilitator asked them to be patient and imagine that it was an unusual year and that the snow was much deeper than normal. The point is that hunters were comfortable with the scenario at the outset and at the conclusion of the discussion. We warned them that the introduction of separate changes might get a little tedious and asked them to be patient.

Hunters realized the value of the scenarios being specific to places they had hunted.

> *You know when you paint these scenarios, we probably all have an actual picture in our mind, and it does make a difference that they are in heavy timber, or they are going through the trails, are they on a bald knoll at the Horseshoe, are they coming out of the timber right before, you know, the other side of the Horseshoe. Everybody has sort of a picture in mind and that's what we're relating and really there's a lot more variables here that you haven't covered.* [E1026]

This following quote from a Gwitch'in elder suggests that he wanted the group to realize other reasons that account for whether and how caribou make themselves available to hunters, and for them to think about whether this "stepwise" way of looking at caribou behaviour was appropriate.[18]

> *If you don't get caribou, you don't get caribou. If you get caribou, that's been given to you, it doesn't matter if you're a good hunter or not, the*

caribou gave himself to you…You don't know what's going to happen until you sit there, you can't say that, because if you don't, you don't, if you do, you do. [I997]

Finally, hunters recognized the importance of valued, credible input in the decision making process but will judge the value of the processes by the changes, if any, that result.

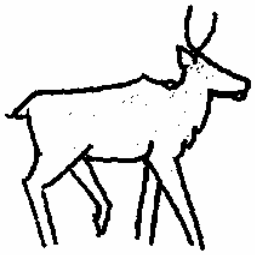
Yeah, I enjoy having input. I guess you're going to determine better than us if it's very effective in terms of collecting what you want to know. Certainly, if you're going to talk to a lot of people, so much the better. …I just hope we have the political will to do something about some of the problems we've talked about. Otherwise, we're wasting our time. So I, yeah, I think there's value to it. We'll see what happens in the end. [C1481]

Hunters' wording and ranking of caribou reactions

During our preparations to host the focus groups, we became concerned that participants would use different words than we would to describe caribou behaviour. To try and standardize words so that we had a common vocabulary, we drew pictures of 6 caribou postures to present to the focus group participants. During the sessions participants suggested 3 more postures.

We showed the participants in the first 5 focus groups pictures of caribou along with the names of the posture names used by the biologist. We asked hunters to use these words whenever possible during our discussions. This was somewhat helpful because it allowed us to understand the behavior being described, but it did not help us to understand the relative level of disturbance being described. We had assumed that the participants agreed with what the biologist had decided the caribou was doing in each picture and that they agreed with the ordering of the pictures from least to most disturbed as we presented them. To understand if this was the case, we asked the last 5 focus groups to use their own words to describe each posture. During the last 3 focus groups we asked participants to name the postures in the pictures and to arrange the pictures in order of least- to most-disturbed caribou.[19] We taped the pictures to the wall in order and the facilitator asked them to specify the posture or word if their description of the caribou's reaction was vague.[20]

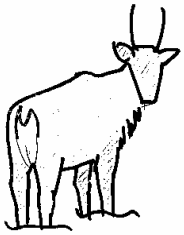
Focus groups used different words — different from the biologist and different from each other— for the same posture, and used the same words for different postures (Fig. 10). However, for all but 2 pictures, the intent or meanings of the words were similar.



Biologist: Unaware - walking
Participants: Unaware

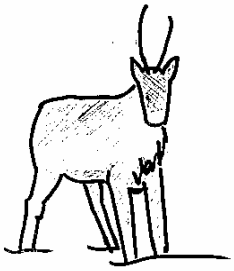
Biologist: Unaware - feeding
Participants: Unaware, grazing, feeding

Biologist: Unaware - lying
Participants: Unaware

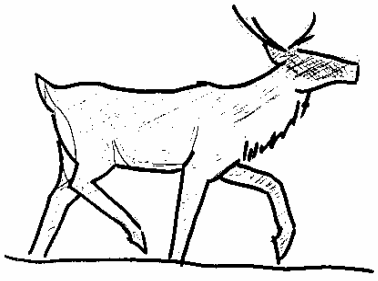


Biologist: Stop and look
Participants: Curious facing away, alert facing away, warned caribou, looking around, lookout

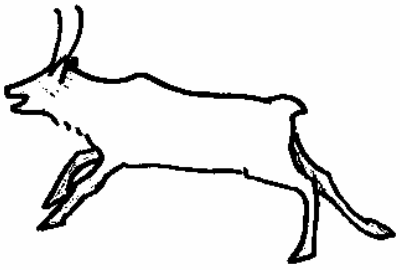
Biologist: Curious approach
Participants: Curious facing you, curious, alert, lookout



Biologist: Alarm stance
Participants: Alarm, startled, frightened, lookout



Biologist: Trot
Participants: Trot, strut, retreating, moving away slowly



Biologist: Run
Participants: Spooked, run, flee, being chased or shot at, gallop, taking off

Figure 10. Names of postures by biologist and focus group participants.

Figure 11. A young bull in “alarm stance”. Spread rear legs suggest the animal may be urinating. This was one posture where biologists ranked the relative level of disturbance higher than did the hunters. This difference reflects a theoretical definition (physiologically preparing to flee) compared to a practical definition (alarmed, startled, frightened, lookout). The snow conditions are typical of late September. (K. Gustafson photo)

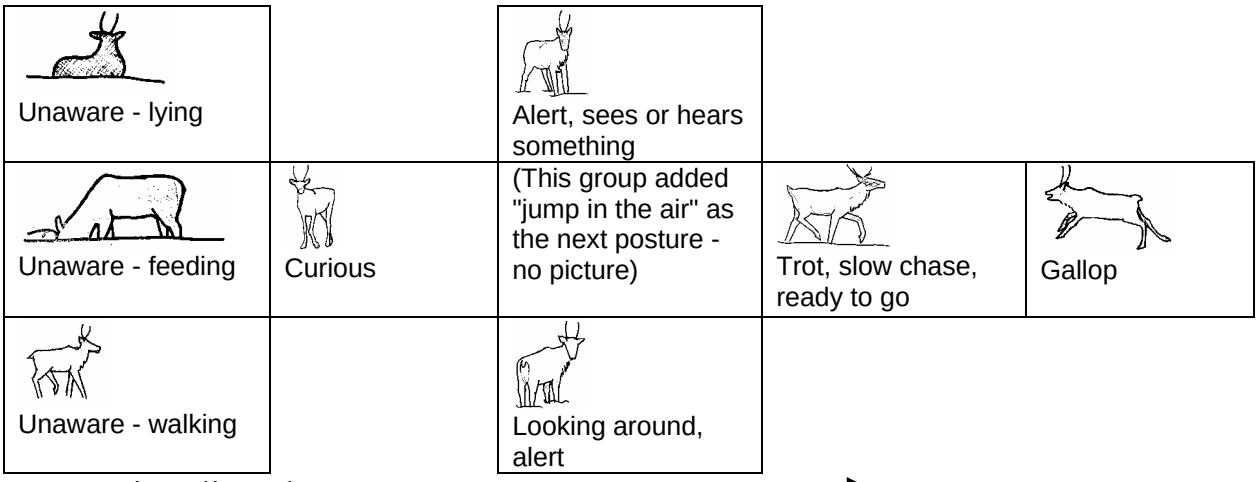


Figure 12. Example of how a Ft. McPherson focus group sorted caribou postures on a gradient from least disturbed to most disturbed. Moving left to right indicates increasingly disturbed caribou. Pictures arranged vertically are of caribou at equal disturbance levels.

Hunters used the word *alert* to describe several postures. For the picture that the biologist called s*top and look*, a picture intended to indicate curiosity, 4 of the 5 groups called the picture a variation of *alert*. For the picture the biologist called c*urious approach*, 2 of the groups called the picture *alert*. Generally, the participants judged caribou exhibiting these behaviours to be more disturbed than did the biologist (Fig 12).

All groups agreed that *lying*, *feeding,* and *walking* showed the least disturbed caribou, while *trot* and *run* showed the most disturbed caribou. When we asked the 3 Ft. McPherson focus groups to order the pictures from the least to the most disturbance, 2 groups concluded the same order (Fig. 12).

We concluded that the words used by the biologist and the focus group participants were slightly different, but that in most cases, the meanings of the words were similar. Therefore words were used interchangeably in the transcripts.

Hunters can judge when a group is about to flee, but described this imprecisely using these postures. They knew how alarm spreads through a group of caribou. Video may be useful to distinguish what visual cues hunters use to make these judgments[21]. Some hunters said they would hear grunting sounds when caribou were in certain postures.

Factors influencing caribou reactions

In the transcripts, we looked at the predictions that hunters made in particular situations, and then looked across all the situations to see the patterns that related to changes in particular factors. The following pages provide summaries of these patterns. We start with a long description about season.

Season

We could not look at the effects of day length, temperature, breeding activity, etc. because they all change at the same time. It was important, though, to look at some of the patterns in the variation in caribou reactions that hunters saw as the season progressed, and to provide a description of how caribou distribution and hunting changed over the season (Fig. 13).

Figure 13. Gwitch'in from Delta communities cannot hunt caribou on the Dempster Highway for 4 to 8 weeks in October and November. How many weeks depends on the weather (when the Peel and Mackenzie River ferries stop operating because of ice, and when the river ice is thick enough in the ice bridges to allow traffic). Within several hours of caribou arriving on the Dempster Highway in August or September, hunters arrive and select for large fat bulls. Hunters worry that when they can safely drive south to look for caribou in late November the caribou will not be near the highway. Hunting under the recent rules which restrict snow machine use off the highway and do not allow shooting from the road is different than the way these hunters have grown accustomed to hunting caribou since the highway was completed in 1978. (Gwitch'in Renewable Resources Board photo)

Early in the fall migration, hunters saw relatively little variation in caribou reactions. They described caribou moving steadily in small groups, along trails or routes used by preceding groups. A group from which a caribou was shot would generally pause, flee briefly, and then continue in their original direction. Subsequent caribou would walk around the downed animal or pause, as if curious, to watch the hunter with the kill. This situation was mainly in the flat tundra or open forests near the border on the west facing flanks of the Richardson Mountains. The major variation described by hunters

was when the migratory flow deflected to new routes to the north or west. This deflection followed extreme events, such as hundreds of rifle shots; fleeing, bleeding caribou running against the flow of the migration; many dead caribou; or a concentration of either vehicles on the highway or snow machines on the tundra. Hunters described situations with many or all of these activities as a "shoot up". All hunters believed that these caribou would flow south for 1–3 days before again trying to cross the highway.

Mid fall (early September to mid October) was the period when hunters described the greatest variation in caribou reactions to the hunting scenarios.

> *I don't think I've ever really seen any normal behaviour from caribou up there, three times up there, they've always acted differently each time I've hunted, which is always late October, early November…they could be skittish on the east side and just as stupid on the west side— walk right past you as you shoot them. East side, they sniff you or hear you they could take off running for three kilometers before they stop…they're very inconsistent and they can be as cagey as hell sometimes.* [E669]

This was also the period of greatest variation in almost every other dimension including:

- behaviour within caribou groups (breeding bulls with harems compared to other groups];
- migration speed;
- snow depths (none to 30 cm);
- caribou use of terrain and cover (open forest to dense black spruce forests, to tundra ridges);
- hunters' methods and selectivity (foot, ski, or road hunt; foot stalk/snow machine retrieve; snow machine pursuit and retrieve; Figs.14, 15);
- traffic flows (heavy until the ferry goes out then light until a strong ice bridge forms]
- caribou exposure to hunting and resulting wariness;
- hunting regulations (open to closed, snow machines could be used or not, shooting from the road allowed for first nation hunters); and,
- location and number of different types of caribou hunters.

Hunters carefully considered each of these factors.

Late fall was a period when temperatures were cool and most hunting involved snow machines and (Figs. 16 and 17). Snow depths did not constrain where caribou ran. Caribou had finished breeding and were in wintering mode, generally in the Blackstone uplands. Hunters saw relatively little variation in caribou reactions

Figure 14. P. Heebink camp early November 1999, 4 km west of highway in Blackstone Uplands. Hunters travelled on skis and hunted on foot, pulling caribou and their gear on sleds. The quality and success of their hunt is constrained if hunters on snow machines scare caribou away. (B. Smith photo)

Figure 15. B. Bennett hauling a cow caribou back to the highway km 80, November 1999. There was much variation in caribou distribution and hunting strategies in October and November. (B. Smith photo)

Figure 16. Whitehorse hunters R. Tait, F. Close, and B. Lacey, Chapman Lake vicinity, November 1999. About 10% of the hunters, mostly non-first nation, wear white clothing when there is complete snow cover. (K. Gustafson photo)

Figure 17. Late November 1999 hunt by a Minto-area family near km 108. Seventeen caribou were taken using snow machines several kilometers to the west of the highway and then pulled back to Two Moose Lake (wildlife viewing platform in background) for processing. The conservation officer inspected animals and directed hunters to remove tissue remains from the lake ice surface. Future studies could examine caribou reactions to concentrations of scent from tissue remains near the highway. Hunters are asked to field dress caribou immediately (in the field where they drop) which also allows rapid cooling. Gut piles on the roadside attract wolverine, foxes, wolves and ravens that can get hit by vehicles. As well, vehicles can be damaged when they hit these frozen piles hidden in the snow on the edge of the highway. (D. Cooley photo)

Few hunters went out in winter because of the cold temperatures and short days. Deep snow limited caribou movement, and hunting was exclusively by roadside shooting or by snow machine. Much of the hunting was incidental to travelling the highway. It did not seem like there was much variation in caribou reactions. In winter, caribou were in more sheltered open-forest habitats near Engineer Creek.

During the spring migration, cow caribou moved north in single file on established trails on ridgelines and were described by hunters as being “lined out”. A few hunters used snow machines to intercept moving groups and to haul the animals to the road. At that time of year the snow was relatively hard, the days were long, nights could be very cold, and wind speed varied greatly (Fig. 18). While there were usually relatively few caribou and associated hunting opportunities compared to earlier in the season, the few hunters who had experience saw little variation in caribou reactions.

The northward migration of bull caribou in April and May coincided with river break-up. For many reasons, this was not a hunting time. When and where caribou moved, and which habitats they used were not very predictable.

Figure 18. Gwich'in spring hunting camp at Rock River on the Dempster Highway in the mid 1980s. Caribou meat is on the racks to the left. (R. Cruikshank photo)

Prior exposure to hunting

Hunters in all the focus groups believed that prior exposure to hunting, particularly hunting involving pursuit by snow machines, was one of the most significant[22] factors that influenced how caribou reacted to people. Hunters described groups of caribou and individual caribou as being in two categories: either *spooked* and *disrupted* or *bush* and *wild*.

Caribou referred to as *bush* and *wild* were *tame*, *curious*, and did not move off when they saw people or vehicles or were approached by them (Fig. 19, see also Fig. 2). In contrast, caribou described as *spooked* and *disrupted* were much more wary of approaching vehicles, snow machines, and people on foot, and tended to flee earlier, faster, and farther when they were approached. All of the hunters felt that *wild* caribou could be encountered anywhere along the highway, but that it was more common to see them early in the season and on the northern Yukon portion of the highway. In all 10 focus groups, hunters felt that the *spooky* caribou had been chased by snow machines or had been in groups that had been previously shot at, typically in the vicinity of the border.

People who hunted at the border also described some caribou as being *spooky*, and suggested that they had been chased by Aklavik hunters on snow machine before they had reached the highway. Hunters did not talk about caribou as being partly wild or partly spooky; they were either one or the other.[23]

Every time we changed the scenario to indicate that the animals had been in the area a week and had been exposed to hunting during that time, hunters indicated that a greater proportion of the animals would watch for people and that the caribou would stand earlier, leave earlier, and would flee faster and farther when they were approached.

Hunters' use of the term *disrupted* seemed to indicate that they thought caribou seemed to be stressed by human contact (mostly by snow machine pursuit) to the point that they were often hyper alert, continuously vigilant, in small fragmented groups, and sometimes running.

Hunters often modified their hunting strategies based on their assessment of how spooky the caribou were. Many hunters indicated that they assessed the spookiness of caribou groups by how they responded to their vehicle; hunters would not unload their snow machine and approach groups of caribou if they seemed *spooky* because their chances of success would be low. A few hunters spoke of their attention to not making caribou spooky: by taking animals to the rear of lines of travelling caribou, by not standing or approaching downed caribou until the group had moved off, and by shooting caribou from several hundred yards away. When snow conditions allowed fast snow machine travel, hunters, particularly those who used powerful machines, did not seem as concerned about the spookiness of the caribou; they would approach caribou if they saw them.

These quotes illustrate the range in ideas about the effects of prior hunting. Additional quotes can be found in the section looking at snow machine use.

> *…has this herd experienced hunting pressure before?* [No, this is the first time.] *First time, they probably won't even run. They probably just stop for a moment and decide 'hmm, we don't know what happened here, this guys taking a nap, and then keeping doing what they did before'.* [C328]

> *Then later in the season they're more spooked 'cause they've been hunted a lot.* [B300]

> *Caribou are more aware at the Horseshoe [because they] have been heavily hunted before they arrive.* [A365]

> *…we get* [shoot] *them on the highway so they are more alert and they are disturbed.* [But are the first ones the people report, the first week OK? Are just already some of them being spooky or are they all pretty tame and approachable?] *You could say so, so they learn that in like a day or two.* [I1208]

Figure 19. *Bush* caribou on Blackstone Uplands portion of the highway, October 1999, during the 7-day no-hunting period. Instead of continuing to migrate south or east, this group of several thousand animals stayed in the Chapman Lake vicinity for the week but moved off when hunting resumed. (R. Armour photo)

> *Previously hunted caribou— more caribou* [would be] *watching— once you approach, caribou would trot off till they know they are safe— half a kilometer, sometimes less.* [What about if they'd been hunted in the previous week?] *They wouldn't still be there, they would have moved on.* [C862]
>
> *Caribou are more nervous, keep their distance. Move as soon as they hear a skidoo. Will take off sooner.* [J394–428]
>
> *Sometimes they've come all the way down the highway through the Horseshoe, and all that, but sometimes they come out on the southern end, they come right out there, so you're getting the bush caribou without being scared. So in the first of November, you might be getting untouched caribou. There's no question about it, the early shooting that occurs…has a definite effect on the caribou.* [E620]

We make truck trips up to Inuvik, and the caribou seem to come through in that upper area and as soon as when the caribou started getting there the boys from _____ are there. We've gone up there and just seen the first caribou coming through and you can drive by, like they're right there by the side of the road, and we go up and unload and that, and coming back and usually when we're coming back the caribou see a truck coming down the road and they're running. And there's people shooting them right in the road and stuff. [E588]

Yeah, there's a big difference from animals just out of the bush and ones that have been there and been shot at for a few days, and not just shot at, I'd like to make – I'd like to emphasize the point – its not just a matter of shooting one, and going out dragging it back on foot, it's a matter of shooting 20, 30, and 40 animals and going out and herding with skidoos, all of which I have seen…That has an effect on the animals, but shooting one out of the herd whether they're leaders or whatnot, has no effect on those animals. [E651]

You know, 20 years ago the respect was there for the animal you took, you didn't chase them until they couldn't run anymore…you went in and you walked in and you took the animal that you wanted and you carried it out to the road whereas now there's more snowmobiles and more vehicles and more people hunting. It's more accessible and therefore the caribou are more disrupted. [A1144]

Snow machine approach styles

Hunters described many reactions by caribou to various snow machine approaches. They frequently contributed examples or changes to scenarios to describe better ways to use machines to hunt caribou in particular situations (Fig. 20). Snow machine pursuit and herding of caribou, which was always associated with rifle fire and dying animals, was the biggest influence on caribou reactions seen by these hunters. No scenarios or discussions looked at reactions of caribou to snow machine use in forested settings because hunters typically don't take their machines into the trees.

The hunters saw *wild* or *bush* caribou react to individual machines much as they react to wolves, particularly if the snow machines are approaching slowly and at a constant engine sound: as the machine closed in more caribou stood, watched, and prepared to flee. The most detailed information came from Focus Group F:

- Slow direct approach, caribou not hunted before --> normal caribou behaviour until 200 yards.
- Fast direct approach, not hunted before, hunters jump off their machine start shooting --> caribou quickly spooked and trotted.
- Fast direct approach, caribou hunted before --> caribou trotted and ran at 1 km

Figure 20. Hunters using snow machines to return to camp at km 110, early November 1999. All hunters leave their snow machine lights on. Conservation officers decide when snow is deep enough to permit snow machine use so tundra vegetation will not be damaged. Scrub birch is surprisingly fragile in winter and snow machine routes through this 'buck brush' are apparent, even after 1 pass of a machine.(B. Smith photo)

We did not ask hunters about a more random kind of approach that got the machine gradually closer to the caribou.

We defined *pursuit* as a change in the direction of the machine's travel so that it was always pointed towards the caribou, even if the caribou moved. Hunters would only pursue caribou if the snow conditions and terrain allowed them to travel fast enough to get close enough to shoot. Hunters never described caribou fleeing downwind or into cover in response to pursuit by machines. High-speed pursuit led to the caribou running and the machine catching up. A number of examples were given of the hunter stopping and shooting when the caribou stopped to pant and look back. Hunters told us that when caribou in these situations detected that they were being overtaken, they would break into smaller groups and take longer flights at angles. Individual animals were described as running "panicked" in large circles when they had no way of outrunning machines. Shooting was always a part of these situations. (The shooting was not necessarily from moving machines or at the running caribou, but there was a lot of rifle fire noise in the area, and some nearby animals may have been killed.

We define *herding* as a shift in the direction of the snow machine to steer the caribou towards hunters either hiding near the highway or in cover of willows away from the road. Hunters saw *bush* or *wild* caribou in October and November as being easily herded. Caribou were reluctant to move into softer deeper snow that would slow them or towards cover where there might be risks. Hunters used slow steady machine speeds, distance, and topography to get into position before herding and indicated that once the caribou had seen them they would run off. When we asked "How would you hunt caribou using snow machines in this situation?" hunters described sophisticated plans and strategies that were based on contingencies and their experiences hunting caribou in the same area in the past.

The following quotes cover the range in ideas related to caribou reactions to snow machines.

[Group of 3 caribou, first time this year at highway] *I would think that you could pretty well drive right up to them with a skidoo, you know. They could be looking at you and then all of a sudden you stop.* [How close in yards?] *100 yards.* [J265]

[snow machine approach angle] *I think going at them really scares the heck out of them, once they have been hunted for a little while and they've tuned into what's happening and they run. I just don't know if there's a difference on the angle* [of approach] [G1200]

*If they watch you, they watch, as soon as they hear the sound, and if its going toward them, then they move, but if it's going right by them they just take their time [*H1738]

[Going on an angle is different than going straight on?] *They would be more aware of you because they can see more of you moving sideways instead of going straight at them.* [F426]

Last spring though I was just scooting around and if you come up to them fast, and catch them while they are bedded down, they'll stay bedded down until you get right too close to them like from me to you. [F472]

Faster skidoo you'll get them, you got a slower machine, it'll be very difficult to get them. With an Elan or Tundra, you'll probably chase them quite a ways and get them. With a big skidoo, I seen it happen, you know them big skidoo, they just catch right up to them, they can't get away. I seen it happen before. It makes a big difference. As fast as they can go they can still get caught up. [I679]

I think they can tell if the snowmobile is after them, or if its just a snowmobile riding around, you know, they got some kind of instinct about that you know [How would they know, if they had an instinct, it was coming towards them?] *Oh they'd be scared of that,… they're gone. That's the main reason they're so nervous up there, it's the snowmobiles you know.* [B409]

If they [snow machines] *are driving full speed, you got motor revving way up then, you got a loud noise, but with a quiet machine you can get close, especially in the trees, let the skidoo idle and you can walk around and get really close to them because they are not watching you, they are watching the sound of your machine.* [H34]

[Is it important if we talk about your headlight on or not?] *No* [F431]

We went up hunting with snow machines 2 years ago. As soon as the caribou heard those snow machines starting up on the road, they started in the opposite direction. [D628]

[What sort of posture do they take, how far do they go away from the snowmobile?] *If they get chased?* [Yes] *Oh what they basically do is make big circles eh, you know they come back all the time, they make big circles.* [Back to the original?] *Not to the original but just kind of go around and around eh, or it they have, going up a pass that's different but in big flats like up in Chapman Lake, …that's what they do, they go around in big rounds, if they are chased.* [B431]

[Is there a difference in how they respond, if you come straight at them with skidoo or you sort of angle?] *They just keep trying to run away but we just keep on cutting them off. I think, they'll stop at one point and we'll just start shooting. If they're going this way and you're going this way, you just keep being ahead of them. Wind doesn't matter, when you shoot the leader, you can get lots once you get the leader, they seem to get disorganized. You get a good hunt, you shoot the leader the rest of the caribou will come back this way, usually someone is here. Try to shoot the leader again and they go this way. You go back and forth. If there's enough of you, you can just get them going in a circle. Keep shooting the leader. You can get the whole works.* [J422]

[How far will they go before they stop?] *Some of them go quite a ways, but some of them don't go far. But if you kill some, keep bothering them maybe they'll go about 2–3 miles, they forget about you, they keep watching you. Once in awhile they look around, feed;, once they know you're coming, they will take off.* [I562]

I don't think they make the connection of somebody dying: they do make a connection if they have to run and they're chased and that's relating back to how they deal with wolves. [E21]

Caribou group size

In every scenario, hunters predicted less intense reactions when caribou group sizes increased from 20 to 100 and more intense reactions when group sizes declined from 20 to 3. In all but 2 scenarios, there was little uncertainty over the definition or boundaries of what constituted a group: these were the only animals in the map area on the flip chart.[24] We did not get clarity on thresholds in group size that led to changes in reactions. In 2 scenarios where there were caribou ahead of a travelling group that was being approached or hunted, hunters predicted that the caribou reactions would be influenced by the presence of the other caribou; in most cases fleeing animals would try to join the group in front.[25]

The following quotes cover the range in ideas related to how caribou group size influences their reactions to disturbances.

[The big bunch would be more likely to do what?] *Probably they'll probably just keep crossing…but if you got a smaller bunch (probably*

maybe 30, 20 heads) they won't cross they'll veer off or else stay where they're at or go back. [F992]

I found some safety in numbers with them. A single animal approaching the highway, sort of trying to cross the highway west to east, they see you, they'll take off. But some big herds they'll walk right... [faint] [E972]

In a small group, you shoot one [or] *two* [they] *will probably spread out and normally that's what happens. In a big group they'll sort of stampede, you know stay together, crowded together.* [I510]

[How about you, if you had a smaller group, rather than 15 there were 3?] *Smaller would definitely cause more disturbance, which, more panicky. What I have observed is they don't seem to walk along with a plan in their head "what happens if we get attacked there", they're totally panicky, don't know what to do, running totally uncoordinated in different directions.* [C558]

Snow depth and trails

Most of the hunters had typically experienced ankle- to knee-deep snow in October and November. They described deeper and softer snow in the treed areas of Eagle Plains, and more wind-packed snow elsewhere. The deepest snow that caribou would likely encounter would have been about 5 to 30 cm. In most scenarios snow depths were initially described as being 8 inches (20 cm) deep. In the few situations where snow depths were changed to 2 feet (60 cm) deep hunters emphasized that caribou made much greater use of trails (Fig. 21).

Hunters saw caribou trails worn deep into the tundra or traced along ridges as part of the landscape. A trail could be a *route* down a valley used in most years or a specific *path* used that afternoon.[26] Either way, trails were as much an indication of where caribou might be as an indication of where caribou had been. These experienced hunters searched for caribou on these trails, and planned their hunts expecting caribou to use them. Snow machines were used on or parallel to these trails.

The following quotes cover the range in ideas hunters raised in relation to trails and snow.

Just before where the caribou is coming to the border, across, he [a hunter on snow machine] *come to the top of the mountain and they all headed west, so any caribou that was coming hit that trail and follow.* [J372]

Caribou never, you know, one of the pieces of the scenario that perhaps is missing is whether they are following a trail. If they are the first herd that's come here, the first herd that crosses anything and is moving down a ridge or, in particular, if there's trees nearby, is extremely

nervous and I have a sneaking hunch that if that was the first group of caribou that passed there this year, no trail, nothing, boy their reaction would be different than if this was the 300th group of caribou that walked this valley and they are following a really good trail and its going to be safe because everybody's been there… [C537]

Figure. 21. A well-used caribou trail on Blackstone River, km 114, mid November 1999. Snow depths were greater in lee areas, and hunters described much greater use of trails when snow was deeper. Caribou leave scent on trails from glands between their toes (between the two hard crescents on each hoof), so presumably these trails would be rich in information and secure places for traveling caribou.

…they might choose that one [smooth well used trail] *that time but is just the rest of the group is on it and they will definitely follow, especially when they're truly migrating and not just meandering and feeding around. But when they're lining out and moving from A to B, they will follow the ones ahead of them. And you could have, you know, like twenty come through here and half an hour later they'll come over that ridge on the same trail and that twenty will move through. That's how hunt we them in that situation. You take advantage of that and know they're going to be there.* [E1150]

I find that caribou, in deep snow, they don't seem to run any further than they have to. If they're running away from you, they run for a

distance but they don't run steadily but they don't run 2 miles where they can't see you. They run, say a couple of hundred feet, until they know you're not following them and then they trot or walk slowly, but continuing in the opposite direction. But where there's not much snow, the caribou don't seem to follow the same trail, but they seem to run further, maybe because it's easier running or it's a safe distance. [D1141]

*[*Snow now 2 feet deep?] *I'd say that they'd stay the same, they'd follow to the east on the main trail to the caribou, they wouldn't scatter off because it's easier walking through.* [G615]

I think the most important thing about the time of year is the thing I have already mentioned: if there is a tradition that's been established by, you know, scent. Scent is there where, by November, there's been a lot of caribou crossing that point. [C620]

I've hunted on a trail, it was last fall actually. Caribou were heading south, south of the Eagle Plains lodge, its pretty heavy timber there. And, at first I had no idea, how I can possibly hunt in this heavy timber. I move away from the highway, first thing is, how do we determine we are one kilometer away in that heavy timber in the northwest. Then I saw this cut line, huh, I thought that's the solution. I walk on this cut line until I was sure this was a kilometer for sure and then I saw one of those trails go in the bush and just wait there in ambush, huh, for 5 minutes as a young bull, took that bull, started butchering that bull, right there where I found him. And next caribou are almost stepping into me…. They came standing 30 meters and suddenly "Oh" there is something wrong, huh, there's a caribou lying there and I'm butchering that caribou. Standing there, looking for a moment, taking a wide circle around me and keep walking. And that kept continuing, oh, at the rate of every couple of minutes a caribou. They just took a little detour and kept walking. [C1062]

Approaches on foot – scent and visibility of hunters

Hunters predicted that as long as hunters remained in sight, caribou would tolerate direct or angled approaches by hunters on foot until a certain range. Caribou that were not spooked by previous hunting tolerated much closer approaches before they moved off. All groups described "non-extreme" reactions ("they will watch you") or even curious approaches when caribou saw people, if no shots were fired. One group ranked the relative importance of caribou seeing or smelling hunters in an interesting way. They said that for *wild* caribou the effect of smelling hunters was greater than seeing hunters and that for *spooked* caribou, the effects of seeing and hearing hunters was greater than smelling them. Multiple shots and movements of dying caribou were seen to disturb the animals and increase their flight rate and distance from the kill site.

In the scenarios where we sought predictions about changes in caribou reactions to hunters on foot if caribou were aware of distant hunters, shooting, or snow machines (1–2 km away), about half the groups said the reactions they had predicted would remain the same. The others felt that caribou in the immediate group would be more vigilant or looking around.

These quotes capture the broad range of ideas related to caribou reactions to variations in stalks.

> *All the animals that I find take off in the opposite direction, they just avoid where that noise come from.* [D565]
>
> *I get the feeling that, when trying to sneak up to get into rifle range, they're on the alert and "oops somebody is after us". After the shot is made and I walk into open sight…they are not concerned at all anymore.* [C438]
>
> *Well, like again the shots don't mean nothing to them and as soon as the guys leave the cover that whole group is going to get up and walk away maybe half a kilometer and continue what they were doing, sleeping or eating or, they won't go far.* [B648]
>
> [What if caribou see the hunters before the kill?] *Well then the caribou won't walk there. I would say* [they'd go] *about half a kilometer, safe distance for them.* [B362]
>
> [Three hunters out of sight?] *Don't see them. Don't smell them. Don't react.* [C999]
>
> *I almost think that the act of standing up so that they can see you kind of relaxes them, in that they know where you are and can maintain a safe distance from you, as soon as they know where you are they seem to be curious, they really want to know what happened, and they often circle where the actual kill site is then move off, if they haven't been hunted previously.* [G599]
>
> *More than likely they're going to spook if they smell you, but it doesn't mean that necessarily they will. They may throw their heads up in the air where you can tell they've smelled you but they'll circle back around to look at you again. So its not like many other animals that once they've smelled you they're gone, you can't say that absolutely but if you're hunting caribou you always keep the wind in mind, you always keep it in your face.* [E803]
>
> *I think if you had multiple shots like that… then they would react. I think if…you had 3 guys hiding and they took 2 shots, struck 2 caribou, I think if there was more than, the more shots you have the more they react. Because the first one is like, "What was that?", and if you have another one, "Oh, it's a gun shot" I think. And in other places where shots, they seem to be moving, so I think that... if it's a single shot once in the morning, I don't think it will affect them, but if you have a whole*

bunch…within earshot and there's a bunch of things happening, they'd get spooked. [E940]

I went hunting with a fellow from Aklavik one time, and we saw caribou just a mile or so off the highway. We were walking toward them and, once we got so far, he told me to hold my rifle straight in the air and sort of bend down. So we were both doing that, then we, he said stop and sit down so we did that… we didn't make any noise. Next thing they all look toward us and they start walking, then they start feeding, and this one was watching us, and he says we have to walk. And we walked again, and he said, okay sit down, just keep your gun in the air, then he made, like he bent over and he was digging, eh, and they just kept coming, and that's how we got them both bulls. [H649]

Long ago, we used to have dogs to go hunting…you always got canvas over your load. I had one like that. Caribou too, way out in the open up towards… [can't hear]. *I tell those boys "You going to make something sweet". They took that tarp. I make them laugh, "You seen that caribou close? What you going to do with it?" Put stick in that canvas and fold it over. I carry needle and thread, I sew it. "'What are you going to do?' they told me. I show you tomorrow." Next morning getting daylight, everybody taking off. I took off too. The caribou is up there in the flat, way open like that. I told him "Let's go a little ways down. You guys – you go that way." About 7 or 8 of us. I put that gun stock in between that tarp and that stick, the gun barrel. We walk toward that caribou. Pretty soon getting close to it. Every time we step once or twice they look. I'm right behind that tarp (they don't know I'm right here). Pretty soon all get close. He* [caribou] *hear noise, he never see nothing, just white – snow, the tarp is new. I sat down and put that tarp over there while it look down. Funny for him, he don't see nothing. I shot 2 caribou.* [I1011]

I've never had any problem like that with a tripod on the front of my rifle and I walk straight at them. By the time they're starting to move off I've been hunting sometimes it's 250 yards but never had any problem walking right at them unless they've been shot at a lot…I think the fact they can see you and get the sense that you're stalking them they start moving, they don't run but they just move so that you can't actually ever catch up to them but if you're visible you can walk right up within hunting range…[possibly another participant comments] I think that too cause I mean they're out, I mean they're being chased by wolves and the wolves are in and out of the willows and whatnot whereas if you're in the open they can see, you might be a wolf so they're not as scared whereas if you disappear and they're you know they know something's up but they don't know what…wolves will do that: they'll get out of sight and use cover and then they'll pop up and…[G768]

Time of day

Shifting the time of day in the scenarios did not change hunters' predictions about how caribou would respond to hunters, traffic, or snow machines. Although they only saw them during the day, hunters understood that in the fall these caribou were active day and night, with longer resting periods at night and a peak in activity at sunrise and sunset. They suspected that caribou migrated at night.[27]

Individuals who hunted on foot or skis avoided competition or disruption of their hunts by camping near the caribou and trying to get out on trails at first light, before the hunters with snow machines arrived. Some said the caribou weren't as spooky first thing in the morning because nobody had shot at them overnight.

These 4 quotes cover the limited ideas raised about the effects time of day had on caribou reactions to hunters.

> *Lots of people go hunting early in the morning, that's when the caribou is along the highway, daytime they sort of spread out, closer to tree line. I notice that a lot too. A lot of people go real early to hunt, around 6–7 in the morning. They take off, they get to the hunting grounds around 8. Caribou would be close by. Later on in the day they start spreading out towards the mountains, along the ridge. I notice that all the time.* [I571]

> *They start moving early in the morning. During the night you probably see some travelling, on the other side of Eagle Plains* [Lodge?] *they go on the road at night.* [*I1081*]

> *You can have a tough time finding them. They seem to be more available right at dusk, like most animals. They're be coming back to the road, although that doesn't help you any, but, um…*[E1056]

> *[*We've had some input that they don't move at night, so its kind of interesting to hear the different experiences.] *Maybe not every night, I don't know, but often you see them at night, I mean, that's why they hit so many of them. That's why they had to change that one narrow cut through there, this side of Eagle Plains. They killed all kinds of caribou there, at night mainly.* [E1074]

Traffic

Hunters reported that caribou had a wide range of reactions to approaching vehicles; they saw this variability as being mainly due to the caribou's prior exposure to hunting. Hunters understood that caribou learned to avoid trucks after they had been hunted for 2 days and that caribou were calmer when they were away from the road.

Vehicles on the highway create many stimuli: light (e.g. headlights of various shapes, colours, and movement rates); sounds in many frequencies

and patterns (e.g. rumble over potholes, pulses in groups of vehicles); objects seen that change speed, angle of approach and temporarily disappear that may mimic movements of predators; and scents of exhaust (Fig. 22). Hunters saw little or no reaction by caribou to parked trucks. Hunters were able to judge whether a caribou group was going to be approachable on foot by the way the caribou responded to their vehicle. We did not learn about caribou reactions to traffic in the absence of hunters. Very few hunters had watched groups of caribou that were not aware of them or other hunting parties, trying to cross the highway as vehicles of various types and speeds were going by.[28]

The following quotes cover the range in ideas about traffic expressed by hunters.

> *They should, they should really start working up there [can't hear], study it. People should study it in the fall. Let it,[the herd] you know, come to the highway, see what it's going to do, might settle up there, you know, watch it, just leave it alone and don't bother it.…This fall when caribou first came at James Creek, that caribou was on the highway for four days. The crossing, the workers up there wouldn't never even tell their boss caribou was there. They just left it, kept it quiet (this lasted 4 days). They were walking right among those caribou themselves, those workers.* [H866]

> *…it never see truck before highway, caribou. Even caribou come up to truck. Look funny for them, they come to it. But now they see light coming down the road they run for their dear life.* [I726]

> *By the time it* [the caribou] *hits the highway, somebody see one caribou up there, the whole damn town goes up there.* [H803]

> *The caribou ran off the road when I approached them. He stayed off the road. Then I hid away and the caribou started to come back to the road. By the time I got the bull I wanted, another vehicle came by and he ran off again, and he did that about 10 times in a row. So I walked up to the caribou, but, yeah, they always seem to keep running away from the road* [D1291]

> *It* [traffic] *affects them for sure, it affects us when we're trying to hunt. They piss us off you know, we sneak at caribou and damn big trucks come around and they all take off. You got to just like plan how you going to go again…The noise is louder when you're about two kilometers off the highway when you hear the truck, rather than right beside it. It echoes. You can hear it about long ways too…* [J466]

> *If the truck's driving up and down that's not too bad, but if, if the truck stops, then you hear the car door slam and they're spooked caribou, they're usually starting to – skittish, get skittish.* [E882]

> *In terms of highway noise and vehicles moving, I had an experience two years ago where we were just south of those Ogilvie ridges (before*

you climb the hill) and there were a number of caribou attempting to cross. Some did, but we just kept going along and we noticed quite a bunch start to run parallel to us and they run quite hard. And then they kept going until we actually slowed down and stopped, and we just stopped, and then they crossed the road, so I felt they were disrupted by us moving quickly. [C380]

…I think the reaction she got was result of those animals having been hunted already or been exposed to it. But I went up during that week that it [hunting] *was closed as well. I'm really in favour of what they've done there. I think that's a great move. I took my wife and kids and hiked off and I was able to walk right up to a number of caribou that were going through the whole rutting stage and there were trucks going back and forth the whole time and I didn't see it affecting them whatsoever so I don't think the vehicles have an effect on them until they are accompanied by actual shots being fired.* [G752]

They were crossing the road and playing on the road and walking right beside the road. You would drive by and they would only be like 10 yards off the road. And I think they probably just moved into the area so there wasn't any hunting that week. They didn't react, they didn't run or anything. They just continued on with what they were doing. [G732]

A line of them would come out, and stand there. And sometime when they're just about to the road there (because we'd be waiting for them to come out in the opening) and… if a vehicle was coming they'd just stop. All of them would stop and walk out, stand there and then they'd just walk across once the vehicle's gone by. You still hear the vehicle a little bit, but they – once the vehicle's gone by they cross. [D410]

If you're just driving by slow and, soon as you can, sometimes you just start stepping on the brakes and they'll know and start moving and then they'll speed up a little bit. But if you keep on going they won't even bother, they'll just walk off slow. But if you, as soon as you start kinda stopping and stuff the vehicle: back in the bush they go. [A910]

Figure 22. Dempster Highway at dusk in the Richardson Mountains near km 450, late November 1999. Note road edge markers reflecting in vehicle headlights. The road appears as a raised dark gray line where plumes of snow lift behind moving vehicles. Sounds can be sudden and loud in cold weather. Heavy truck traffic increases in the winter after ice bridges and ice roads are built (B. Smith photo)

Weather

All scenarios started with sunny weather. Hunters predicted caribou would not react to fog or falling snow, but if the wind grew strong the caribou would move to lee areas (Fig. 23). We did not ask about heavy rain, freezing rain, or extremely cold weather because hunting effort would decrease under those conditions.

The few weather-related quotes follow.[29]

[Storms or weather moving in?] *Generally they head for cover. Just like any other game they're going to head for the timber or little draws and stuff, get out of the wind. They don't like it as much as, well, they can endure it better than most, but if there's some place to hide, they'll hide there.* [another person] *Yeah wind will drive them. Heavy snows and things, they'll just disappear in the timber, whenever there's much weather, but it's wind that usually (well, up the Dempster), it's wind that drives the weather too. So, you seldom get a major change in weather without lots of wind.* [E1824]

Figure 23. Windblown snow and icy road surface near NWT Border, early March 2001. Hunters described caribou selecting less windy places to feed and rest. (B. Smith photo)

And different, different weather conditions are to your benefit. Cause if it's snowing, then all that snow is falling. When it's in the air, they can't hear anything. [H1129]

And wind might be a pretty serious, pretty serious hunting aid in that country. Many times, I betcha many, many of those caribou get shot that otherwise wouldn't get shot, simply because the caribou's curious and wants to get wind of what it is he sees, sees somebody up there. [C756]

…they get wind of something and they don't know what it is, they will circle around and get a better look at it, quite often. So it might be

something that attracts the caribou to the hunter, just getting the wind. [C770]

Terrain and cover

We did not change the scenarios' terrain or cover descriptions as the discussions proceeded. We looked at the effects of these landscape features by comparing the predictions made by hunters in different scenarios, and by looking at some of the incidents they described (Table 3). We discussed no situations where caribou were between the hunters and the road. In that situation the fleeing caribou would have had to run parallel to the road, cross the road, or run past the hunters.

- Only 1 of the 39 hunters predicted that caribou would hide in trees until hunters had left. Hunters did not see caribou move into thick vegetation to obtain cover – caribou preferred to stay in the open.
- Hunters described caribou behaving differently in treed areas. They stuck to trails in the snow, were much easier to approach, and did not seem as afraid of nearby people as when they were in the open (Fig. 24).
- They described caribou using certain terrain features for travel routes (often ridgelines), bedding areas (slopes with a view), or to get away from people (hills as barriers). One hunter noted that caribou avoided narrow canyons.
- Few hunters went into treed areas to hunt caribou, but if they were available they used trees as cover to get closer to caribou.

These quotes capture the range in ideas related to the use of terrain and cover:

But after they get up there (like around [Km] *274 and stuff like that, around Horseshoe Bend), soon as it starts getting into timber you don't see them much off the highway, you know. But in the open area, that's what they really use the skidoos for. You never see much of the hunters go in the timber area with the skidoos, not unless it's open, not unless they got a road like an old cat road or something like that. I never see very much of them hunting off the road. But as soon as they get them caribou in the timber, they feel safe eh. 'Cause not much people goes in the bush, eh.* [A598]

Or whatever they have for cover, like if you're hunting them in that open area there, and once they've had enough they're going to go and... They'll be out of [there*], they'll be over that ridge or they're going to be away from the highway or away from people.* [E1602]

[Ogilvie River stretch of highway where narrow valley floor and steep slopes] *It might be because of the canyons, because of the traffic that they won't go through. They won't go through the canyons. The odd one will, but not the numbers that go over the top.* [F765]

They'll go straight up and they won't stop until they are over the top of them. Yup, right up to the peak. I've seen them. [F742]

One thing when you talk about timber or bald hills, they run a lot less in the timber. They'll run to the timber and that's about it. They'll migrate through there and, you know, they just don't keep running. But on the bald hills if they're really pushed they'll, you'll see them just go right over the top [can't hear] *quite a ways.* [E1398]

[Why is it hard to get them off the road in the forested Eagle Plains area?] *It's because of the snow. It's deeper and they tend to stick to that ridge, at least that's what I've seen. They're using the highway as a corridor and it's a natural travel way, just like they use the ridge here but that way the highway is following the ridge and it was really hard to get any more than 600 meters off the road because that's what they were doing, both sides of the highway and on the highway. And once you get them off the highway, they eventually come back and move in. It's wooded there too, whereas this is open, and when I see them farther on the other side where it's open, the same thing happens. They'll stay off the side and because they have more room to move around, the snow isn't as deep.* [C402]

… you know that very hill [ridge near Eagle Plains airstrip], *we must have been 4 or 500 yards away from large bulls and they treat us with respect, they took off* [Because you were in sight?] *Oh yeah, yeah.* [C414]

They are not aware as much of me in the woods, that why they're not as disturbed. But I don't usually see them hanging around the woods. They're always moving that I see. They're going for the open areas. [G466]

One of the things that I notice is over the few years that we hunt on the highway, is that a lot of the caribou would go into the trees, now it'll stay in the trees. Not many caribou stay on this side along the mountains , open space, when they're on the mountains they're spotted very easily. You notice they stay down in the trees, because it's warmer. They can get food easily too. Plus the change of climate, big difference I notice over the years. [I419]

You talk about in the trees… so we we're dragging him out but then we kind of stop and have a breather…so we just sit behind a spruce tree and just crouch behind and these caribou would come... I don't think they saw us, maybe they smelled us, but they would just kind of veer around you, just about 50 yards and they'd just keep going…in the small scrubby spruce trees…Its almost like they felt your presence you know? [quiet assent from others] And that's the first time I ever heard them click when they walk. [E1090]

Figure 24. Typical black spruce forest along the Eagle Plains section of the Dempster Highway between km 260 and 380, late November 1999. In these habitats the snow was softer and deeper, and caribou tended to stay on the road more. Hunters described caribou as being less wary in the trees. People sometimes hunted on cut lines. (B. Smith photo)

Table 3. Terrain and cover qualities in the scenarios, and patterns in caribou reactions.

Location	Terrain	Cover	Undisturbed caribou behaviour	Caribou movements when alarmed by hunters near road.
Arctic Circle east	3 km wide valley parallel to road with slopes to east rising 800 m; some draws on slopes. Road on ridge top overlooking valley.	1-m high brush scattered near road, but rest open tundra.	On lower slopes or valley floor, tending to be on top of flats on slopes between draws	Often up slope and over ridge tops [or chased into main flat valley by snow machines]
Eagle airstrip ridge to north	Open ridge top about 2 km wide heading NW-SE	1-m shrubs and 3-m spruces about ¼ way down slopes.	Along ridge top trails	Along ridge top trails
Eagle Plains	Ridge top road, flat ridge tops, gentle slopes, to 200 m relief	Dense 3 - 4 m black spruce, except in recent burns	Often seen on road, walking along road, a few crossing areas noted	Frequently stand on and run down road; appear reluctant to jump off road into trees and soft snow when the snow is deep or berms are high.
Horseshoe Curve	Road along open sinuous ridge tops, descending often quite steeply 900 m to valley bottoms	Often small shrubs and open forest about ¼ way down slope.	Walking from NW to SE,	In scenario caribou on west side and they returned along route to west and north. [If on east, run down slope away from highway into trees towards open country to the south]
Ogilvie River	Road in narrow 1 - 3 km wide valley bottom, steep talus mountain sides rising 700 m	Small, scattered spruce on slopes with soil, large spruce and poplar along river edge	Down steep talus or forest slopes to quickly cross floodplain then up and over ridge.	Delay crossing in large trees, go back up slope, and follow trails if available and safe. One hunter said they'd hide in trees for several hours until the hunters had left
Engineer Creek	Road in flat floodplain 2 km wide where 2 creeks join, gentle valley sides rising 100 - 400 m to flat slopes and dome ridges	Clumps of dense shrubs and scattered spruce in floodplain, scattered spruce on valley sides, open slopes on upper flats	Following trails from west to east, feed and rest on open flats.	Continue to follow trails; may backtrack on trails.
Blackstone Uplands	Flat valley 2 - 8 km wide with gentle slopes rising to 700 m. Numerous creeks and pothole lakes	Primarily tundra with some dense shrubs beside creeks, and ponds. Sedge flats.	During week closure, spend nights on aufeiss flats and days on sedge and tussock flats beside highway.	First half of day on or near sedge flats, moving to flat lower and upper slopes or over the ridge top to the open slope on the far side, away from the road.

Position, number, and sex of caribou killed

The factors of position, number, and sex of caribou killed seemed straightforward, but they elicited much discussion and variation in responses between and within groups.

Hunters described few differences in caribou reaction in scenarios when we varied the sex or position of a single caribou taken from a stationary group. In a moving group, taking caribou from the front or middle versus the rear of the group increased the intensity of the reaction (Fig. 25). Taking a bull or cow did not make much difference except during the rut, when cows were warier than mature bulls intent on fighting, herding, and breeding. Given the same group size, caribou reactions intensified as more animals were taken, more shots were fired (particularly from visible hunters), as the number of hunters in sight increased, or if the group was chased.

Figure 25. A group of *bush* caribou, mostly bulls, in the Blackstone Uplands during the no-hunting week in 1999 (October 15–23). Many hunters deliberately selected animals depending on their position in the line of moving caribou. Some took the trailing animal(s) to minimize disruption and spare the leader. Others took the leading caribou so the group would stop or mill around, so that more of the group could be taken. (R. Farnell photo)

When we started to shift the position, number and sex of the animals taken in the scenarios, we found that hunters wanted to interrupt the process and talk about their hunting strategies. The scenarios typically started with 1 animal shot and then increased to 2 or 3. This situation was relevant for a licensed hunter with 1 or 2 tags. Licensed hunters were eager to talk about the strategies they used to take individual animals, to kill caribou quickly and not injure other caribou, to get close to caribou, and to select animals in good condition. First nation hunters typically gather meat for their extended families, and they do not hunt for only 1 or 2 caribou if they can take a few more. These hunters sought to explain to us how their hunting group would take 1 or 2 dozen caribou, which animals they would select, and how the meat would be distributed in their community. It was difficult to focus the discussion on the reactions of the caribou that were not shot, particularly as the number of caribou taken from a group increased. The caribou that were not down left the area; sometimes they would be followed.

The topic of "leaders" arose every time the factor of position was discussed. This is an important topic but these focus groups gave us too limited an understanding of how Gwich'in know this topic. More work is required.[30] In these focus group discussions *leaders* were those:

- **individual caribou**, often older cows, that steered and led migrating groups;
- **vigilant caribou**, usually any caribou other than calves, that detected danger and then led fleeing caribou;
- **scouting caribou** that went ahead and looked for danger;
- caribou **groups** that led the migrating waves north or south;[31] and
- **any individual** at the front of a moving group harvested if the goal was to take many caribou from the group.

These quotes cover the range in ideas related to which animals were taken from a group.

> *What happens is they have a number of leaders in the herd. And the rest of the caribou, their instinct is not to watch you as a person or the hunter, it's to watch their leader and the reaction of that leader who'll trigger the herd. And a lot of times you won't see, you'll see this stance where the alarms stance by the* [?] *in the herd watching and sort of observing and as soon as they react the rest of the herd reacts and they kind of follow suit of whatever the leader does in the herd, it's not you…* [A895]

> *If he's out of sight* [the hunter] *and he shoots one out of the back, they go into a trot for maybe a hundred yards and that's it, and then they'll just keep on walking like nothing happened, they just lost one. If you don't chase those animals they are real quiet, you know.* [B194]

[If group had been exposed to hunting on highway for a week, and once the bull a the back had dropped would the reaction be different?] *They would trot a bit longer if he's out of sight* [the hunter] *and you shoot him* [a caribou] *they would keep on going, they wouldn't scare but they might run a bit longer.* [Farther before they stopped?] *A little further before they kept on walking again* [How much further do you think?] *Oh, maybe half a mile.* [B495]

That's one thing we learn, there's always a leader and one of the traditional ways the first nation people hunt is to knock the leader down. Once the leader is dropped, everything is a standstill. You could almost take them all down especially if you're hunting with skidoos, a good hunter, you hit the leader…they stand there… If you don't shoot that leader, you shoot maybe caribou in the guts, it [the group of caribou] *always spread out all different…it spread out all over, 2, 3, 4, here and there.* [G441]

[In a stationary group with many bedded down?] *…if it were taken from the middle of the herd then* [?]*…the caribou might detect that there is some danger, but if it's at the outskirt of the herd then it would* [another hunter interrupts and says…] *That will stir them up if you shoot one in the middle and they both run. At the edge they won't be bothered.* [A246]

They're totally focussed on, on, [the rut] *you know. We would watch a bull come off the side of a mountain and run two miles to come down and try to break up a fight between two smaller bulls and you could walk and watch that. They didn't seem bothered by it at all. Whereas, prior to that, they were certainly more concerned about people in the open.*[And when are you finding that timing?] *In October… usually the first week it starts, or from my observations anyway, right in the middle of October you are in the thick of things and I shot a bull once on October 24, and it didn't taste bad at all. I could eat all the meat and no problem.* [C1167]

[If the group was 3 instead of 15?] [one person says] *They'd be gone, they'd be long gone.* [another says] *Unless they're with young ones, though. Say you got a cow and a couple calves, then say you shoot a cow and the calves just hang around – or a bull with a couple young bulls…the young bulls will look for the big bull so they'll hang around too eh, but if you got 3 big bulls or 3 cows, then they'll take off, cause there's always another one there about the same age so they'll take off…* [A341]

Presence of wolves or bears

Hunters viewed bears and wolves as negligible factors influencing how caribou responded to people, traffic, or snow machines. Questions about these species were peripheral to the study and were not included as *what if*s in the

scenario discussions. Ft. McPherson hunters indicated that wolves or bears waited for migrating caribou at particular locations north of the border, and that they contributed to the spookiness of some caribou.[32] Wolves are shot when they are seen near the highway, and because of this are not common in the open country north of Eagle Plains Lodge.[33] About 1 in 6 hunting parties report seeing wolves on their Dempster hunting trips between September and November.[34]

These quotes provide the range in hunter ideas related to wolves, bears, and dogs.

> *That caribou, by the time it comes up this way, and it's got all the wolves and grizzlies and black bear after them, they get pretty jumpy after awhile.* [H717]

> [Dogs?] *… and we came back with the dog team, loaded up the caribou, hauled to the highway, came back for the second caribou, they were still there watching…* [C1116]

> *… they would just let that dog get quite close because they know, of course, they can, how close they can let a wolf get to them before they can outrun it. So, I think a dog is a pretty benign thing to have with you as long as he is under control…* [C1123]

> *… Cows will look a little harder at me if I have the dog and they will actually come a little closer just to size her up and have a look at her. But they don't seem to be terribly concerned. They seem to know the safe distance…* [C1131]

> [Do you see any wolves hunting the caribou?] *Last year I bumped into five, but there was no caribou around. I think they're more scared of the trucks than anything else. Any wolf that comes around gets shot right now. That covers your gas; if you get a wolf it covers your gas expenses.* [J554]

Viewing from a distance and close range photography

People viewing nearby or distant caribou from the highway were seen by hunters as having a negligible influence on caribou or caribou hunting. Off-road stalks to view caribou were not common (Figs. 26 and 27). Snow machine-supported viewing and photography were seen to be incompatible with hunting.

Figure 26. Dempster Highway looking south, km 90. Both the scenery and wildlife attract winter tourists, although people wanting to view caribou must come during the week-long no-hunting period, or be ready to visit when they hear the caribou are near the highway.(K. Gustafson photo)

Figure 27. Youth, B. Smith and S. Jingfors, viewing caribou and caribou hunting west of Chapman Lake, October 1999. (B. Smith photo)

Many scenarios included the question "What if you did not shoot and watched the group for some time?" In every instance, hunters said caribou that were a certain safe distance stood and watched the people. Spooked caribou might move off, or have a greater safe distance.

The following quotes cover the range in ideas related to caribou reactions to viewing.

> [Hunter on foot seen, but no shooting, unhunted previously?] *Yeah, if they saw you they might come around you. They might be curious, they might ignore you…they might just trot off too. Like see you, and don't know what you are, whatever, but they might just trot off just to avoid you.* [E966]
>
> [Hunter on snow machine seen but no shooting, stopped 250 m away, unhunted previously?] *They'd just stay and graze 250 yards away.* [F566]
>
> [If they'd been hunted for a week?] *That's a different story…alarmed and ready to run.* [F587]
>
> [Off highway tours to take people on snow machines to view caribou, mid November?] *Better shut the hunting down or you're going to have media all over you. You know, I can just see some tree huggers out there and you drop a couple of caribou in front of them with some cameras it's going to be like the seals in Newfoundland…* [E1855]
>
> *…I don't see that as a realistic scenario. I don't think they are compatible…unless you planned your track to get away from all the hunters…It's not the killing, it's the noise and other factors which are just as much of an impact whether you're taking pictures or shooting them.* [E1864]
>
> *…he was wearing these wind pants, and when he walked he made a swish-swish, the nylon against each other, it was really quite strange…but he walked on a trail and through the snow and I counted them, he had 13 small bulls following him and they were not afraid of him…we just surmised that the sound of those pants were quite similar to antlers going through the spruce…* [C475]

Confirmation of themes

After we had hosted 6 focus groups in 3 communities, we wanted to confirm with the remaining groups some of the themes we had heard. We wrote each theme as a behaviour on a separate card.[35] For example, "Most fresh caribou tracks on the road are made at night". During each of the next 4 focus groups we showed a card, then asked "Are we on the right track? Do you agree or disagree with what was written on the card? Are you seeing this more or less often?" (Fig. 28).

Figure 28. Facilitator with statement card used to seek confirmation from group about the emerging conclusions. (D. Cooley photo)

Did hunters see caribou avoid the highway?

We thought of some of the patterns in caribou behaviour that could indicate that caribou were avoiding the highway, and if hunters might see these patterns. For example if caribou were hesitant to cross the road due to learned avoidance, their migration "stream" might be backed up on the "upstream" side of the road, and hunters might see more caribou on that side compared to the "downstream" side. Based on conversations with colleagues, we came up with a list of caribou behaviours that hunters might see from or near the highway that could indicate possible learned avoidance. We recognized that there could be alter-first nation explanations of why these caribou behaviours might be seen by hunters. The point was to ask, in an unbiased way, if and how often certain caribou behaviours were encountered. We showed the groups 10 cards, one at a time. Each card had a sentence describing caribou behaviour pattern they might see. The facilitator asked the group if this behaviour was seen and how often. Some of the behaviours were written in a manner that if caribou were avoiding the highway the behaviour would not be seen, so that we were not leading the group to answer in a particular way.

We were trying to get at learned avoidance of the highway by caribou, rather than caribou reactions to people on the road, but we were only partly successful. Most of the patterns hunters see would be of caribou reacting to them or their vehicles on the highway. Hunters agreed that caribou were more abundant on the "upstream" side of the road during both spring and fall migrations. This may have been learned avoidance of the road or a hesitation for other reasons. Hunters agreed that fresh caribou tracks on the highway were usually made at night or in the early morning, suggesting that caribou avoided the highway and vicinity when there were people, vehicles, and hunting present (Fig. 29). There were mixed opinions on other statements (Table 4). Hunters did not agree that caribou ran when machine sounds changed.

Figure 29. Fresh caribou tracks on the highway crossing a low berm, November 1999. Hunters in later focus groups confirmed the theme emerging from previous sessions that most fresh tracks on the highway surface were made by caribou at night or early in the morning. (B. Smith photo)

Other themes

Hunters liked the questions “Are we on the right track? “Are we hearing you correctly? Do you agree with what we have been hearing from other groups?” There was general agreement that prior exposure to hunting was very important in changing how caribou reacted to people, that caribou were alarmed by fast approaches of people on snow machines, and that cow caribou often lead migrating groups in the fall.

Table 4. Prevalence of 9 behaviours in caribou observed in the vicinity of the Dempster Highway.

If caribou were avoiding the highway, but could be seen near the highway they would...	Statement on card associated with this behaviour	Comments from focus groups
...be more numerous on the "to cross" side than the "have crossed" side (i.e. more on the west in the fall and the east in the spring).	Caribou are more often seen on the west side of the highway.	Caribou are seen on the west side of the highway during the fall migration and on the east side during the spring migration.
...move would more when it was not daylight when people are out.	Most fresh caribou tracks on the road are made at night.	Opinions differed: Some thought caribou move on the road at all hours while others thought only early in the morning.
...learn to separate steady sounds that are non-threatening from risky changing sounds.	Caribou run away when machine sounds change.	Participants agreed that machine sounds do not make caribou run
...when moving south in the same valley as the highway, stay out of sight. This means most trails seen would be parallel rather than crossing.	During the daytime, caribou travel parallel to the road, often out of sight.	Participants had differing opinions: some thought the road does not deter caribou from crossing, others said that caribou travel parallel but not necessarily out of sight.
...select rest areas away from the road.	Caribou rarely bed down within 1 kilometer of the road.	Opinions differed; some participants said that caribou do not bed down close to the road while others said they do.
...follow animals that were not focused on sparring or finding mates.	Cow caribou most often lead migrating groups, but not rutting or alarmed groups	Most participants agreed that cows lead in most situations, but there are discrepancies.
(Not applicable)	Prior exposure to hunting that season is the most important factor affecting how caribou respond to people.	Participants agreed that previous hunting exposure was very important in changing caribou reactions to people.
(Not applicable)	Caribou are most alarmed by snow machines approaching quickly, particularly on an angle to the herd.	There was general agreement that caribou are alarmed by a fast approach by a snow machine. They were less sure about the angle of approach.
(Not applicable)	Caribou will let slow machines get closer than on foot.	Ft McPherson hunters disagreed . The others agreed that you could get closer on a slow machine.

Hunters' feelings and recommendations on minimizing disturbance to caribou

Towards the end of each focus group session, the facilitator asked hunters to identify what hunters might be able to do or how hunting practices might be changed to minimize the disturbance to caribou near the highway.[36] By that time the sessions were intense, honest, and participants did not hold back. Many of the conversations continued, and often became more spirited, after the tape recorder was turned off.

The 7 themes in the hunters' responses to this question, in decreasing order of how often they were raised, are described below with quotes. There were no obvious differences between first nation and non-first nation groups in the comments that were given.

1. **Deal harshly with those hunters from other communities who are the problem.**

   I actually found it quite disturbing the few times that I've been up and just watching the reaction of the caribou to the people and the hunters... I was watching the migration further north and they have a purpose and they are just kind of heading and they're not – whereas the [?trot] *is something that you see a lot of up the Dempster and where the caribou's eyeballs are kind of – you know he has this look of fear. And the running around, and not sure what direction to head. And because they – at that point – they have reached their winter area and when they get there, there is no sense of relief but instead there's a lot of chaos for them. So it really bothered me. I was in, you know I thought, I don't know, it just, it was something that was, I don't know how to describe it was just not normal. It wasn't something that was normal, that I was used to seeing, you know and watching the reaction and just observing the people and, it was just total disrespect and that's kind of what totally – I was so mad, I mean it was just like, you know and it's not, it wasn't, it was a lot of first nation hunters not having you know, they chase the caribou back and forth and the caribou running with their heads up in the air like you know always just totally freaked out about what's going on and, I remember I was watching these people right and here's this elder man from _____ on a snowmobile chasing the caribou! It was like, aah!, walk after them or you know the whole thing with the snowmobile, its just and the idea of taking the time to walk off the highway and not disrupt them and I think that's really important, and I think allowing the use of snowmobiles I think is totally not right.* [B562]

2. Pursuit of caribou by snowmachines must stop but snow machine use must continue

I guess you're not going to get away from skidoo, that's our main source of transportation in the small communities around here so there's no way around it I guess. [I1484]

…I'd definitely want to see people do less. You know that might mean you know running around and in a very large group but or even chasing the herd with machines whether it's ATVs or snow machines. [G1314]

I guess if you use snow machines, there's no sense in roaring right at the herd. You can (I think we all agreed) that if you approach slow and you know, steadily towards them that you can always get within shooting range without getting the herd into fleeing or running mode. [G1386]

... good we had these discussions here, helps you guys understand the way we live, the way we always gonna live, skidoos is never gonna go away now, bring big skidoos, better skidoos that's our traditionally way of hunting nowadays. [I1504]

[What is a definition of harassment?] *Yeah like the snow machines are getting out there too fast and are chasing the caribou a lot farther than if you go out like we go out and stalk them.* [You park the machine?] *Yeah and walk in on them.* [F672]

3. Hunt farther away from the highway

I think I try to hunt with little disturbance on the animals, but I kind of work at that. You talked about going out with your skidoo a kilometer or two away, shutting it off and being back there. Not a darn thing wrong with that. Take your animal through a relaxed herd like put it on your skidoo, you're back to the highway, not a thing wrong with that.… We like to go miles back and hunt back there or camp back there and then it's an entirely different caribou, its back to the bush caribou, more the natural thing. [E162]

We can walk out there, but you know like try to pack caribou all the way from there. It'll take us all day and night. Plus you got to watch for grizzly too. There's a lot of grizzly that time of year. [J807]

…but I found this year we used snow machine in the early opening and we went back 30 miles up the highway. There was nobody else and it was a more enjoyable hunt, the animals weren't now way nervous at all. You know you drive up 30 yards and they come towards you, so I found it, with a snow machine being able to get a greater distance off the highway was more pleasurable. [G173]

I think its going to have one of the biggest effects, if you can just minimize the amount of hunting right in that corridor. [G1375]

The experience that they're having here, I don't think has anything to do with the highway. They are not going to associate anything that's bad with that highway, but they are going to associate traffic with that highway, with what happened to them. They are not geniuses, so this bad thing happens, and there's a car going by, there's guys stopping on the road, there's all kind of action over there along this road. I think that's a much, much more believable scenario. And that's definitely what happens. When a caribou herd shows like that near the road, the best hunter in the world can be out there trying to drop one of them. The rest of them [hunters] *are all going to be on this road, off loading snow machines, and just all kinds of action, and those caribou are going to associate all of that with something bad. And that's what we really have to avoid, is the action on the road, and breaking that connection between that hunting experience and that highway is what it has to be.* [C1018]

I think that, and the ones who really like it, you know, you see their sparkles in their eyes and when they talk about, you know the things they've seen and the wonderful things I've seen when I've been well away from the highway, you know. That's where you get the wildlife viewing aspect as well as hunting…[C1310]

4. Improve shooting accuracy and skills

I guess if I was out with a novice or something, the marksmanship means a big thing. I was up, last October, up by the Arctic Circle and one day we heard over 500 shots. Just sounded like a war; just boom boom boom boom boom, boom boom boom boom and uh obviously you're group shooting, like you know flock shooting like you would geese rather than singling out an animal. You just shooting shooting, shooting. Its when you get that many shots there's got to be a problem. [G1338]

…like it just went from say 8 o'clock in the morning until 6 at night, just continual shooting. Yeah, you know you count 100 in the first hour and a half and it just continued all day,…I know not that many caribou got shot so there's no reason for it. And they also seen the odd fellow just shooting at white, not necessarily [at caribou]. *They just see a white patch moving through the trees so they shoot at it and if it doesn't fall they'd just carry on. So that was pretty upsetting too.* [G1364]

There were also references to avoiding areas where people were shooting for safety reasons (Fig. 30). A few hunters emphasized the dangers to their safety by describing situations where they had observed wounded caribou, heard bullets moving near them, or seen hunters shooting towards caribou when people were behind the caribou.

Figure 30. Hunters R. Martin and M. Billowitz pulled a caribou 3 km back to the highway, November 1999. Orange safety clothing is encouraged by the PCMB, but most of the time only about 2 % of licensed hunters and 0.5% of all hunters wear orange. In November 2002, however, about half the hunting parties observed had at least 1 member wearing orange, and one individual pulling a caribou back to the highway 'wore' an orange tarp. (B. Smith photo)

5. Set examples, practice what you preach, teach novice hunters and youth (Fig. 31)

Better to get caribou before they run too much too…Cause they get a little tougher after they run for a while. That's from the elders. [H673]

… you [are] *going to be less of a burden on a caribou when you are hunting* [if you] *take someone with experience with you. Like an experienced hunter wouldn't go out and strike the caribou, they'll find ways to go around it. Caribou would be less intimidated.* [I1484]

…anytime after that [October 7–10] *they start rutting so we never bother* [bulls] *anymore… be shooting cows, straight cows, calves.* [J239]

[Hunters need to make] *less noise. Maybe* [be] *less disruptive, you know. Like you know, you like just take your time more and think about the more, think about the long-term instead of just short-term gain of getting your animal and, you know, who cares about the other 50? You spook them. Because you're just spooking them for the next guy when maybe, maybe in the long-term run just take your time, get in the trees, wherever…*[E1954]

I think hunting in small groups (like you know a couple of people, three people type of thing) is. And I try to hunt just staying out of sight after I've shot, and waiting. Because I think that, you know, hopefully later on if somebody else goes to hunt that same herd they won't have any association even you know, so just waiting and being patient. [G1323]

The only way you're going to get everybody to agree with it. [The rule about no caribou hunting for 7 days as soon as caribou reach the highway to "let the leaders pass.] *Let's see if caribou comes past Aklavik. Everybody is disturbing it. Old Crow, they disturb it…* [too many talking] *Lot of those hunters in Old Crow they don't shoot caribou with high power rifle, in the water they use .22. You see on TV. Other thing is our leader want to OK the regulations on the highway, GRRB, Caribou Management Board, they should get back with what they preach too. Show us they mean business. That's all I have to say. Show us they mean business instead of telling us you can't do this and the next day you're sitting down there, you see them shooting from the highway. You should see them gutting caribou 50 feet off the highway., They're not serious as far as I'm concerned. They're not serious about the job they have.* [H2546]

And another thing too, they make this corridor, that's not good too. The other people, they take elder with them…See if by elder, you can just [shoot] *off a road…they all take elders, you know.* [H997]

We've gone up there the week of the 15th of October and the week of the 30th of October and we purposefully looked for the young bulls and targeted young bulls only and we never had a problem. But at the same time, we drive down the road and there's people skinning big mature bulls that are in the rutting groups and it's, it creates a smell, you know which people don't seem to get that. You know, some people still look

for that big mature bull right in the middle of the rut which is no way you can make that into palatable meat… [C1556]

6. Protect leaders as they migrate

Yeah, the closure, the initial closure at the beginning, and as we were saying that serves both groups: the people who want to look at them and the people that want to hunt them later. But I think that it's closing it for 500 meters for everyone is going to have a big effect on the pressure right on the road. [G1427]

…protect the leaders along the highway as they move. [H1067]

7. Avoid hunting where others are hunting

I like skidoos, whenever I see a lot of people some place I keep away. I don't want to get shot. Sometimes I walk, depends on where the caribou is, the season, too.[J70]

One thing with the snow machine is that snow machine's a really useful tool for hopefully dispersing hunting pressure, …unfortunately not everybody does that… The reason it becomes a zoo is the high concentrations of people. [C1546]

8. Some rules may be increasing disturbance.

Now that I'm supposed to go off the road 500 meters before I shoot, I pull off my machine and go after them. I caused fewer disturbances when I could just take them on the side of the road and did not have to unload my snow machine. [paraphrased from group F?]

9. There is no problem.

This view was expressed by only 1 of the 39 hunters (a young first nation man) but is significant to PCMB members and researchers, given all the intensive work to educate hunters.

I don't see what the problem is. I go up there for a day hunt and take my fast machine. I saw them a mile off, I pulled off the machine and went after them. I shot 6 when they stopped. Dragged them back to the road, gutted them and loaded up. They were standing there a mile off when I arrived, they were standing there when I got them, and when I got back to the truck they were still standing there, So what is the problem? [paraphrased from discussion over coffee break with FN participant in group D].

Figure 31. Hunter and child from the community of Tsiigehtchic cutting up caribou. Hunters believed that hunters had obligations and governments had obligations to fund programs to train young hunters in proper and respectful ways to hunt caribou.(R. Cruikshank photo)

Discussion and recommendations

Limitations of this method and of the results

This was a new process for us and we were guided by Jim Tousignant, the senior statistician with the Yukon Government's Bureau of Statistics.[37] We called our approach a *local knowledge focus group*. We used scenarios and a complete-the-story structure to probe how the "system" of caribou, hunters, and the road worked. Scientists could also see that this allowed us to develop a model and "partition the variation". It also made the process a lot more fun for the participants. We appreciate concerns that social scientists have with inappropriate use of quotes as "data" and "TEK" use by natural scientists,[38] and welcome suggestions on how to improve the validity and reliability of this approach.

A companion paper describes the strengths and limitations of the local knowledge focus group research process. The key finding of that paper is the critical importance that participants visualize the same site, have personal

experience with the factors being introduced, have accurate recall, and can describe the reactions they predict in terms that researchers can understand. Through their eyes we can look at caribou (not known individual animals), and caribou reactions, not the long-term responses to the activities.

We feel this study provides a reasonable summary of expert hunters' knowledge about current caribou hunting along the Dempster Highway during the fall migration. Hunters had a widely-shared understanding that within-season, learned avoidance of hunting explained most of the variation in caribou reactions. Hunting closures, like the one in 1999 at Chapman Lake, may provide opportunities to test this. Through the eyes of hunters we saw how swiftly a group of caribou can change from *bush* to *spooked*. We are still looking at other datasets to see about between-season learned avoidance of the highway vicinity: Do caribou that get spooked at the Dempster never return or behave much more warily that bush caribou if they return in later years?

The statement approach offered a way for hunters to review the ideas that will go into reports and, if videotaped, could be a fast way to brief decision-making bodies.

Interactions between uses and factors

A caribou group responds to a suite of stimuli, some of which hunters cannot detect or know[39]. As one participant put it "When they have had enough they just leave". But what is *enough* has to be viewed in context. Hunters are not in a position to see the cumulative stimuli that one group might be exposed to over the week or month that they are near the highway.

The findings in this study suggested that we need to be most worried about patterns in snow machine use. Hunters observed that the strongest reactions of caribou were in response to certain types of snow machine use, in particular the use of several machines to herd and pursue a group. However, hunters may have been less able to detect stress to caribou from repeated approaches by snow machines every few hours, every day, over a week or two. The probability of an individual or group of caribou having to react to a snow machine by flight or displacement will be difficult to estimate and measure.

Some combinations of factors were sufficient to turn the stream of southerly migrating caribou. Hunters felt that the deflections were temporary, and that caribou would try to cross the highway later, farther south, but this may be an optimistic view. There was agreement among the northern hunters that substantial deflection was already occurring, and that caribou did not use the Peel Basin winter range east of the highway as much as they used to. We found ourselves variously speaking about events that deflected migrating groups, barriers to crossing, the highway as a filter to migrating caribou, where some would pass and others would not, as well as *waves*, *streams*, *leaders*, and *vanguard* caribou. The point is that deflection is a response to a suite of cumulative stimuli and that it is already occurring. The patterns of deflection and the combinations of stimuli that lead to deflection need urgent attention.

What are the long-term ecological implications of reduced use of the Peel River Basin in the winter by this herd at various population sizes?

Important questions

These conversations with expert hunters helped our thinking about what the important questions are:

- How can people use snow machines for hunting so that surviving animals cross the highway and use habitats near the highway?
- How can we spread out hunting so caribou groups near the highway are not fragmented, repeatedly approached, and pushed away from the highway?
- Is the actual kill by hunters, both recovered and unrecovered animals, too high?
- How can we allow caribou hunting before the ice in the Peel River prevents hunting by Delta hunters and still ensure that the caribou groups leading the fall migration can cross the highway?
- What happens to a migrating caribou group in the days and weeks after it is deflected from the road by intensive hunting?
- What can we learn about caribou migration during the week-long no hunting periods designed to let the leaders pass? (Fig. 32)

Figure 32. Caribou tracks in fresh snow on the Dempster Highway in the Blackstone Uplands vicinity, October 1999, during the one-week no-caribou hunting period implemented when the caribou arrived to 'let the leaders pass'. Icy road conditions south of this area, and road closures to the north limited traffic over this week. Rather than passing, these caribou lay in beds beside the highway and fed nearby. (R. Armour photo)

Notes

[1] The Porcupine Caribou Management Board was formed in 1985 under the Porcupine Caribou Management Agreement. This co-management agreement is between the Federal Ministries of Environment and Indian Affairs and Northern Development, the Government of Yukon, the Government of the Northwest Territories, the Council of Yukon Indians (now Council of Yukon First Nations), the Inuvialuit Game Council, the Dene Nation, and the Métis Association of NWT. The Board is an 8-group organization whose membership is mandated to include an equal number of first nation and other representatives. They meet 2 or more times a year to advise governments and to facilitate communication among parties involved in management, including user communities. The roles and relationships of this Board and its international sister board, are described in the 1998 dissertation *The Costs of Community Involvement in Canadian Porcupine Caribou Co-Management,* by Gary Kofinas, University of British Columbia.

[2] *Nank' kak Geenjit Gwich'in Ginjik- Gwich'in Words About the Land* is a 211 page book published in 1997 by the Gwich'in Renewable Resource Board. It is available from grrb@inuvik.net. A second 322-page report in 1999 by Erin Sherry and Vuntut Gwitchin First Nation is called *The Land Still Speaks- Gwitchin Words about Life in Dempster Country*. It is available from Vuntut Gwitchin First Nation Lands and Resources Department, Box 102, Old Crow, Y0B 1N0. Chapter 4 Management Relations: Community and Caribou, in the PhD thesis completed in 1998 by Gary P. Kofinas, University of British Columbia, provides a useful summary of these issues and the management of this herd. The thesis title is *The Costs of Power Sharing: Community Involvement in Canadian Porcupine Caribou Co-Management*.

[3] Assessing the effect of these disturbances typically requires measuring the responses of identifiable animals to particular disturbances. Marking animals so that they can be monitored might change their behaviour or they may migrate elsewhere away from the road. The high variation in behaviour between years and between individuals could make this expensive and fruitless. Typical studies have people with stopwatches carefully looking from a distance at other people approach groups of caribou. When the caribou stop what they are doing and look at the approaching person, the time is recorded and the approaching person drops a stick. When the caribou start to move, the time is recorded and another stick is dropped. When the person reaches where the caribou were, a stick is dropped. This continues. Later the location and distance between sticks is measured. This allows calculation of how close people could approach groups of different composition and in different areas before the caribou showed signs of nervousness, and how far and fast the caribou moved away. These studies have been done recently in Newfoundland and for many years in Scandinavia. See the 2001 paper by S. P. Mahoney, K. Mawhinney, C. McCarthy, D. Anions and S. Taylor, called *Caribou Reactions to Provocation by Snowmachines in Newfoundland*, in Rangifer 21(1):35–43. There are many analyses and proposals related to disturbance and hunt management of Porcupine and Hart River caribou on the Dempster Highway available from Dorothy Cooley, Northernern Regional Biologist, Fish and Wildlife Branch, Box 600, Dawson City, Yukon Y1A 1G0.

[4] More information on caribou migration can be found in *Local Caribou Availability*, a report from Community Involvement Phase 1 of the NSF Community Sustainability Project, by Gary Kofinas and Steve Braund (1998), available at http://www.taiga.net/sustain/lib/reports/availability.html . See also Doug Urquhart's 1986 report to the Yukon Government Department of Renewable Resources called *The Status and Life History of the Porcupine Caribou Herd (1983).*

[5] Morgan, D.L, 1998. *Focus groups as qualitative research*. Newbury Park: Sage Publications.

[6] M. B. Miles and A. M. Huberman. 1994. *Qualitative Data Analysis 2nd Edition*. Sage Publications contained much useful information on the ethics and procedures that were appropriate to draw inferences and conclusions from this quote-style information.

[7] This 2001 file report, *Profiles of Dempster Caribou Hunters*, by Barney Smith and John Russell used a collaborative approach to create fictional narratives self-describing various types of hunters. Conservation officers with decades of experience intercepting and interviewing hunters on this highway reviewed drafts of the emerging narratives, adding text, and arguing until the draft best reflected their perceptions of these groups.

[8] Composition and other details of the focus groups.

Group	Size	Facilitator	Composition	Location	Hunt methods
A	2	Cunningham	FN, 1 man, 1 woman Ages 40–50	Dawson	No snow machine
B	2	Cunningham	Non-first nation. 2 men, Ages 40–55	Dawson	No snow machines
C	5	Cunningham	Non-first nation. Ages 40–55	Whitehorse	No snow machine
D	3	Cunningham	FN, men. Ages 35–40	Whitehorse	Snow machines
E	6	Cunningham	Non-first nation, men. Ages 30–60	Whitehorse	Snow machines, walk, half seek large antlered bulls
F	2	Smith	FN, men. Ages 30–40	Dawson	Snow machines
G	4	Cunningham	Non-first nation, 1 woman 3 men Ages 30–50	Dawson	No snow machine
H	5	Cunningham	FN men. 2 elders Aged 60–70, others aged 35–40	Ft. McPherson	Snow machines
I	5	Cunningham	FN men. 2 elders Aged 60–70, others aged 35–40	Ft. McPherson	Snow machines
J	5	Cunningham	FN men. 2 elders Aged 60–70, others aged 35–40	Ft. McPherson	Snow machines

[9] Ft. McPherson participants received honoraria.

[10] Analyses of the transcripts revealed additional topics that we would like to explore with hunters in future focus group sessions including:

a) *What if* questions where the caribou are between the shooter, snow machine, and other source of stress and the highway. In all our situations, both the stress and the highway were on the same side of the caribou.
b) Thresholds – how close can a snow machine get in late October, mid November, mid December, mid March before the caribou run? (guidelines for snow machine use).
c) Difference if the hunting scenario were on the west versus east side of the highway during migration. (Option to hunt only on the lee side of the migration).
d) *What ifs* that addressed a group being approached and losing members to hunters several times in one day. It's hard for hunters to know the experiences of the particular caribou they are hunting.
e) *What ifs* where calves with cows were stressed, noting the behaviour of the calf.
f) *What ifs* where the terrain was more varied, for example glacier ice, burns, draws, and steep slopes.
g) *What ifs* involving multiple hunting parties that were less than one kilometer apart. (Possible future option to limit number of hunters afield – permits, etc.).
h) Meat quality of bulls, by antler size, rutting behaviour, and by week,
i) Thresholds in hunter density or behaviours that would lead them to seek another site to hunt,
j) Video-based interpretation of behaviour within a caribou group, looking at how leaders lead.
k) Predictions of responses by hunters to a variety of situations involving hunter densities and behaviours, viewing, and alternate policies and regulations.

[11] The selection of scenarios is important. By using real sites well known to the hunters, their responses are specific in relation to the terrain and vegetation, but this can bias the sites chosen to those where the hunters can see the caribou from the road (and where the caribou can see the vehicles on the highway).

For example in our analysis we realized we had no scenario in which the caribou were forced to choose between fleeing past a group of hunters or the road, they always could flee away from the road and the hunters. Also, most of our situations allowed the caribou to go over a hilltop out of sight, so we were concluding that caribou flee uphill. This situation also limited estimation of what the caribou did when they were out of sight. It can be difficult to find hunters who know a range of locations and who have been there close to caribou during several months in the autumn.

[12] In retrospect it is important to specify wind direction on the flipcharts as some hunters may wish to orient their prediction on which way the caribou run in relation to the direction of the wind.

[13] Del Klassen, an intern with a geography degree who had grown up in the area attended one session, did a process review, prepared a transcript, and then methodically went through the transcripts selecting quotes for a data sheet on effects. Smith and Cooley also separately completed the data sheets. Most of the quotes we selected were the same, but there were some that were different and we had some discussions about what the hunter was saying. This work takes people with good attention to detail, and should not be done for hours at a time. Wide margins on the transcript are useful for notes. It would be useful to include a community member with interpreter skills, and to do some follow-up questioning in a few cases where meanings are unclear (e.g. there were so many pronouns in the quote we could not tell if "they" referred to caribou or hunters). In retrospect it would have been useful to involve Gary Kofinas in this work, given his experience with these communities, caribou hunting, and experience with interpreting meaning from individual and focus group transcripts with Gwich'in hunters.

[14] See the Yukon Fish and Wildlife Branch 2001 File Report by Barney Smith and John Russell called *Profiles of Dempster Caribou Hunters*. These are written as fictional narratives from the perspective of an individual in a group and are based on the knowledge of conservation officers who intercepted hunting parties they encountered on the highway during their patrols over the past decade.

[15]

Process pattern seen in transcript	Comment	Next time
Cutting people off too soon. Finishing people's sentences	Seen occasionally in the McPherson transcripts. This was not apparent in the meeting.	Need to discuss "How am I going to know you are done?" at the outset and to ask people if they are finished speaking. Allow more silence.
Inexperienced participants	In some groups it was very hard to locate individuals with enough experience to include, yet their perspectives were important	Modify scenario until it is suitable. Make sure participants know they should not go beyond their experience. Don't worry about small groups.
Individuals who did not show up	About half the FN participants expected in Dawson showed up. Some drove by outside but did not come in.	Talk to people about how we might have made the session more comfortable for them.
Pronoun use by Gwich'in speakers was confusing in transcript.	While it was obvious what the pronouns *he*, *it* and *they* meant in the sessions, it was hard to follow in the transcript if *it* was the caribou or the hunters "going around that way".	Paraphrase more or perhaps have a video camera to record hand movements. Involve translator more. Biologists ask questions to clarify.

Elders scolding or chiding younger FN participants	Younger hunters have much to say about realities of current situations and how they respond to pressures they face as meat gatherers for their community. It was not helpful where they were told they have it easy compared to the old days, or that they should use practices that are not efficient.	Avoid mixed age groups Make rules regarding scolding
Inappropriate scenarios	Analysis becomes more complex as more columns added to make situations realistic. We underestimated the sophistication of group hunting methods.	Have hunters build the initial scenarios. Participate in some hunts before the session.
Tapes took much longer to transcribe than we expected	This delayed the analysis. We could not build the analysis table from the transcripts as we went along.	Have dedicated trained transcribers lined up. Build a draft table based on notes kept at meetings.
People find process hard to understand until they observe it.	Individuals who observed the process believed it was useful.	Arrange for users of the information to be observers of the process and participants in discussions after coffee break.
Participants trying to steer discussion so that focus group results would promote a preferred agenda	Obvious to facilitator when participant is using process as a platform	Provide opportunity for participant to make their points in the agenda, and commit to include in summaries. Reduce incentive to steer discussion.

[16] Hunters often used the scenario technique on the conservation officers! They would probe how the conservation officer would behave under various combinations and degrees of infractions. “Well suppose you came across someone who was…” [Maybe this research approach came into our heads after hearing, so many times, the way that hunters probe the behaviour of enforcement systems…]

[17] One individual in one group was concerned that the information might be used against the community’s economic development agenda. We stopped the tape and discussed the issue and the proposed report to PCMB. The individual was comfortable with this and we continued.

[18] Eight of the 39 individuals were FN elders, but this was the only quote in the 10,000 lines of text that reflected this view of caribou. However, the sentiment may have been widespread. Certainly the elders were unhappy with most of the roadside hunting behaviours and scolded the younger hunters. In this case the elder appeared to be getting frustrated with the facilitator’s efforts to look at one change at a time. The 3 Fort McPherson focus group participants were grouped by family; it may be better to group by age. The process of predicting what the caribou would do, particularly at the start of the session, may be so engaging to hunters that it may not be until later that they reflect back on the view that caribou would not even have been there in the first place making themselves available to the hunters had the individual hunters not been respectful people.

[19] This is a good example of how the research is modified with subsequent groups as qualitative understandings and new questions emerge. This approach to learning sacrifices what may be perceived as authority in the design based on increasing sample size that a researcher might be looking for where the groups all were treated in an identical fashion. Some of the research has to remain unchanged, but the focus group process is designed to probe qualitative understandings and to reach further. The

important learning from this departure from the method used in the first 5 sessions was that 1) we had missed the posture where the caribou twists and raises its front feet off the ground, 2) that the rear leg split posture where the caribou urinates is interpreted usually as a lower level reaction by hunters than biologists (possibly because the urination is not seen), and 3) the relative level of reaction and words the groups had been using were generally quite consistent with those used by Dempster caribou managers. We had to probe language, meaning, and interpretation.

[20] In future studies it may be useful to ask participants to rank the relative degree of disturbance on a 1 to 10 scale. This would allow calculating of averages between groups.

[21] It is hard to gauge average behaviour of a group when individuals might be walking, bedded, grazing, or standing watching you. In our work with conservation officers, estimation of the percentage that were bedded, for example, was possible, and may provide a way in the future for groups to describe the diurnal and other activity patterns of a group.

[22] This high level of significance was obvious from the hunters' comments and from the review of the statements. They would interrupt and say "Had the caribou been shot up before?" or "Had these caribou just reached the highway for the first time?" followed by "Oh well, in that case…". This was clearly the biggest effect that hunters used to explain the differences in initial caribou reactions they termed as *spooked* or *wild*.

[23] We predicted that wariness would be on a gradient, not an either/or characteristic (spooked versus wild) as hunters seemed to be indicating. But after we explored this with one group we concluded that hunters might not see 'middle range' behaviours. That is the transition from bush to spooked may be very rapid (one exposure to chasing by a machine or a day or 2 of heavy hunting). As well, any group that contains a caribou that looks ready to flee might not be worth stalking. We attempted to get one focus group to sort various reactions by caribou to people along a wariness gradient (see Table). In this wariness gradient, "0" indicated no fear or response, and "10" indicated caribou so wary that they avoided the highway. Two hunters in one Dawson focus group sorted these behaviours written on cards along a 5-meter gradient line. The hunters had no difficulty with the ranking.

Caribou response behaviours sorted by hunters along a wariness gradient

Behaviour	Wariness ranking (0 to 10)
When you let your foot off the gas they are already running	7 or 8
Walking in a line parallel to the road, 300 yards away	1 or 2
Spending time in trees during the day	2 or 3
Crossing or travelling on the road at night, not during day	6 or 7
Caribou panting and running in a big circle	Not ranked
Group approaching highway, turns and crosses later down the road	6 or 7
Hiding behind tree of bush, using trees or shrubs as cover	Not ranked
Line of walking caribou splits I middle and 2 groups go different ways	2 or 3

The prevalence of rankings at 2 and 7 confirmed the earlier impression that hunters viewed caribou wariness to people as being strongly bimodal, that is the caribou are either 'wild' or 'spooked'. However, it could be that hunters' use of these terms might be in relation to perceived bimodality in the probable success of a stalk. We would also likely see strong bimodality if there was a very fast transition between wild and spooked - hunters and CO's told us that caribou get spooky within 2 or 3 days of heavy hunting.

[24] In real-life undisturbed situations, defining what is a group in a "lined out"' migration stream, or in a loose aggregation of clumps (or sub-groups?) of feeding or rutting caribou is less clear. In the latter case, the caribou in one "small clump" (subgroup) probably gain the benefits of increased vigilance from being part of a loose, aggregation of clumps, even if it is moving. Similarly in real-life *disturbed* situations where these aggregations of clumps fragment into small dispersed, independent groups of 1 to 7 caribou, they may lose these advantages. The patterns of caribou behaviour in various forms and sizes of aggregations

were not explored in detail with hunters. However, hunters knew of the variations in these aggregations, and these variations may be important to look at in predicting caribou response in future scenarios.

[25] Hunters understood that caribou wanted to be near other caribou, where they could see other caribou, and where they could benefit from other caribou finding abundant forage and detecting danger. We worry about circular thinking however, where a) smaller groups are more nervous, b) heavy hunting tends to fragment larger groups into smaller groups, c) small groups are more nervous because they have been hunted before, d) a large proportion of small groups may be a result of previous hunting exposure, and so on. Don Russell (Canadian Wildlife Service biologist, personal comm) did not notice any differences in caribou group sizes in on and off groups measured in the winter timed activity budget measures close to and away from the highway, and Brian Horesji (according to Don) never measured a difference in reaction based on group size based on his limited sample of vehicle interactions.

[26] Hunters and caribou use trails that go where they want to go, particularly through forested areas. There are thousands of cut lines in the Porcupine caribou herd winter range. Don Russell and Rick Farnell (caribou biologist, Yukon Dept. of Environment) don't think that the seismic lines direct migration or that caribou avoid the lines as woodland caribou do in Alberta. If the line is going in the right general direction, caribou will follow it. If the line is perpendicular to the movement, the caribou will cross it and keep going.

[27] Conservation Officers believe that more caribou are crossing this highway at night than in previous years.

[28] The question associated with this is "Have you ever watched a group of caribou that were intending to cross the highway when various vehicles were going by and the caribou did not know you were there?" In all of the scenarios, the hunters were between the caribou and the highway, so the caribou would be reacting to both, assuming they had detected the hunters. To watch both the caribou and the vehicles on the highway for an extended period undetected by the caribou would be difficult.

[29] One reviewer was surprised at how few comments on weather we received. We queried the hunters about wind speed, wind direction, cloud/fog, and heavy snowfall that might make it hard for caribou to see. We did not discuss rain or freezing rain events, hot weather, or smoke from forest fires. Gary Kofinas and Stephen Braund discuss a variety of weather related driving variables that influence caribou availability to communities in their 1998 paper, *Local Caribou Availability:* A Draft Report from Community Involvement Phase 2 of the NSF Community Sustainability Project, available at http://www.taiga.net/sustain/lib/reports/availability.html .These understandings came from focus groups and interviews in 4 communities in the Porcupine Caribou Herd range between 1993 and 1998.

[30] Gwich'in hunters described the concept of caribou leaders in many roles and many types of caribou. The concept of human leaders and leadership in Gwich'in culture is broadly rooted in ethics and relationships. In a culture where it is inappropriate to interfere with or confront people, where people have special gifts to know animals, and where individuals learn by watching and later doing, leadership within and between groups of caribou would be expected to be perceived in ways that may not be easily described or understood by individuals from cultures that perceive leadership in other ways. Gary Kofinas discusses this in Chapter 4 of his dissertation *The Costs of Power Sharing: Community Involvement in Canadian Porcupine Caribou Co-Management*, University of British Columbia.

[31] It may be also useful to talk of the tendency for individual caribou to want to follow, until some situation pushes them into the front or lead, and all the other animals then choose to follow them. There may be much communication going on in a group that is based on scent, sounds or postures that humans are not detecting. These could govern the collective behaviour of a group, but to a human viewer it may appear as if the animal in the front of the group has made a decision. Although we frequently queried focus group participants about the qualities, behaviour, age and sex of "leaders", we heard a wide range in responses from both first nation and other hunters. Not withstanding this, all participants like the concept of a leader, and supported delaying hunting to allow the leading caribou groups to cross the highway.

[32] Future scenarios should examine what if one or two wolves were seen approaching the group.

[33] This study on wolf ecology on Yukon's North Slope is summarized in a 30-page presentation at http://www.taiga.net/wmac/wolf/index.html .

[34] Average annual sighting rate per respondent from Dempster Highway Visitor and Caribou Hunter questionnaire, 1996–2000. Range is 8 to 24%. This information is summarized in annual *Dempster Highway Traveler Questionnaire* file reports. We had speculated that the elevated road surface and presence of gut piles near the highway may have increased wolf activity near the highway in some situations, but hunters predicted the opposite. Patrollers and researchers see tracks and wolves feeding on gutpiles on the highway more in March than in November, and believe that wolves are probably more nutritionally stressed in late winter than early winter.

[35] Some of the statements were reversed so as not to lead the groups, that is, expressed in a way that the expected answer would be negative.

[36] See also the 1999 book *The Land Still Speaks* by Erin Sherry and Vuntut Gwitchin First Nation, pages 287–291, for additional quotes and ideas on this topic.

[36] We are thinking here about the inability of hunters and researchers to sense odours of blood and viscera the way a caribou might, or machine-related smells that may be more concentrated near and upwind of the highway. As well, we cannot know the previous experiences with predators or exposure to hunting that a particular group may have experienced.

[37] M. B. Miles and A. M. Huberman. 1994. *Qualitative Data Analysis 2nd Edition*. Sage Publications contained much useful information on the ethics and procedures that were appropriate to draw inferences and conclusions from this quote-style information.

[38] See Chapter 3 Arcadia in Julie Cruikshank's 1998 book *The Social Life of Stories: Narrative and Knowledge in the Yukon Territory*, UBC Press, Vancouver**.** Also Paul Nadasdy's 1999 paper *The Politics of TEK: Power and the "Integration" of Knowledge,* in Arctic Anthropology 36 (1–2): 1–18.

Appendix 1. Maps showing Dempster Highway and locations of scenarios.