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Prioritizing seismic lines for restoration in west-central Alberta

Within caribou ranges in west-central Alberta, there are 15,587km of seismic lines with mean densities of 1.45km/km^2. In 2013, the fRI Research Caribou Program, in collaboration with the Grizzly Bear Program, started a project that combined LiDAR and GPS collar data from caribou and their predators to identify seismic lines that could be prioritized for restoration in caribou ranges of west-central Alberta.

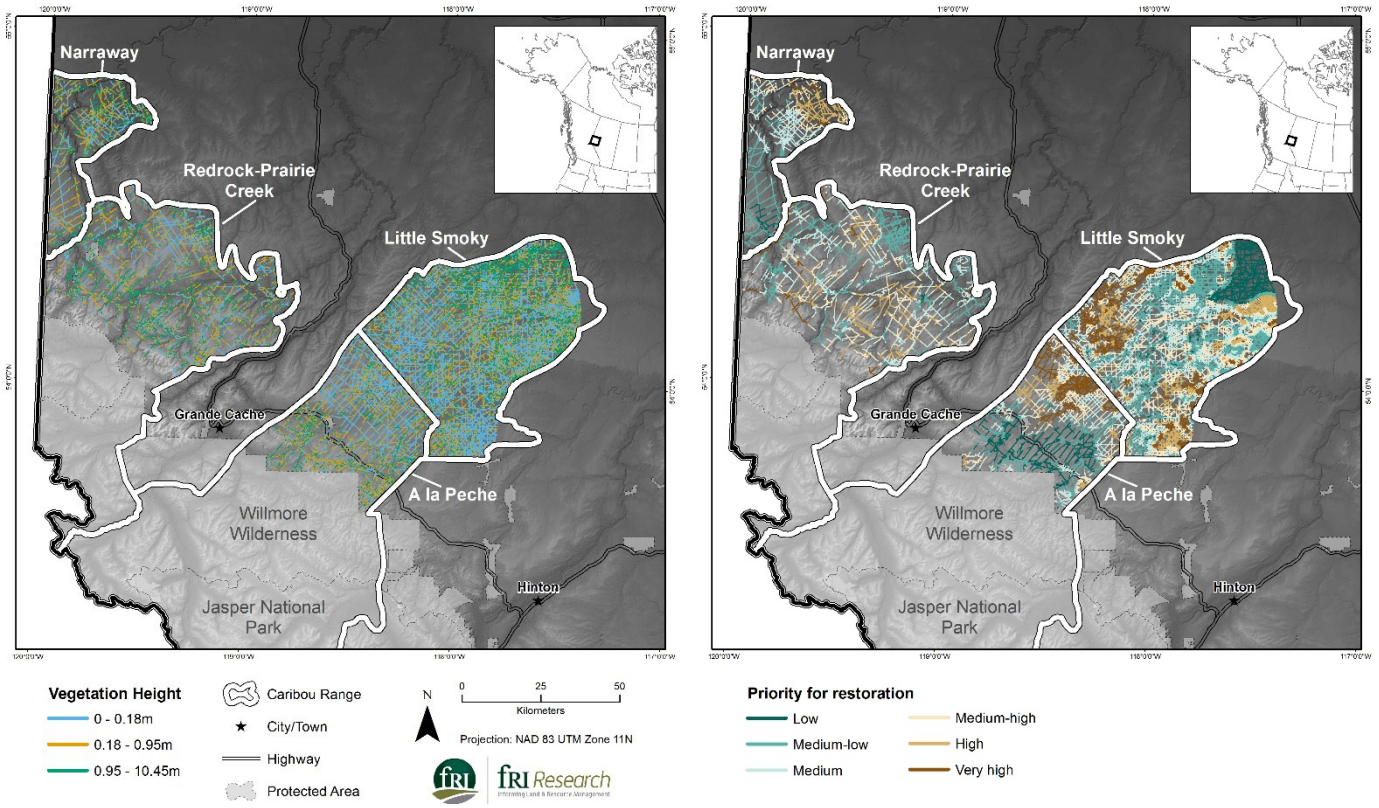
Measuring regeneration on seismic lines

We used LiDAR data collected primarily in 2007 to measure vegetation height on seismic lines. Mean vegetation height was 0.8m (range 0 to 15m) and 11,755 km (75%) of seismic lines had vegetation <1m in height (left map).

Caribou, wolf, and grizzly bear response to regenerating seismic lines

We used the LiDAR measurements of vegetation height, wet areas mapping, other GIS data (e.g., habitat type, elevation, and density of disturbance), and 2003–2009 GPS collar data to assess wolf, grizzly bear, and caribou response to regenerating seismic lines. We further split grizzly bears by sex and age, and then assessed habitat selection by distance from seismic lines: 0–62.5m, 62.5–125m, 125–250m, 250–500m, 500–1000m, 1000–2000m.

Wolves were generally closer to seismic lines, specifically closer to seismic lines with lower vegetation, but in some areas and seasons, wolves were also closer to seismic lines with higher vegetation.



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Grizzly bears didn't really respond to seismic lines, but when they were close to seismic lines, they were closer to wetter seismic lines, those with lower vegetation during fall, and higher vegetation during spring and summer.

Caribou were generally further from seismic lines, but when they were close to seismic lines, they were closer to seismic lines with higher vegetation during spring and summer, but those with lower vegetation during winter.

Identifying priority seismic lines for restoration

We mapped seasonal habitat use by wolves, caribou, and grizzly bears, and then combined these maps to identify priority seismic lines for restoration. We first combined all the distance-to-seismic line areas, and then added these maps of seasonal habitat use for each species into an annual map of habitat use so that areas that were used by a species in more seasons got a higher value. We then assigned restoration priorities based on the overlap between caribou and wolves, or caribou and grizzly bears, within 1km of the seismic line at any time of the year (Table 1).

Table 1: How we assigned seismic line priority based on annual bear-caribou and wolf-caribou overlap.

		Caribou-bear overlap					
Caribou-wolf overlap		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 predator response to regenerating seismic lines, we identified 3,580 km of seismic lines in west-central Alberta where restoration efforts could help decrease the overlap between caribou and their predators (Table 2; right map). One caveat is that it is unclear how vegetation within seismic lines, and corresponding wildlife habitat use, has changed since the LiDAR data was collected in 2007. New field or remote data collection (e.g., using UAVs) would allow us to provide a more up-to-date prioritization map to help direct restoration efforts.

Table 2. Length and percent of total seismic footprint in each category of priority level for caribou-wolf-grizzly bear overlap within west-central Alberta caribou ranges.

Priority for Restoration					
Low	Medium-Low	Medium	Medium-High	High	Very High
1,354 km (8.7%)	3,137 km (20.1%)	4,118 km (26.4%)	3,390 km (21.7%)	1,606 km (10.3%)	1,974 km (12.7%)

Acknowledgements

This project was funded by Alberta Environment and Parks, the Alberta Upstream Petroleum Research Fund, the British Columbia Oil and Gas Research Innovation Society, the Habitat Stewardship Program for Species at Risk, the Foothills Landscape Management Forum, the Forest Resource Improvement Association of Alberta (FRIAA), fRI Research, and the Sustainable Forestry Initiative. In-kind support (GIS and GPS data) was provided by Alberta Agriculture and Forestry, ANC Timber Ltd., Canfor Corporation, the Universities of Alberta, Calgary, and Montana, West Fraser Mills Co. Ltd., and Weyerhaeuser Company.