

**Technical Report
Paramount Cameron Hills Extension
Developers Assessment Report (EA03-005)**

Submitted to: Mackenzie Valley Environmental Impact Review Board

Prepared by: Resource, Wildlife and Economic Development (Wildlife and Fisheries)

Summary of Recommendations:

- The status of boreal caribou and boreal caribou habitat in the Cameron Hills should be considered as uncertain and of concern. Existing and future requirements of federal and territorial species at risk legislation highlight the need to address these uncertainties and ensure effective mitigation of development activities.
- Baseline data deficiencies and uncertainties in cumulative effects predictions for boreal caribou should be addressed through a cooperative multi-party working group. The GNWT is willing to work with Paramount to establish a Deh Cho Boreal Caribou Working Group with the inclusion of aboriginal participation.
- Efforts need to be taken to minimize the amount of additional linear development in the area until a clearer picture of boreal caribou status and habitat is obtained. In particular, linear developments that provide predator access to large areas of boreal caribou range over a long period of time.
- A Boreal Caribou Range Plan for the Cameron Hills area should be prepared. This plan should include details of monitoring and mitigation (including application of best practices and habitat restoration) and be consistent with NWT Recovery Planning for boreal caribou.
- Development and implementation of a Boreal Caribou Range Plan could be included as part of an Environmental Agreement.

Introduction

The Wildlife and Fisheries section of the Government of the Northwest Territories (GNWT) Department of Resources, Wildlife and Economical Development (RWED) is pleased to offer the following technical comments to the Mackenzie Valley Environmental Impact Review Board (MVERIB) on the Developers Assessment Report (EA03-005) for the Paramount Cameron Hills Extension. The mandate of the Wildlife and Fisheries program of RWED is to manage the wildlife resource in the NWT and related programs and policies.

We have conducted a technical review of Paramount's Developers Assessment Report (DAR) and related information requests. Our emphasis is on boreal caribou, their habitat and their predators.

The Wildlife and Fisheries program of RWED serves in this assessment as both an expert adviser and a regulator. The comments included here are offered in our departmental capacity as an expert advisor, except where it is specifically indicated otherwise.

Responses to questions posed to the GNWT on February 18, 2004 at the Public Hearing held in Hay River are provided in Appendix I. In response to the request by the MVEIRB on February 19, 2004 to provide information on GNWT boreal caribou research in the South Slave Region, an update has been partially included Appendix I. Copies of a landscape level draft report by Gunn et al has been provided separately to the MVEIRB. Copies of project descriptions for the South Slave boreal caribou research study and new research that will commence in late winter 2004 in the Trout Lake area has been provided separately. Draft reports of the first year of research in the South Slave will be available in spring 2004.

1. Issue: Boreal caribou designated as Threatened species under the federal Species at Risk Act (SARA)

Developer's Conclusions:

No statements are made by Paramount regarding implications of SARA for the Cameron Hills Extension.

Our Conclusion:

The full legislative requirements associated with the Federal *Species at Risk Act* (SARA) will come into effect on June 1, 2004 and Territorial Species at Risk Legislation is being drafted. RWED contends that measures need to be taken to comply with anticipated legislated requirements to contribute to the conservation of boreal caribou and their habitat in the NWT.

Our Rationale:

In 2001, boreal caribou were assessed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). SARA was passed by Parliament in 2002 and the 233 species assessed by COSEWIC including boreal caribou, were identified in Schedule 1 of the Act. With the Act coming into partial force in June 2003, boreal caribou were listed as a threatened wildlife species at risk under the Act. In June 1, 2004, when the Act comes into full force, it will be an offence to kill, harm, harass, capture or take an individual of a listed threatened or endangered species; possess, collect, buy, sell or trade an

individual of a listed threatened or endangered species, or its parts or derivatives; or damage or destroy the residence of one or more individuals of a listed threatened or endangered species. These prohibitions apply immediately to all listed aquatic species and their habitats, listed migratory birds protected under the Migratory Birds Convention Act, and all listed species on land under the authority of the Minister of the Environment or the Parks Canada Agency.

The GNWT is expected to provide similar protection to any federally listed threatened or endangered species that occurs in the NWT. If the laws of the NWT do not effectively protect a listed species, the federal government must step in and, by Order in Council, apply the prohibitions everywhere in the NWT where there is no effective protection.

SARA also includes provisions for the identification and protection of critical habitat for listed threatened and endangered species through recovery planning.

SARA requires that federal recovery strategies for threatened species on Schedule 1 be prepared by June 5, 2007. A recovery strategy sets out population goals and objectives, broad approaches to respond to known threats to the survival of the species, identifies critical habitat if possible or identifies studies required to define critical habitat, and establishes time lines for the preparation and completion of action plans. Recovery measures are not to be postponed in the lack of full scientific certainty, but rather data deficiencies are to be addressed in the recovery strategy.

Once a recovery strategy is finalized and included in the public registry, it automatically becomes an offence to destroy any part of critical habitat identified for a listed endangered or threatened species. This prohibition applies on all federal land, including unoccupied Crown land.

The intent is for each Canadian jurisdiction to develop legislation complementary to the federal law to protected listed species. The GNWT is currently drafting a Species at Risk Legislation for the NWT. The proposed legislation would include the same prohibitions to protect individuals of a listed species, their residences and the critical habitat identified in a recovery strategy.

GNWT will promote conservation of boreal caribou by highlighting legislative requirements associated with SARA and the protection of boreal caribou and their habitat that will soon come into effect on June 1, 2004. Therefore, RWED recommends that preventative measures be taken to comply with future legislated requirements to contribute to the conservation of boreal caribou in the NWT. RWED also recognizes that caribou conservation depends on consultation with and involvement of aboriginal people.

Section 79 of SARA states that:

Any projects requiring an environmental assessment under federal law that are likely to affect a listed species or its critical habitat need to identify the adverse effects, and, if the project goes forward, steps must be taken to avoid or lessen those effects and to monitor them."

RWED had identified deficiencies in Paramount's description of predicted effects and identification of critical habitat for boreal caribou. RWED is concerned that Paramount's proposed mitigation and monitoring is insufficient based on the detail provided and in comparison with adaptive mitigation practiced in northern Alberta and northeast British Columbia. RWED is aware that mitigation has to be results-based rather than too prescriptive to ensure adaptation to local conditions. RWED does, however, require detail on possible mitigation (such as but not restricted to shape and size of drill sites; cut line widths and orientation, placement and use of ice roads and pads). RWED acknowledges the progress on mitigation offered through MVEIRB's listing of good environmental practices in its Draft Preliminary Screening Guide for Seismic Operations.

Adaptive monitoring and mitigation will require shared knowledge and experience both locally and from elsewhere. RWED is concerned that Paramount has not taken advantage of opportunities to develop partnerships to effectively avail themselves of local knowledge and expertise. For example, while Paramount is a lead contributor to caribou research in Alberta (IR 1.2.7), to date through discussions with their community liaison person in Hay River, Paramount has not offered to participate in boreal caribou research in the South Slave Region (we acknowledge that Paramount has confirmed provision of incidental logistical support such as use of their airstrip and camp if RWED happens to be operating in the general area).

In Alberta, Paramount is required to develop a Caribou Management Plan for its operating areas to the Alberta Energy and Utility Board (INFORMATIONAL LETTER IL 94-22 14 November 1994 OPERATING GUIDELINES FOR INDUSTRIAL ACTIVITY IN CARIBOU RANGE - NORTH-WEST ALBERTA). Paramount has not indicated that it produces a similar plan for its NWT operation area. The Cameron Hills is an extension of their Alberta operations and the Alberta/NWT share caribou herds and caribou range. Paramount has indicated that it is a confidential document and cannot release its Alberta plan.

Paramount, however, has indicated in IR 1.2.7 that it will assist in the collection of accurate data in all areas where it conducts its activities. RWED wishes to see a mechanism for this proposed commitment and has agreed to cooperate with Paramount.

Recommendations:

- Given existing and future requirements of federal and territorial species at risk legislation, a process needs to be established to address uncertainties in the status of boreal caribou and their habitat in the Cameron Hills and ensure effective mitigation of development activities.
- Paramount should support and participate in a Deh Cho Boreal Caribou Working Group. Discussions are currently underway with the Alberta Cooperative Conservation Research Unit (ACCRU) based at the University of Alberta on ways to coordinate joint boreal caribou research and management programs through ACCRU. The Working Group would include representation from Deh Cho communities, RWED, industry and ACCRU. Alberta's Boreal Caribou Committee is a useful model, which consists of government, industrial, and academic partners working together to integrate industrial activities in northern Alberta with the conservation of caribou and caribou habitat. A multi-partner funding partnership would be established for the Working Group and research. The Working Group will work within NWT Recovery Planning for boreal caribou and would:
 - Develop a boreal caribou range plan for the Cameron Hills area. The range plan would develop local strategies for remedying deficiencies in baseline, and, as well develop adaptive mitigation strategies. Range plans will identify the current status of habitat and boreal caribou population trends to provide specific direction towards developing and monitoring thresholds of human and natural disturbances. Additionally, these plans will describe methods and priorities for habitat restoration.
 - Develop a monitoring system to measure changes in boreal caribou population status, recovery of altered habitats and number and distribution of predator levels in relation to altered habitats.
 - Identify and justify the identification of critical habitat in the Cameron Hills.
 - Develop specific adaptive mitigation including restoration and remediation practices that will, within specified timeframes, reduce the effects of habitat changes on boreal caribou (such as reducing the attractiveness of cut lines and other linear developments as travel routes for predators).
 - Develop a research program to determine vegetation recovery patterns for various types of disturbance activities across different habitat types.
 - Develop a cumulative effects model for the Cameron Hills and surrounding area to identify target levels for human and natural disturbance that permit use of natural resources but with acceptable levels of risk to boreal caribou.

2. Issue: Inadequate baseline information

Developer's Conclusions:

Section 6.2.9. of the DAR states that "sightings of all varieties of big game, fur bearers, and birds has not indicated a decline in populations". Page 216 of the DAR states that "Although the Cameron Hills appears to have good quality habitat, there are few caribou within the Cameron Hills."

Our Conclusion:

The baseline information is inadequate and uncertain. Paramount's conclusion raises the question that if there is good quality habitat, why are there few caribou? Possible answers include inadequate baseline on caribou numbers, predation or cumulative effects from existing level of development. Paramount has not collected baseline information to adequately distinguish between those potential answers. Information is inadequate to assess boreal caribou abundance or population trends.

Our Rationale:

Paramount's wildlife observation system cannot be used to assess boreal caribou abundance or population trends in the area; it can only be used to document the presence of boreal caribou. Even if Paramount staff never see boreal caribou, this would not allow Paramount to claim that boreal caribou were not present in the Significant Discovery Licence (SDL) without doing extensive survey work throughout the year, as it is much easier to demonstrate presence than absence. Consequently, Paramount does not have any information to assess impacts from their past, current or future activities on boreal caribou populations. While the GNWT notes that Paramount has an employee wildlife observation system which does provide basic location information to map boreal caribou occupancy in areas frequented by employees in the Cameron Hills, the system should be improved through the completion of specific details on geographic location, sex and age of caribou, response to disturbance, etc. The GNWT acknowledges that, during the Public Hearing Paramount, indicated an intent to improve in the information collected and committed to include additional relevant information of interest to the GNWT.

Wildlife observations in the DAR clearly indicate that Paramount consultants, staff or contractors have regularly observed boreal caribou and/or sign in the southern part of the SDL since 2000 including significant numbers in December 2003. Paramount acknowledged significant caribou habitat in the SDL along the NWT/Alberta border. Boreal caribou range in the Cameron Hills area extends south into Alberta to the Caribou Hills, which is a known range for boreal caribou.

However, Paramount instead used RWED reports (Gunn et al. 2004, Colosimo 1968, Lines 1969) to substantiate low boreal caribou numbers in the Cameron Hills. In 2002, RWED used traditional knowledge and an aerial survey to develop

and test a habitat model in cooperation with Deh Cho First Nations (Gunn et al. 2004). The survey collected sightings of boreal caribou but was not designed to estimate caribou densities. Colosimo (1968) and Lines (1969) used aerial transects to record wildlife and wildlife sign but boreal caribou are difficult to spot from the air and in dense black spruce stands it is even hard to see their tracks; therefore, the issue of sightability underestimates the number of boreal caribou obtained from aerial surveys. It was also noted in Colosimo that a forest fire had occurred in the Cameron Hills. It can be assumed that regeneration of habitat has occurred in the intervening 30 plus years but was not acknowledged by Paramount.

The GNWT also notes that Paramount's baseline information does not fully take into account what is known about boreal caribou ecology. Typically, boreal caribou are scattered in low numbers across large areas. Research in the provinces has emphasised that boreal caribou require large areas to reduce their exposure to predators, namely wolves and black bears.

Paramount's baseline does not include information on whether boreal caribou are likely increasing, decreasing or stable in abundance. Consequently, Paramount is not able to monitor the population's response to any environmental changes. In Alberta, for example, the approach established by the Boreal Caribou Committee to determine population trend is to monitor adult cow and calf survival. This is also one of GNWT's recommended approaches to determining status. Other indicators to longer-term status include, for example, comparing current occupation with potential habitat.

Recommendations:

- The status of boreal caribou in the Cameron Hills should be considered to be uncertain but also of concern.

3. Issue: Under-estimating boreal caribou habitat changes

Developer's Conclusions:

Paramount used a Habitat Suitability Index (HSI) model to evaluate boreal caribou habitat availability in the Terrestrial Study Area (TSA) and predict the effects of each of the development scenarios on wildlife habitat quantity. The HSI model for boreal caribou used for the Cameron Hills Extension was developed using habitat rankings from previous environmental impact assessments, incidental field observations, literature review, review of secondary information and professional judgement by experienced biologists.

Our Conclusion:

HSI models are a relatively common approach used in environmental assessments but their predictive value depends on the information used

especially a clear understanding of habitat requirements. The HSI model used by Paramount to model year-round boreal caribou habitat availability does not adequately reflect the range of habitats used by boreal caribou in the NWT. This observation is based on preliminary data analysis from boreal caribou habitat use in the Inuvik region (J. Nagy pers comm. 2004) and on-going boreal caribou research in the area surrounding the Cameron Hills. Both studies indicate that boreal caribou in the NWT use a wider range of habitat types in the summer, fall and early winter months than described in previous boreal caribou projects in Alberta. Therefore, Paramount most likely underestimates the availability of year-round boreal caribou habitat in the Cameron Hills Extension and thus may underestimate the amount of impact to boreal caribou habitat.

Our Rationale:

The HSI model used by Paramount, as clarified in IR 1.2.10, was used to assess the availability of year-round habitat. Four level of habitat suitability were used (nil = 0, low = 0.33, moderate = 0.66 and high = 1.0) to rate vegetation types. In Alberta, boreal caribou extensively use and select peatlands over uplands at multiple scales (Bradshaw *et al.* 1995, Stuart-Smith *et al.* 1997, Anderson 1999). This pattern of lowland use in combination with lichen-rich stands of black spruce appears to be common to boreal caribou. In Saskatchewan, female caribou selected black spruce-dominated stands through out the year and patterns of daily area use were largely the same as seasonal range selection (Rettie and Messier 2000). Accordingly, black spruce habitats associated with lichen were rated as high in the HSI model. However, other habitat types such as herbaceous, herbaceous wet, herbaceous with shrubs, shrublands, white spruce mature closed, aspen mature closed, burn are rated as nil or low even though preliminary data from the NWT indicates contrary results.

Based on observations of radio-collared animals in the NWT, lichen-based habitats primarily associated with black spruce bogs are also important to boreal caribou in the NWT. In contrast to studies south of 60° N, boreal caribou in the NWT, however, appear to use a greater variety of habitat types, especially during the summer, fall and early winter months. Based on observations of radio-collared animals throughout the NWT, boreal caribou have been seen to use non-peatland habitats such as grass and shrub-dominated fens, mature upland white spruce and jack pine stands, mature mixed wood forests, mature aspen stands, windswept ridge lines, shrublands associated with late fire regeneration and young burns usually less than 10 years old (J. Nagy pers. comm. 2004, A. Zimmer per comm. 2004 and D. Johnson pers. comm. 2004, Gunn et al. 2004). Non-peatland areas are for the most part intermixed with black spruce bogs to form a complex landscape mosaic; therefore, these areas may be used incidentally or actively selected by boreal caribou (Schneider et al. 2000).

Greater variety in boreal caribou habitat use in the NWT may be reflective of a more diverse landscape found in the NWT; however, boreal caribou surrounding the Cameron Hills, which is similar to the boreal region of northern Alberta, have been observed to use non-peatland habitats especially during the summer and fall months. In IR 1.2.10, the GNWT asked Paramount to compare how the habitat in the Cameron Hills area compared to areas from which the HSI model was developed; however, Paramount did not provide the comparison.

Furthermore, RWED provided Paramount with a model that was developed to map boreal caribou occupation and occurrence (potential habitat) across the southern NWT. This study used traditional knowledge, aerial survey data and habitat mapping to conclude that boreal caribou in late winter (March) are strongly associated with black spruce and lichen on uplands and in lowlands. The study predicted that there was high quality boreal caribou habitat in the southern Cameron Hills (Gunn et al. 2004). While Paramount acknowledged the report in its DAR it did not indicate any use of it in its model development. (Note: RWED has provided this report to MVEIRB.)

Recommendations:

- Deh Cho Boreal Caribou Working Group to identify and justify the identification of critical habitat in the Cameron Hills.

4. Issue: Inadequacy of impact predictions for boreal caribou – Predation Risk

Developer’s Conclusions:

Paramount states based on professional judgement, that “predation risk to boreal caribou is low due to the low density of wolves and prey in the TSA”.

Our Conclusion:

Predation risk to boreal caribou as a result of oil and gas disturbance is underestimated by Paramount based on on-going RWED studies and published research in Alberta (James and Stuart-Smith 2000, James 1999 and Dyer et al. 2001). The characterisation that as wolf and caribou density are low, predation risk is low is a flawed ecological understanding. Put simply, even a ‘few’ wolves can have an effect on a ‘few’ caribou especially if habitat alteration changes the likely encounter rate between prey and predator.

Our Rationale:

The strongest research finding for boreal caribou across Canada, but especially well documented in northern Alberta, is the increased risk of predation on boreal caribou when their habitat is changed through oil and gas development or forestry. For example, in Alberta, James and Stuart-Smith (2000) found that

wolves travel three times faster on linear corridors (seismic lines and access roads) than in the surrounding forest, increasing hunting efficiency. Caribou mortalities attributed to wolf predation were closer to linear corridors than were locations from live boreal caribou, which suggests that caribou that live closer to linear features are at a higher risk of being killed by wolves. Therefore, high wolf use and higher predation risk are associated with utility corridors and roads. Predation, however, should be viewed as a proximate limiting factor for boreal caribou, as disturbances (human and natural) that affect predator-prey dynamics may be ultimately responsible for boreal caribou declines.

Paramount states that the risk of wolf predation is negligible due to wolf densities in the area. However, Paramount does not have any information to substantiate this comment. RWED's on-going studies indicate wolf and black bear predation is a factor in the relatively high death rate for boreal caribou in the South Slave regional study area, which includes the Cameron Hills.

Wolves are wide ranging species and, although moose populations are not high in the TSA, the area is in close proximity to productive moose habitats (e.g., west end of Tathlina Lake and flats to the east of the Cameron Hills), which appears to permit the establishment of higher wolf and black bear populations on a regional basis. Natural travel corridors such as rivers and adjacent cut blocks (the presence of older cut lines that lead into the Cameron Hills TSA is not known) provide access into the TSA and existing roads and utility corridors in the TSA allow predators to efficiently travel into boreal caribou habitat in the Cameron Hills and thus increase predation risk. Continued use of roads and utility corridors will prolong the time period over which access to predators is maintained.

Recommendations:

- Deh Cho Boreal Caribou Working Group to monitor baseline information on predator numbers and distribution especially relative to habitat alteration such as cut lines (black bears and wolves) in the Cameron Hills.

5. Issue: Inadequacy of impact predictions – Indirect Habitat Loss

Developer's Conclusion:

Paramount rated the magnitude of the indirect habitat loss as high for boreal caribou.

Our Conclusion:

The GNWT agrees that the magnitude rating for indirect habitat loss is high for boreal caribou; however, the GNWT feels that Paramount may have under-

estimated the quantitative assessment due to uncertainty associated with the zone of influence and disturbance coefficients.

Our Rationale:

The Zones of Influence (ZOIs) and Disturbance Coefficients (DCs) are based on research in northern Alberta under somewhat different landscapes (Dyer 1999). Thus the GNWT recommends caution in applying these parameters. Also, the GNWT recognizes that there are differences in the recent seismic lines in the Cameron Hills conducted by Paramount (avoidance type cutting) and seismic lines that apply to Dyer's report (conventional cutting). It is not clear, however, how much of the seismic lines in the TSA are low impact as avoidance cutting is not possible in dense stands or young stands. Given that Paramount has indicated that there is no merchantable timber and, therefore, likely few stands in which avoidance cutting would benefit, it is likely that avoidance type cutting still results in a cleared right-of-way in densely treed habitats. The GNWT suggests that Paramount provide an account of the types of seismic lines based on the stand types (height and density) impacted.

Based on Dyer (1999) and IR. 1.2.123, it appears that Paramount used professional judgement to determine the ZOIs and DCs to take into account seasonal variation and individual caribou variation in avoidance. The GNWT argues that using an averaging-type approach is not sufficiently conservative because we are dealing with a nationally threatened caribou. The GNWT believes that the maximum seasonal and higher individual boreal caribou avoidance effects should have been used to define the ZOIs and DCs for the model.

The GNWT notes that Paramount has refused to buffer the direct disturbance by 250 m as requested by the MVEIRB and has declined to do comparisons with results from boreal caribou populations in Alberta (IR. 1.1.30 and IR. 1.2.114). The GNWT supports the requirement for analysis that calculates the percentage of range within 250 metres of a linear corridor in order to compare linear corridor density in the Cameron Hills to linear densities and boreal caribou population trends to select boreal caribou ranges in Alberta.

Recommendations:

- Paramount should estimate the percentage of annual range within 250 metres of a linear corridor to compare linear corridor density in the Cameron Hills to linear densities and boreal caribou population trends for select boreal caribou ranges in Alberta.

6. Issue: Significance of Cumulative Effects on boreal caribou and critical habitat

Developer's Conclusion:

Paramount states that:

The Cameron Hills holds a modest level of wildlife. It is not critical habitat for any endangered species and the development is forecast to have no significant impact on wildlife.

Our Conclusion:

The cumulative effects of Paramount's operation and natural environmental changes could have an effect on boreal caribou populations and portions of the Cameron Hills may be critical habitat for boreal caribou. If the boreal caribou population in the South Slave Region study area is already declining, which is likely if adult female survival is as low as our preliminary data indicate, the population will be less resilient (i.e. more vulnerable) to any environmental changes especially those that could increase predation. In addition, current densities of linear features in the TSA are at a level, which are considered to result in boreal caribou population declines. GNWT has identified habitat with a high probability of boreal caribou occurrence in the Cameron Hills and has suggested that in the absence of more detailed information, habitat with a high probability of boreal caribou occurrence can be considered critical habitat.

Our Rationale:**Preliminary Boreal Caribou Data in the NWT**

The GNWT initiated research in the South Slave Region (which includes the Cameron Hills) to examine trend in boreal caribou numbers in response to concerns about the caribou. The objectives are to describe population trend by monitoring adult female and calf survival rates, map home ranges, predict high value habitats and examine habitat selection at a coarse scale. The intent of this project is to maintain VHF collars on a sample of 30 adult cows. Collaring in March 2003 deployed 17 collars and GNWT proposes in March 2004 to deploy collars in the Cameron Hills and other areas to uniformly distribute collars throughout the study area. However, due to the difficulty associated with deploying collars in new areas, it may take several years to achieve a uniform distribution of collars.

Preliminary findings (based on 1 year) are of concern. Of the 17 cows that were collared in March 2003; 4 cows were killed by wolves or black bears. This translates to an adult female survival rate of 0.77 (95% Confidence Limits 0.58 to 0.95).

The GNWT notes that results from this research are preliminary and indicate the need for further work. However, if the population is declining, which is likely if adult female survival is as low as the preliminary data indicate, the population

will be more vulnerable to any environmental changes especially those that could increase predation.

Other boreal caribou research in the Cameron Hills area includes GNWT's work in cooperation with the Deh Cho First Nations in 2002 to develop a landscape model to map boreal caribou occupation and occurrence (potential habitat) across the southern NWT (Gunn et al. 2004). In August 2003, the GNWT initiated a study to examine the recovery rates of lichen in lowland black spruce bogs following fires in order to model the effects of wildfire on boreal caribou winter range; data analysis is still in progress for this project. Adjacent to the Cameron Hills, 10 satellite-radio collars will be deployed on boreal caribou in the Trout Lake (west of the Cameron Hills) area in March 2004 to examine seasonal range use and movement patterns. In 2003 and 2004, aerial surveys were conducted in the Edehzhie and Trout Lake areas of the Deh Cho to refine the landscape model developed by Gunn et al. (2004) to map boreal caribou occupation and occurrence.

Density of Linear Features

The density of linear features for the Baseline Case (existing conditions plus what has also been approved) is approximately 3 km/km². This level is considered by biologists to be at the upper limit for the survival of boreal caribou based on research in northern Alberta where boreal caribou populations declined when total corridors are > 1.8 km/km² (see Table 1). Coarse analysis of human footprint and demography data for boreal caribou ranges in Alberta indicate there might be threshold for habitat effectiveness beyond, which caribou populations begin to decline (BCC 2001). McLoughlin et al (2003) found a relationship between functional habitat loss resulting from cumulative effects of natural (wildfire) and human disturbance and finite rate of increase for 6 boreal caribou sub-populations in Alberta. Human and natural disturbance was defined as the percentage of human footprint within a caribou range buffered by 250m on all sides and the percent area burnt by wildfire in the past 50 years, respectively. The amount of anthropogenic disturbance averaged 54% and although it varied considerably between populations, it was higher than the average percentage of burnt habitat (22%). Significant effects were found between population dynamics and levels of disturbance. The associations, however, are correlational and caution should be used in applying the results to wildlife management. However, this is a first attempt to identify thresholds of cumulative disturbance in boreal caribou ranges.

Table 1: Mean annual percentage population change data from Alberta boreal caribou herds and the linear corridor density and percentage of range within 250 m of lines. Note: all types of linear corridors included (e.g., roads, seismic lines, pipelines, etc.). Data from Dzus (2001) and Boreal Caribou Committee (2001).

Boreal Caribou Range	Mean Annual % Population Change	Linear Corridor Density (km/km²)	% of Study Area within 250 m of Linear Corridor
Caribou Mountains	-2.7	0.7	27.9
Cold Lake	0.0	0.89	38.6
West Site of Athabasca River	0.0	1.64	45.3
East Side of Athabasca River	-1.5	2.04	51.9
Red Earth	-3.1	1.8	55.5
Little Smoky	-10.8	2.4	70.2

Results in Table 1 need to also incorporate changes to boreal caribou habitat effectiveness through natural disturbances. Wildfires are a main agent of landscape level disturbance in the boreal forests that influences boreal caribou survival and their habitat. For example, there have been extensive wildfires in the Caribou Mountains and declining boreal caribou numbers are the cumulative effects of both the wildfire and human disturbances in the area. Consequently, cumulative effects assessment needs to model the impacts of both natural and human disturbances to boreal caribou and its habitat. The current assessment by Paramount does not adequately model wildfire impacts. Large fire events tend to occur at a regular cycle and this potential impact should be incorporated into the cumulative effects analysis.

In northeastern British Columbia, a tiered threshold system identified a critical threshold of 3.0 km/km², 1.8 km/km² and 1.5 km/km² for areas zoned for enhanced resource development, general resource development and special resource management development, respectively (Salmo et al. 2003). Through a Delphi process, caribou biologists in Alberta identified that at a threshold density > 3 km/km² above which boreal caribou populations are not sustainable (Salmo et al. 2003).

Current linear density levels in Paramount's Cumulative Effects Study Area are near or exceed preliminary threshold data from Alberta and threshold levels established for northeastern British Columbia. Furthermore, current linear density levels in the Cameron Hills are near or exceed these thresholds for survival of boreal caribou even though the TSA was expanded beyond the average home range of a boreal caribou and the localized linear feature densities are acknowledged as concentrated and very high within key portions of the SDL that are considered to be of high habitat value for boreal caribou.

The GNWT notes that there is uncertainty over the applicability of these thresholds for the NWT, as for example, they depend on age of the seismic lines and the unknown rate of vegetation regeneration. On the other hand, the GNWT notes that the estimated density of the seismic lines and access roads did not include seismic lines planned, as IR. 1.2.2 produced information that a further 200 km of line is planned but was not included in the analysis.

Recommendations:

- Efforts need to be taken to minimize the amount of additional linear development in the area until a clearer picture of boreal caribou status and habitat is obtained. In particular, linear developments that provide predator access to large areas of boreal caribou range over a long period of time.
- Deh Cho Boreal Caribou Working Group should develop a cumulative effects model for the Cameron Hills area to include the following:
 - Evaluation of the densities of seismic lines including various scenarios for future development. Those densities then should be buffered by different widths for the Zones of Influence and Disturbance Coefficients to examine the effect of differing conditions including the rates of vegetation regeneration relative to possible predation use and seismic line width. Then the range of linear corridor densities should be evaluated as thresholds for cumulative effects including the likely changes in predation rates. The outcome will be projections for changes in caribou status relative to the density, width and vegetation state of proposed linear corridors.
 - Options for reduction in habitat loss from applying best practices (reduced line width, hand cut lines etc).
 - Implications of wildfire.
 - Digital database of the cumulative human footprint in the Cameron Hills area including the age of origin (e.g., seismic lines, roads, well sites, mine sites, transmission lines, trails, cut lines, forestry blocks, land leases, etc.).

7. Issue: Long-term loss of boreal caribou habitat

Developer's Conclusions:

Paramount predicts that the duration of boreal caribou habitat loss impacts are medium-term (20 years).

Our Conclusion:

GNWT considers that the duration of boreal caribou habitat loss impacts is long-term. There is no literature to substantiate that utility corridors, roads, Right of Ways or well sites will be revegetated in 20 years to a point that the vegetation will be considered to be effective habitat for boreal caribou or will not be used as

travel corridors by predators. More importantly, the criteria should be defined as the time for these areas to become revegetated in a manner that supports boreal caribou use or does not support predator use rather than merely supports vegetation. IR. 1.2.118 demonstrates that considerable time is required for disturbed areas to reach their pre-disturbed states.

Our Rationale:

The Far Case Scenario for boreal caribou is based on the assumption that sites are able to regenerate to their pre-disturbance states and that boreal caribou will still exist in the regional area. However, it is not known how long it will take for disturbed sites to return to their pre-disturbed state and whether there will be boreal caribou to re-occupy those areas.

As a result, the GNWT disagrees with the overall ratings for boreal caribou for the Far Case Scenario. In terms of the Reversibility rating, there is no guarantee that habitats will regenerate to the pre-disturbance state. In terms of Duration, the GNWT believes that the rating should be long-term due to the timelines required to regenerate disturbed areas. In terms of Frequency, the GNWT believes that it should be rated as continual due to continued development in the area and re-use of lines.

Paramount does not have a valid ecological basis to assume that disturbed areas will regenerate to their pre-disturbed states. Succession is complex and is dependent upon many factors such as, for example, level and frequency of disturbance, availability of seed source, environmental and site conditions, fire events and unusual weather.

The Far Future Vegetation Composition initially appeared to be a modelled forecast of vegetation change by 2070. Such a forecast requires the use of growth and succession curves for overstory communities as well as modelling of changes caused by natural disturbances such as fire. Responses to information requests indicate that the future forecast is merely the assumption that overstory communities disturbed by construction of well sites, roads, pipeline corridors and seismic lines are merely replaced by the same overstory species or colonizer communities (i.e. aspen).

Paramount also indicates that it does not have quantitative information on reforestation rates of seismic lines, models of natural disturbance by fire or other information on ecological changes.

Recommendations:

- Without active range recovery, the duration of boreal caribou habitat loss impacts should be considered long-term.

- Paramount in consultation with the Deh Cho Boreal Caribou Working Group should conduct research to determine vegetation recovery patterns for various types of disturbance activities across different habitat types. This work should be coordinated with the Alberta Caribou Range Recovery Program, and should focus on adaptive mitigation to speed the recovery of linear disturbances (roads, seismic lines and pipelines) and other human developments using the most effective and cost-efficient techniques, so that their negative effects on boreal caribou and other sensitive wildlife species are lessened and eventually eliminated.

References:

Anderson, R. 1999. Peatland use and selection by woodland caribou (Rangifer tarandus caribou) in northern Alberta. M.Sc. Thesis, University of Alberta, Edmonton, AB. 59 pp.

Boreal Caribou Committee. 2001. Strategic plan and industrial guidelines for boreal caribou range in northern Alberta. Report prepared by the Boreal Caribou Committee, Edmonton, AB. 35 pp.

Bradshaw, C. D. Hebert, A. Rippin and S. Boutin. 1995. Winter peatland habitat selection by woodland caribou in northeastern Alberta. *Can J. Zool.* 73:1567-1574.

Colosimo, L. 1968. Aerial census of moose and caribou, Game Management Zone #6, Hay River District, February 1968. Northwest Territories Wildlife Service.

Dyer, S. 1999. Movement and distribution of woodland caribou (Rangifer tarandus caribou) in response to industrial development in northeastern Alberta. M.Sc. Thesis, University of Alberta, Edmonton, AB. 106 pp.

Dyer, S., J O'Neill, S. Wasel and S. Boutin. 2001. Avoidance of industrial developments by woodland caribou. *J. Wildl. Manage.* 65:531-542.

Dzus, E. 2001. Status of the woodland caribou (Rangifer tarandus caribou) in Alberta. Alberta Environment, Fisheries and Wildlife Management Division, and Alberta Conservation Association, Wildlife Status Report No. 30, Edmonton, AB. 47 pp.

Gunn, A., J. Antoine, J. Boulanger, J. Bartlett, B. Croft and A. D'Hont. 2004. Boreal caribou habitat and land use planning in the Deh Cho, Northwest Territories. Report for Environment Canada's Habitat Stewardship Program for Species at Risk.

- James, A. 1999. Effects of industrial development on the predator-prey relationship between wolves and caribou in northeastern Alberta. Ph. D. Dissertation, University of Alberta, Edmonton, AB. 77 pp.
- James, A. and A. Stuart-Smith. 2000. Distribution of caribou and wolves in relation to linear corridors. *J. Wildl. Manage* 64: 154-159.
- Lines, T. 1969. Aerial census of moose and caribou, Game Management Zone #6, Hay River District, February 1969. Northwest Territories Wildlife Service.
- McLoughlin, P. 2003. Identifying disturbance thresholds for woodland caribou to target allowable levels of cumulative effects. *J. Wildl. Manage.* In Press.
- Rettie, W. and F. Messier. 2000. Hierarchical habitat selection by woodland caribou: its relationship to limiting factors. *Ecography* 23:466-478.
- Salmo, Diversified Environmental Services, GAIA Consultants, Forem Technologies and Axys Environmental. 2003. Volume 2: Cumulative effects indicators, thresholds and case studies. Cumulative effects assessment and management for northeast British Columbia Study. Prepared for the BC Oil and Gas Commission and the Muskwa-Kechika Advisory Board.
- Schneider, R., B. Wynes, S. Wasel, E. Dzus and M. Hiltz. 2000. Habitat use by caribou in northern Alberta, Canada. *Rangifer* 20:43-50.
- Stuart-Smith, A., C. Bradshaw, S. Boutin, D. Hebert and A. Rippin. 1997. Woodland caribou relative to landscape patterns in northeastern Alberta. *J. Wildl. Manage.* 61:622-633.

Personal Communication:

- Johnson, D. 2004. Regional biologist, South Slave Region, Department of Resources, Wildlife and Economic Development, GNWT, Fort Smith, NT.
- Nagy, J. 2004. Regional biologist, Inuvik Region, Department of Resources, Wildlife and Economic Development, GNWT, Inuvik, NT.
- Zimmer, A. 2004. Cumulative effects biologist, Sahtu Region, Department of Resources, Wildlife and Economic Development, GNWT, Norman Wells, NT.

Appendix I

GNWTs Response to Questions posed at the EA03-005 Public Hearing at Hay River on February 18 – 19, 2004

Note: The questions below were provided by Paramount's legal counsel and are the wording is slightly different from the transcripts of the public hearing.

1. Paramount was asked earlier, if they had identified critical boreal caribou habitat. Can you confirm that the GNWT is responsible for the recovery strategy and the identification of critical boreal caribou habitat in the NWT?

GNWT Response:

Under the federal Species at Risk Act, the intent is for each Canadian jurisdiction to develop legislation complementary to the federal law to protected listed species. The GNWT is currently drafting a Species at Risk Legislation for the Northwest Territories. The GNWT is currently working on the technical aspects of a NWT Recovery Strategy for Boreal Caribou to link into the national strategy. For boreal caribou, each jurisdiction is developing a recovery strategy that will collectively contribute to the national recovery strategy. It is the intent of the GNWT to have a draft recovery strategy placed on the SARA Public Registry by June 1, 2004 to ensure the timely conservation of boreal caribou and its habitat. The draft recovery strategy will identify critical habitat based on current information levels and outline studies needed to further define critical habitat.

Note: Additional clarification on Species at Risk is contained in IR #1.2.1 Response submitted by Environment Canada.

2. The GNWT has referred to several instances of caribou data. I'm wondering if they could provide Paramount with caribou data related to Cameron Hills, including any collaring efforts undertaken, within the Cameron Hills?

GNWT Response:

In 2003, the GNWT initiated a multi-year research project in the South Slave region (which includes the Cameron Hills) on the trend in boreal caribou numbers in response to concerns about the caribou. The preliminary findings (based on 1 year) are of concern. Of the 17 cows that were collared in March 2003; 4 cows were killed by wolves or black bears. This translates to an adult female survival rate of 0.77 (95% Confidence Limits 0.58 to 0.95). The GNWT notes that results from the South Slave region are preliminary and indicate the need for continued work. However, if the population is declining, which is likely if adult female survival is as low as the preliminary data indicate, the population will be more vulnerable to any environmental changes especially those that could increase predation.

The intent of this project is to maintain VHF collars on a sample of 30 adult cows. Collaring in March 2003 proved to be more difficult than anticipated, and therefore, only 17 collars were deployed in the study area. Due to time and financial constraints, collars were not deployed in the Cameron Hills in March 2003. Future collaring efforts in March 2004 will attempt to deploy collars in the Cameron Hills and other areas to uniformly distribute collars throughout the study area. However, due to the difficulty associated with deploying collars in new areas, it may take several years to achieve a uniform distribution of collars. The objectives of this current study in the South Slave region is to examine finite rate of increase (population trend) by monitoring adult female and calf survival rates, map home ranges, predict high value habitats and examine habitat selection at a coarse scale. As this is the first year of this study, no formal reports have been produced to date; however, a year-end report will be prepared for limited distribution in April/May 2004.

Other boreal caribou research in the Cameron Hills area includes GNWT's preliminary work (Gunn et al 2004) in cooperation with the Deh Cho First Nations in 2002 to develop a landscape model to map boreal caribou occupation and occurrence (potential habitat) across the southern NWT. A copy of this report was provided to Golder Associates in August 2003. In 2003 and 2004, aerial surveys were conducted in the Edehzhie and Trout Lake areas of the Deh Cho to refine the landscape model developed by Gunn et al. (2004) to map boreal caribou occupation and occurrence. Data analysis is still in progress for these two aerial surveys.

Additionally, the GNWT also provided Golder Associates with two aerial surveys (Colosimo 1968, Lines 1969) that were conducted in the Cameron Hills areas in the late 1960s.

In August 2003, the GNWT initiated a study in the South Slave region (including the Cameron Hills) to examine the recovery rates of lichen in lowland black spruce bogs following fires in order to model the effects of wildfire on boreal caribou winter range; data analysis is still in progress for this project. It is anticipated that a report will be ready for distribution in March 2005.

Adjacent to the Cameron Hills, 10 satellite-radio collars will be deployed on boreal caribou in the Trout Lake (west of the Cameron Hills) area in March 2004 to examine seasonal range use and movement patterns.

GNWT will continue to cooperate with proponents requiring information for environmental assessments and ongoing monitoring and management. Involvement of Paramount in development of a Boreal Caribou Management Plan

would assist in developing a timely coordination of monitoring and research information to Paramount and from Paramount to the GNWT.

3. GNWT states that Paramount used habitat modeling but that the model did not include a wide enough range of habitats. Considering that Paramount used RWED data on habitat vegetation classification and mapped all of the habitat types within the cumulative effects study area, could you please indicate which habitat types that we did not consider?

GNWT Response:

In Alberta, boreal caribou extensively use and select peatlands over uplands at multiple scales (Bradshaw *et al.* 1995, Stuart-Smith *et al.* 1997, Anderson 1999). This pattern of lowland use in combination with lichen-rich stands of black spruce appears to be common to boreal caribou. In Saskatchewan, female caribou selected black spruce-dominated stands through out the year and patterns of daily area use were largely the same as seasonal range selection (Rettie and Messier 2000). Accordingly, black spruce habitats associated with lichen were rated as high in the HSI model. However, other habitat types such as herbaceous, herbaceous wet, herbaceous with shrubs, shrublands, white spruce mature closed, aspen mature closed, burn are rated as nil or low even though preliminary data from the NWT indicates contrary results.

Based on observations of radio-collared animals in the NWT, lichen-based habitats primarily associated with black spruce bogs are also important to boreal caribou in the NWT. In contrast to studies south of 60° N, boreal caribou in the NWT, however, appear to use a greater variety of habitat types, especially during the summer, fall and early winter months. Based on observations of radio-collared animals throughout the NWT, boreal caribou have been seen to use non-peatland habitats such as grass and shrub-dominated fens, mature upland white spruce and jack pine stands, mature mixed wood forests, mature aspen stands, windswept ridge lines, shrublands associated with late fire regeneration and young burns usually less than 10 years old (J. Nagy pers. comm. 2004, A. Zimmer per comm. 2004 and D. Johnson pers. comm. 2004, Gunn *et al.* 2004). Non-peatland areas are for the most part intermixed with black spruce bogs to form a complex landscape mosaic; therefore, these areas may be used incidentally or actively selected by boreal caribou (Schneider *et al.* 2000).

4. On one of the slides we received on the registry it noted that the rating of high for indirect habitat loss may be an underestimate given the uncertainties about a zone of influence. We're just looking for a clarification as to how we could have rated that higher.

GNWT Response:

Paramount Cameron Hills Extension (EA03-005)
Resources, Wildlife and Economic Development
February 2004

The GNWT agrees that the magnitude rating for indirect habitat loss is high for boreal caribou; however, the GNWT feels that Paramount may have underestimated the quantitative assessment of the amount of sensory disturbance potential due to uncertainty associated with the zone of influence and disturbance coefficients.

5. There was a statement made about line spacing, 3-D seismic program buffering to two hundred and fifty (250) metres that would effectively reduce an area in the southern portion of the SDL to zero habitat effectiveness. Considering the evidence that was presented in the DAR and what was discussed today, I'm wondering if you could provide some support for the fact that suggests that habitat next to seismic lines, particularly low impact seismic, is effectively reducing habitat to zero.

GNWT Response:

Given a line spacing of 300 metres for 3-D seismic programs and using a buffer of 250 m as requested by the MVEIRB in (IR 1.1.30 and IR 1.1.114), habitat effectiveness would be reduced to zero using these restrictive buffer (Photo 1). The GNWT acknowledges that there is uncertainty regarding zones of influence (ZOI) and disturbance coefficients (DC) and that the report by Dyer (1999) on represents the first analysis of boreal caribou avoidance of human disturbance. However, future work is required in different environments and levels of human activity to adequately define ZOIs and DCs.

The use of the phrase "low impact" by Paramount is misleading. It is not clear, however, how much of the seismic lines in the TSA are low impact given the habitat types. The GNWT suggests that Paramount provide an account of the types of seismic lines. In addition, the cumulative impacts of narrowly spaced source and receiver lines required for 3-D seismic need to be factored into the concept of "low impact".

Photo 1. Photo of "low impact" seismic lines in the Cameron Hills.



6. GNWT suggests that the buffering of the seismic lines should be two hundred and fifty (250) metres and that no habitat for caribou exists in that buffer. We'd like some clarification with the application of the scientific information in the peer reviewed document by Mr. Dyer, 1999 and how that would conflict with the DAR's methodology, where indeed we do not use an average weighting for the zone of influence but use a conservative approach.

GNWT Response:

The GNWT only noted that Paramount had not buffered linear disturbances by 250 metres as requested by MVEIRB (IR 1.1.30 and IR. 1.2.114). The GNWT supports a requirement for an analysis that calculates the percentage of annual boreal caribou range within 250 metres of a linear corridor in order to compare linear corridor density in the Cameron Hills to linear densities and boreal caribou population trends for select boreal caribou ranges in Alberta.

7. Would the GNWT recognize that the avoidance type cutting that we've done on our seismic project is indeed different from conventional cutting, and as it applies to the Dyer report?

GNWT Response:

Paramount Cameron Hills Extension (EA03-005)
Resources, Wildlife and Economic Development
February 2004

The GNWT recognizes that there may be differences in the recent seismic lines in the Cameron Hills (Photo 2) conducted by Paramount and seismic lines that apply to Dyer's report (conventional cutting). It is not clear, however, how much of the seismic lines in the TSA are low impact and the GNWT suggests that Paramount provide an account of the types of seismic lines. For example, avoidance type cutting still results in a cleared right-of-way in densely treed habitats, may result in root damage or damage to standing timber. Paramount also has not provided information on rate of regrowth although they note a slow rate of vegetation growth in the DAR. Paramount has also not established whether the effective habitat (i.e. habitat available for foraging or other life cycle requirements versus habitat that an animal moves through to access suitable habitat) is different between their operational area versus the operational area in which Dyer conducted his research.

Photo 2. Photograph of recent in Cameron Hills. Note older cut line in centre of photo and around lake shore.



Photo 3. Photo of recent seismic lines in the Cameron Hills. Note "avoidance" cutting of stand of trees in centre right of photo.



8. Paramount would be interested to see their seismic lines that are extending to the north out of the SDL into the moose habitat that Deb is referring to?

Note: Origin GNWT statement and question did not refer to "Paramount's seismic lines". GNWT statement was intended to refer to linkages or access available to predators from areas that Paramount indicated would support higher densities of wolves (i.e. 'source populations').

GNWT Response:

Wolves are wide ranging species and, although moose populations are not high in the TSA, the area is in close proximity to productive moose habitats (e.g., west end of Tathlina Lake and flats to the east of the Cameron Hills), which appears to permit the establishment of higher wolf populations on a regional basis. Natural travel corridors such as rivers and adjacent cut blocks provide access into the TSA and existing roads and utility corridors in the TSA allow predators to efficiently travel into boreal caribou habitat in the Cameron Hills and thus increase predation risk. It is known that there are old seismic lines around the TSA that would allow wolves to travel to the edge of the TSA; however, it is not known whether these extend into the TSA.

As mentioned during the Public Hearing, the Deh Cho First Nations have a database of past disturbances that the GNWT understands will be provided to the MVEIRB.

9. I'm just wondering if the GNWT could elaborate on the consideration of the cut line use related to human activity and the effect that that has on caribou, recognizing the fact that seismic lines have not been shown to be buffers [sic barriers?], and that indeed it is roads, that act as semi-permeable barriers to caribou movement and how that is related to the two hundred and fifty (250) metre buffer and how that pertains to any discrepancies between GNWT's concerns and the information provided in the DAR?

GNWT Response:

It is critical in this discussion to separate the concepts of "barriers" and "effective habitat". Based on Dyer (1999) caribou were found to cross seismic lines as often as expected throughout the year, and therefore, seismic lines do not act as barriers to movement. However, boreal caribou avoided seismic lines and other human developments to varying degrees, in effective, reducing the "habitat effectiveness" in that all potentially available habitat was not used or may not be used for a normal length of time. Therefore, while seismic lines do not restrict movement within boreal caribou ranges, boreal caribou do avoid the habitat near seismic lines. This avoidance response to boreal caribou appears to occur even when the density of cut lines is low and when human activity in the area is low (J. Nagy pers. comm. 2004).

Density of seismic lines is also of concern to the GNWT due to increased predation risk. As mentioned earlier, boreal caribou avoid areas close to human disturbances and the semi-permeability of roads exacerbates the reduction in available habitat; therefore, avoidance of habitats may result in effective increases in the density of boreal caribou and more predictable distribution thereby increasing the predation risk.

With respect to the 250 metre buffering, as stated previously, the GNWT only noted that Paramount had not buffered linear disturbances by 250 metres as requested by MVEIRB (IR 1.1.30 and IR. 1.2.114). The requirement to buffer would show that the blocks of 3-D seismic would be eliminated as effective habitat. If these dense seismic lines eliminate an area of 'critical habitat' the concern is greater than if the operating area was of composed of lower quality habitat. The GNWT supports the requirement that this buffering be provided at a reasonable scale of mapping so that the MVEIRB can visualize the effects.

The GNWT recognizes the benefit of the manned gate to discourage access and potential hunting in the Alberta and NWT sections of the Paramount operations.

10. *The information provided in the DAR took a very clear, transparent approach to the zones of influence in caribou habitat. Again, recognizing the scientific data presented by a very recognized paper by Dyer, 1999, Mr. More's comments just stated that they've noticed that caribou may be avoiding some cut lines, which would suggest to us that they are using the habitat in association with those seismic lines. Therefore, I'm just wondering what consideration the use around seismic lines is, in response to human disturbance?*

GNWT Response:

As stated above, Dyer (1999) found that boreal caribou cross cut lines, and therefore, use the habitat in association with seismic lines. However, no studies to date have examined how the habitat around seismic lines is used by boreal caribou use. For example, boreal caribou may just use habitats near seismic lines to travel to areas away from seismic lines where boreal caribou forage or rest, for example. The concept of habitat effectiveness as mentioned above, is again, a major concern and requires research to establish how habitat use is affected and how habitat use re-establishes over time as disturbance regenerate.

11. *Mr. More made reference to a biologist knowing threshold levels of three (3) kilometres per kilometre squared of cut lines, precluding caribou use. I'm just wondering, I'm familiar with some literature, could you comment on whether or not, this is peer reviewed or is it a target, considering that some jurisdictions dealing with caribou habitat at the present time, are reluctant to discuss thresholds?*

GNWT Response:

Salmo et al. 2003 references that through a Delphi process held in Alberta, caribou biologists in Alberta identified that at a threshold density > 3 km/km², it is thought that boreal caribou will not be sustained. During the Public Hearings, Terry Antoniuk, Principle of Salmo Consulting and the author of the report indicated that "*recognized specialists on boreal eco type woodland caribou got together and tried to define values that would be meaningful for management purposes*". The GNWT notes that these specialists do publish in "peer reviewed" journals. The GNWT also notes that such meetings of specialists have occurred in the Yukon and that the report by Salmo et al 2003 was commissioned by the BC Oil and Gas Commission. The efforts by these jurisdictions and specialists is intended to provided decision-makers with guidance on impacts of disturbances by oil and gas industry, forest industry, and other human disturbances to natural landscapes. It should also be noted, that the GNWT indicated to Paramount's consultants that the work by the BC Oil and Gas Commission was of interest to the GNWT as an approach to the cumulative effects assessment of the Paramount operations in the Cameron Hills. It should also be noted that the GNWT recognizes Dyer's publication as a starting point for additional research to

refine our understanding of impacts. We have indicated some of these in our responses above.

References:

Anderson, R. 1999. Peatland use and selection by woodland caribou (Rangifer tarandus caribou) in northern Alberta. M.Sc. Thesis, University of Alberta, Edmonton, AB. 59 pp.

Colosimo, L. 1968. Aerial census of moose and caribou, Game Management Zone #6, Hay River District, February 1968. Northwest Territories Wildlife Service.

Dyer, S. 1999. Movement and distribution of woodland caribou (Rangifer tarandus caribou) in response to industrial development in northeastern Alberta. M.Sc. Thesis, University of Alberta, Edmonton, AB. 106 pp.

Gunn, A., J. Antoine, J. Boulanger, J. Bartlett, B. Croft and A. D'Hont. 2004. Boreal caribou habitat and land use planning in the Deh Cho, Northwest Territories. Report for Environment Canada's Habitat Stewardship Program for Species at Risk.

Lines, T. 1969. Aerial census of moose and caribou, Game Management Zone #6, Hay River District, February 1969. Northwest Territories Wildlife Service.

Rettie, W. and F. Messier. 2000. Hierarchical habitat selection by woodland caribou: its relationship to limiting factors. *Ecography* 23:466-478.

Salmo, Diversified Environmental Services, GAIA Consultants, Forem Technologies and Axy's Environmental. 2003. Volume 2: Cumulative effects indicators, thresholds and case studies. Cumulative effects assessment and management for northeast British Columbia Study. Prepared for the BC Oil and Gas Commission and the Muskwa-Kechika Advisory Board.

Stuart-Smith, A., C. Bradshaw, S. Boutin, D. Hebert and A. Rippin. 1997. Woodland caribou relative to landscape patterns in northeastern Alberta. *J. Wildl. Manage.* 61:622-633.

Personal Communication:

Johnson, D. 2004. Regional biologist, South Slave Region, Department of Resources, Wildlife and Economic Development, GNWT, Fort Smith, NT.

Nagy, J. 2004. Regional biologist, Inuvik Region, Department of Resources, Wildlife and Economic Development, GNWT, Inuvik, NT.

Paramount Cameron Hills Extension (EA03-005)
Resources, Wildlife and Economic Development
February 2004

Zimmer, A. 2004. Cumulative effects biologist, Sahtu Region, Department of Resources, Wildlife and Economic Development, GNWT, Norman Wells, NT.