

Literature Review of Human Effects on Barren-Ground Caribou: Inuit Qaujimagatuqangit, Traditional Knowledge & Western Science

Prepared for the Nunavut Wildlife Management Board

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The Project

Goal: Increase understanding of the effects of human disturbance on barren-ground caribou.

Review of the most current:

- Scientific literature
- Inuit Qaujimagajatuqangit (IQ) and Traditional Knowledge (TK) literature

Scientific, TK and IQ Literature

Topics:

- Linear features
- Mining infrastructure
- Vehicles and aircraft
- Local scale effects
- Regional scale effects

References reviewed:

- Western Science: 71
- Traditional Knowledge: 54
- Caribou Protection Measures: 28

General Discussion

- Population declines in barren-ground caribou are linked with human disturbance.
- Caribou are:
 - Smart, with powerful memories
 - Given a strong sense of smell
 - Sensitive at certain times of year
 - Quick to show signs of stress

Traditional Knowledge

Roads:

- Can lead to poaching and a higher number of caribou harvested^{1, 5}
- Offer caribou relief from insects, a vantage point for predators, and make travel easier²
- Fragment caribou habitat, altering migration routes³

“The land out there most the time when you can see through the clouds, look like that checkerboard floor -- there ain't a darn place where a little rabbit can live or a chicken can lay their eggs, where can a caribou feed?” (N. Kakfwi in Fort Good Hope Berger Commission Community Transcripts 1975: 1923, lines 3-7 In Parlee et al. 2013: 59).

Traditional Knowledge

Roads:

- Impacts vary according to season and activity /disturbance level.
- Caribou avoid roads with lots of activity.⁶
- Caribou may be more skittish around roads when not in migration: *“if the ekwò sniff our scent, they will turn back”*.⁷
- Caribou won't cross high snow drifts [banks] on roads.⁸

Science

Roads:

- Increase access for harvesting
- Have a Zone of Influence (ZOI) -- avoidance of up to 4-6 km¹
- May detour migrations
- Degree of avoidance depends on the size of the road and traffic levels.

Science

Roads:

- No difference in activity from caribou adjacent to the Dempster Highway compared to groups at least 10 km away.³
- May create barriers for movement¹ if perceived as dangerous habitat.⁴
- Other studies have reported neutral effects of roads.⁵
- Distributions of calves and adult caribou not strongly influenced by the presence of a road.

Pipelines and Power lines

Traditional Knowledge:

- Direct loss and fragmentation of habitat, noises, smells, contaminants and increased activity are stressful on caribou.⁹

Science:

- Power lines may be a minor disturbance compared to roads.⁵
- Caribou would seek relief in the shade of pipelines²
- Caribou cross beneath elevated pipelines that were 1.5m above ground. ^{6, 7}

Traditional Knowledge

Mining Infrastructure: Buildings, Mines and Pits

- Alter caribou behaviour - both attract and repel animals.
- Permanently remove caribou habitat due to:
 - landscape changes
 - contaminants, and;
 - disrespect shown to the land.

Traditional Knowledge

Buildings, Mines and Pits:

- *If you disturb the calving ground, they'll go elsewhere.*
(Fred Sangris).¹⁰
- *The elders suspect that ekwò have probably gone east because there's been too much exploration or drilling going on in the calving grounds* (Fred Sangris).¹¹

Science

Buildings, Mines and Pits:

- Caribou abundance increased with distance from the mine site in all seasons, and caribou avoided areas within 4 km of the site in most seasons. ⁸
- Depending on the season, the zone of influence varied between 2 to 12.5 km for oil and gas infrastructure. ⁹

Science

Buildings, Mines, and Pits:

- Strong selection for cows with newborns to move away from human activity in the calving period.¹⁰
- 11 km to 14 km zone of influence for caribou adjacent to the Ekati and Diavik mines.¹¹

Traditional Knowledge

Low Level Aircraft, Vehicles, ATVs, Snow Machines:

- Overhead aircraft and snow machines are relatively new disturbances to caribou.¹²
- Affect caribou movements, behaviour and overall health in various ways and to varying degrees, depending on the time of year and size of herd.¹³

Traditional Knowledge

Low Level Aircraft, Vehicles, ATVs, Snow Machines:

- When caribou are stressed and their health is compromised, they may be found in smaller, slower moving groups.
- Noise from vehicles slows migration.¹⁴
- Caribou migrate faster and farther and express more confidence in larger numbers.¹⁵

Science

Low Level Aircraft, Vehicles, ATVs, Snow Machines

- Increased energetic costs if: caribou foraging is interrupted or if caribou move away in response to the disturbance.¹²
- Some studies suggest that caribou are adaptable and can habituate to a wide variety of disturbance stimuli, including moving objects. ¹³

Science

Low Level Aircraft, Vehicles, ATVs, Snow Machines:

- Large groups were more reactive than small groups or individuals.
- Groups with calves were slightly more reactive than groups without.¹⁴
- When aircraft flew at altitudes of less than 60m, a high percentage of panic reactions were observed.
- Helicopters are more disturbing than fixed-wing aircraft.



The caribou are running in front of the helicopter. When a caribou gets scared or surprised or threatened, that's what they do (Fred Sangris in EMAB 2012: 20)

Traditional Knowledge

Local Effects: Behavioural and Physiological

- Naturally calm and curious: *The caribou would get curious, and they'd come over to check what's going on* (Gabe Andre).¹⁷
- More skittish in the heat or around calving and quick to show stress (panic, put nose high up, run fast, gallop).¹⁸
- Some caribou can habituate to disturbance, especially those born into a frenetic and fragmented range.¹⁹

Science

Local Effects: Behavioural and Physiological

- Examples: energetic costs, altered behaviour, avoidance of otherwise suitable habitat, death.
- Fright and flight behaviour can result in elevated glucocorticoid levels, an indicator of physiological stress.¹⁶
- May result in a physiological and/or energetic response, incl. changes in blood constituents, temperature, heart rates.
- May result in reduced fitness and, ultimately, lower fecundity.

Science

Local Effects: Behavioural and Physiological

- Behavioural responses are not always predictable and responses may be interpreted differently (by researchers studying the animal).
- However, animals exposed to natural disturbances on a regular basis without detrimental consequences can also be exposed to human disturbances without consequence.

Traditional Knowledge

Regional Scale Effects: Population Levels

- Development attracts some caribou for shade, insect relief, escape from predators.²⁰
- Development deters some caribou owing to noise, dust, contaminants, physical barriers.²¹
- It can take a long time for caribou to return to an area of disturbance.
- Rapid and unprecedented levels of decline in barren-ground caribou. Some knowledge holders suggest that caribou are not declining, but mixing with other herds and/or shifting migration routes.²²

Traditional Knowledge

Regional Scale Effects: Population Levels

- Unprecedented extremes in weather events make it difficult to isolate the effects of any type of human development on caribou. ²³
- When routes become low in forage quality, caribou shift to other routes. Developments along the ranges of barren-ground caribou interfere with this natural cycle. ²⁴
- Development that affects calving caribou and calving grounds must be avoided. ²⁵
- Caribou must be respected or their migrations will shift and they will not offer themselves to people. ²⁶

Science

Regional Scale Effects: Population Levels

- Protection of calving grounds of migratory caribou must consider the dynamic use of space.¹⁷
- The Central Arctic caribou herd has been studied for approximately 40 years. Despite dozens of studies, over multiple decades, it is concluded that the results are difficult to quantify and that results are often not comparable across studies.

Cumulative Effects and Final Thoughts



Demography



Fecundity

Survival



Migration

Calving

Behavior



Roads

Power Lines

Infrastructure

Pipelines

Aircraft

Vehicles

Traditional Knowledge: Final Thoughts

- People are **not the boss** of the caribou.
- **Working together** (e.g. scientists and TK holders; company A and company B) is key to respecting caribou.
- **Caribou might not return** to a particular migration route or calving ground because of landscape changes, contaminants, and disrespect shown to the land.

Traditional Knowledge: Final Thoughts

- *Ever since the mine was built, it seems like they are forced and chased away. And the places where they lived are different, it changes with them. They don't seem to stay longer or something seems to chase them away. When your trail is not healthy and you don't feel comfortable with it then you don't stay in one place, but right away you keep moving on, that's how it seems to be with the caribou. Because their traditional path is not good, it's blocked up so the caribou don't stay that long. Because of the mining. When you travel somewhere and your skidoo trail is nice and clear, but as soon as you know that something is bothering you on your trail, like mining, you don't feel comfortable with it and you turn away. (Unknown in TG 2013: 30)*
- *In the past, one of the few disturbances to wildlife was the barking of dogs from dog teams. (BQCMB 2011:40)*

Science: Final Thoughts

- The degree of change in the location of calving grounds plays an important role in how susceptible Barren-ground caribou may be to potential population-level effects (as a result of human disturbance).

TK EndNotes

¹ Wray 2011; EMAB 2012; Parlee et al. 2013; Tłjchq Government 2013; Sangris 2012; Jacobsen 2013; GSCI 2015

² KHTO and Golder 2011; Thorpe et al. 2001; GSCI 2015

³ Dogrib Treaty 11 Council 2001; Kendrick 2003; Kendrick et al. 2005; BQCMB 2011; GSCI 2015

⁴ Parlee et al. 2013; GSCI 2015

⁵ Sangris 2012: 78

⁶ Tom Wright in GSCI 2015

⁷ Romie Wettrade of Gameti in Whaèhdôö Nàowoò Kö [Dogrib Treaty 11 Council 2001: 13

⁸ Liza Enzoe of Łutsël K'e in Kendrick et al. 2005: 183

⁹ Parlee et al. 2013: 64-65

^{10, 11} Sangris 2012: 78

¹² BQCMB 2011: 40

¹³ Wray 2011; EMAB 2012; Parlee et al. 2013; Tłjchq Government 2013; Sangris 2012; Jacobsen 2013; GSCI 2015

^{14, 15} Tom Beaulieu 2012: 6

¹⁶ Padilla and Kofinas 2010; Parlee et al. 2013; GSCI 2015

¹⁷ Gabe Andre in GSCI 2015: 30

¹⁸ KHTO and Golder 2011; EMAB 2012; Parlee et al. 2013; GSCI 2015

¹⁹ KHTO and Golder 2011; Parlee et al. 2013; GSCI 2015

²⁰ Colin Adjun in KHTO and Golder 2011

²¹ Bobby Algona in KIA 2012

²² WRRB 2010; EMAB 2012; Beaulieu 2012; Judas 2012; Barnaby and Simmons 2013; BQCMB 2014; GSCI 2015

²³ Thorpe et al. 2001; Krupnik and Jolly 2002; Parlee et al. 2005; KHTO and Golder 2011

²⁴ Whaèhdôö Nàowoò Kö [Dogrib Treaty 11 Council] 2001; Thorpe et al. 2001; Kendrick et al. 2005; Łutsel K'e Dene First Nation 2005; Legat et al. 2008; Croft and Rabesca 2009; Sahtú Land Use Planning Board 2013; KIA 2012; WRRB 2013; North Slave Métis Alliance 2012; Beaulieu 2012; Judas 2012; EMAB 2012; ACFN Elders 2003; Barnaby and Simmons 2013; ACCWM 2014; GSCI 2015

²⁵ KHTO and Golder 2011; BQCMB 2012; Parlee et al. 2013

²⁶ BQCMB 2012; EMAB 2012; Sangris 2012; Barnaby and Simmons 2013; Parlee et al. 2013; GSCI 2015

Science Endnotes

- ¹ Wolfe et al. 2000
- ² Ballard et al. 2000
- ³ Russell 2014
- ⁴ Nellermann et al. 2001
- ⁵ Flydal et al. 2009
- ⁶ Smith and Cameron 1985
- ⁷ Curatolo and Murphy 1986
- ⁸ Weir et al. 2007
- ⁹ Johnson et al. 2015
- ¹⁰ Russell 2014
- ¹¹ Boulanger et al. 2012
- ¹² Weladji and Forbes 2002
- ¹³ EBA Engineering Consultants Ltd. 2011
- ¹⁴ Fisher et al. 1977
- ¹⁵ EBA Engineering Consultants Ltd. 2011
- ¹⁶ Dantzer et al. 2014
- ¹⁷ Taillon et al. 2012