Walking the line: investigating ecological characteristics relating to wildlife linear feature use

E. Tattersall[a], K. Pigeon[b,c], D. MacNearney[d], L. Finnegan[a]

[a]fRI Research Caribou Program, Hinton, AB; [b]Yellowstone to Yukon, Canmore, AB; [c]University of Northern British Columbia, Prince George, BC; [d]Environment and Climate Change Canada, Ottawa, ON

Background

In the western boreal forest, linear features from industrial development are central to the decline of woodland caribou (*Rangifer tarandus*) due to their use by caribou predators[1] (wolves, *Canis lupus;* bears, *Ursus arctos* and *U. americanus*) and alternate prey species[2,3] (moose, *Alces alces;* deer, *Odocoileus hemonius* and *O. virginianus;* and elk, *Cervus canadensis*). Linear feature restoration has been identified as a critical component of caribou conservation; however, for restoration to be effective it must rehabilitate specific linear feature characteristics that promote line use by these species.[4]

Objectives

- Investigate which local habitat characteristics correspond to linear feature use by caribou predators and alternate prey species
- Assess linear feature use for ungulates and bears as a function of vegetation occurring on lines and at line edges

Results

Chinchaga

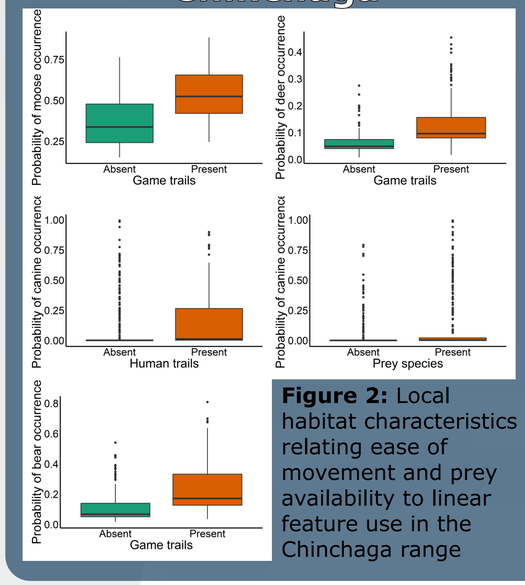

Figure 2: Local habitat characteristics relating ease of movement and prey availability to linear feature use in the Chinchaga range

West-Central

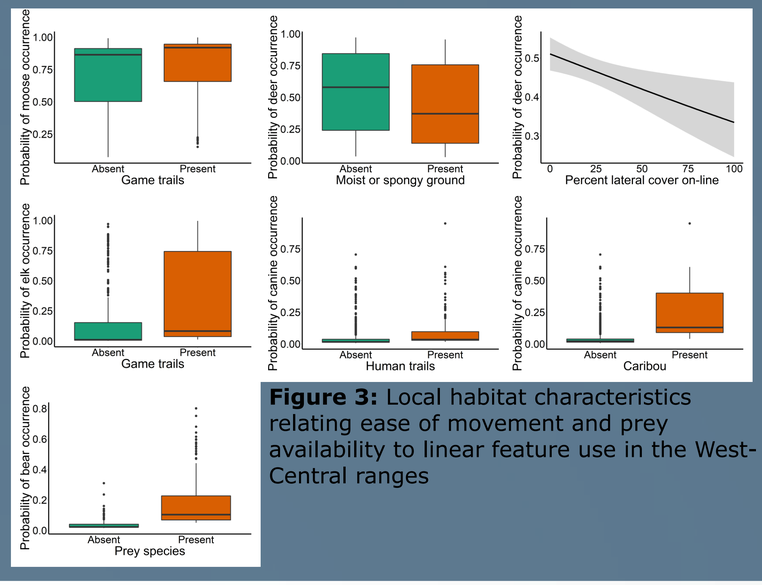

Figure 3: Local habitat characteristics relating ease of movement and prey availability to linear feature use in the West-Central ranges

Vegetation

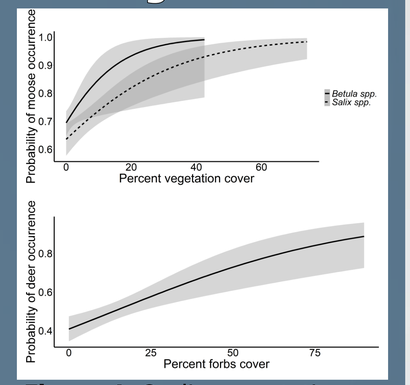

Figure 4: On-line vegetation corresponding to moose and deer linear feature use in the West-Central caribou ranges

Methods

Study area & sampling design

- Linear features (seismic lines, pipelines, old roads) within four caribou ranges in West-Central Alberta (Little Smoky, A La Peche, Redrock-Prairie Creek, and Narraway) and one caribou range in north-west Alberta (Chinchaga)
- Established sampling plots along linear features (0, 100, and 500 m from access road) during summers of 2014 and 2015

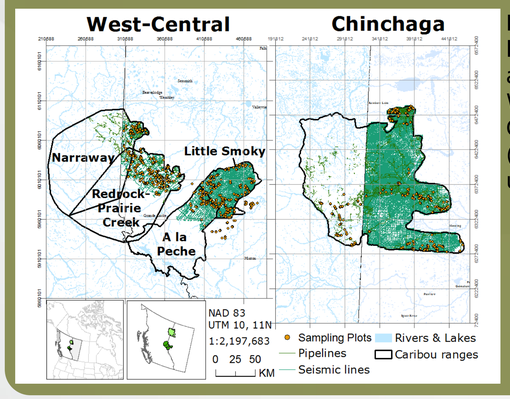

Figure 1: Overview of the linear feature footprints and sampling plots within West-Central and Chinchaga caribou ranges (BC seismic data unavailable in Chinchaga)

Table 1: Working hypotheses and model forms used to explore factors explaining wildlife use of linear features

Data collection & analysis

- Recorded wildlife track and sign for moose, deer, elk, canines and bears along linear features; measured forest and line characteristic data and vegetation percent cover on-line, at line edges, and off-line
- Built binomial mixed-effects models for each wildlife taxa corresponding to hypotheses 1-3, and binomial models corresponding to hypothesis 4 for ungulates and bears (Table 1); used backward selection to optimize model fit, and combined final variables from hypotheses 1-3 into a global model

Hypothesis	Description	Model covariates
1)**Ease of movement**	Trails, soil type, and on-line vegetation characteristics that influence movement along lines best explain wildlife use of linear features	humanTrail + gameTrail + DrySoil + MoistSoil + SpongySoil + WetSoil + Online_LateralVegCover + Online_VegHt
2)**Risk avoidance**	Surrounding forest characteristics and presence of humans or predators best explain wildlife use of linear features	Offline_TreeHt + Offline_LateralVegCover + Human + Bear + Canine
3)**Prey availability**	Presence of prey species best explain predator use of linear features	1) Moose + Deer + Elk + Caribou 2) AllPrey
4)**Forage availability**	Vegetation that provides forage subsidy best explains ungulate and bear use of linear features	Alnus + Betula + Carex + Forbs + Graminoids + Rhododendron + Salix + Trifolium + Vaccinium + VAVI

Conclusions

- All species use linear features for ease of movement (more likely to use linear features with game trails or human trails)
- Predators use linear features for prey availability
- Moose and deer use linear features for forage availability (*Salix* and *Betula* for moose, forbs for deer) in West-Central ranges

Management implications

To deter linear feature use by caribou predators and alternate prey species, **restoration should focus on creating movement barriers** that inhibit trail formation and **replacing early seral vegetation** that provide forage for moose and deer.

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Twitter: @erin_tatt
Email: etattersall@friresearch.ca

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