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Informing Land & Resource Management

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Prioritizing seismic lines for restoration in the Chinchaga caribou range, northwest Alberta

Seismic lines are one of the most pervasive disturbances within caribou ranges, with densities in some areas reaching as high as 10km/km^2. Seismic lines are slow to regenerate naturally due to soil removal and compaction during construction, and many seismic lines will need active restoration to return to pre-disturbance states. However, the magnitude of the seismic line footprint means that targeted restoration efforts are essential to contribute towards caribou recovery efforts across the province. Measuring regeneration on seismic lines, and understanding how caribou and wolves, their predator, respond to this regeneration could help to prioritize restoration efforts to benefit caribou.

In 2013, the fRI Research Caribou Program, in collaboration with the Grizzly Bear Program, started a project that combined LiDAR (Light Detection and Ranging) and GPS collar data from caribou and their predators to identify seismic lines that could be prioritized for restoration in the Chinchaga caribou range, northwest Alberta.

Measuring Regeneration on Seismic Lines

We used LiDAR data collected circa 2005 to measure vegetation height on seismic lines. Overall, regeneration height of seismic lines in the Chinchaga caribou range was low, with 70% of seismic lines showing regeneration heights <1m.

Caribou and Wolf Response to Regenerating Seismic Lines

We used the LiDAR measurements of vegetation height and other GIS data (e.g. habitat type, elevation, and density of disturbance), and GPS collar data collected between 2006 and 2009 to assess wolf and caribou response to regenerating seismic lines. We built models for each species and assessed habitat selection within increasing distances from seismic lines (0–62.5m, 62.5–125m, 125–250m, 250–500m, 500–1000m, 1000–2000m).

Wolves selected flat areas at high elevation in mixed or non-forested habitat types near small streams, away from high densities of linear features at the landscape scale, but near areas with high densities of anthropogenic features at the local scale.

During the snow-free rendezvous season, when < 62.5m from seismic lines, wolves selected areas near seismic lines with low vegetation height.

Despite the extensive seismic line footprint in the Chinchaga caribou range, caribou consistently selected areas away from seismic lines, but when they were close to seismic lines, they were close to seismic lines with high vegetation during spring, summer, and early winter, and close to seismic lines with low vegetation during fall and late winter.

Identifying Priority Seismic Lines for Restoration

We mapped seasonal habitat use by wolves and caribou from the models described above and combined these maps to identify priority seismic lines for restoration. We first combined all maps representing distinct areas for distance-to-seismic line, and then added these maps of seasonal habitat use for caribou and wolves respectively into an annual map of habitat use so that areas that were used by caribou and wolves during more than one season were assigned a higher value than areas that were used during only one season. We then assigned restoration priorities to seismic lines in the Chinchaga caribou range based on the overlap between caribou and wolves within 1km of the seismic line at any time of the year (Table 1).

Table 1: Classification scheme for assigning priority levels to seismic lines based on annual caribou and wolf-caribou overlap.

Caribou selection	Wolf selection: Low	Medium-low	Medium	Medium-high	High	Very high
Low	Low	Low	Medium-low	Medium	Medium-high	High
Medium-low	Low	Low	Medium-low	Medium	Medium-high	High
Medium	Medium-low	Medium-low	Medium-low	Medium	Medium-high	High
Medium-high	Medium	Medium	Medium	Medium	Medium-high	High
High	Medium-high	Medium-high	Medium-high	Medium-high	Medium-high	High
Very high	High	High	High	High	High	Very high

Applications and Further Work

By modelling caribou and wolf response to regenerating seismic lines, we identified 1,539 km (2.9%) of seismic lines in the Chinchaga caribou range where restoration efforts could help decrease the overlap between caribou and their main predator (Figure 1). Our study was limited because LiDAR data were collected in 2005 and it is unclear how vegetation on seismic lines, and corresponding wildlife habitat use, has changed since that time. New field data collection or remote data collection (e.g. using UAVs) could help update vegetation growth on seismic lines since 2005, and provide a more up-to-date prioritization map that could help direct restoration efforts.¨

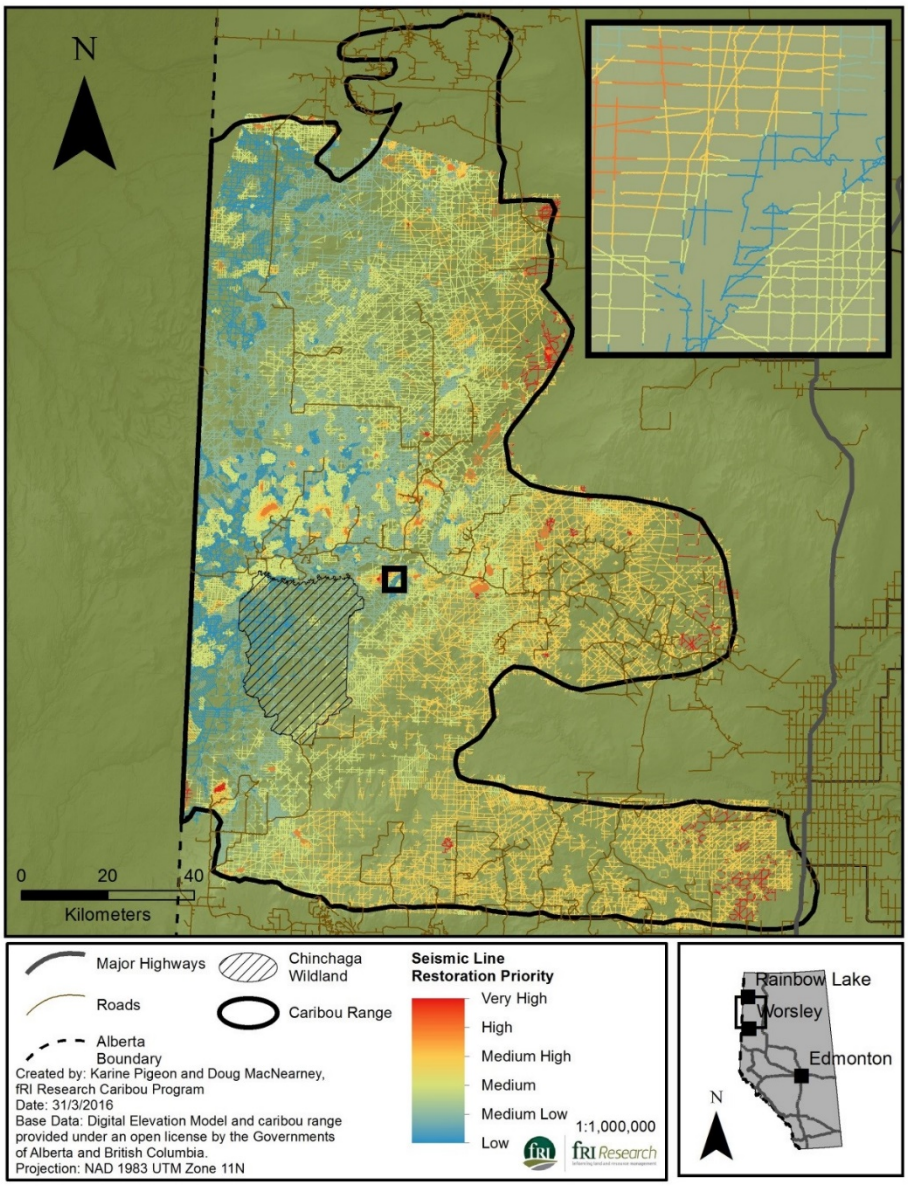

Figure 1. Seismic line priority ranking for restoration based on the overlap between the relative probability of selection for wolves and in the Chinchaga caribou range, Alberta, Canada.

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