

Energy development and caribou conservation

A dense array of seismic lines in northern Alberta's oil sands region

Photo: Cole Burton

Recent controversies over oil and gas pipelines in western Canada have sparked societal debates about energy development: environmental protection vs job security, Indigenous land rights vs resource-dependent communities, climate commitments vs struggling economies. In the Lower Mainland, First Nations, environmental groups, and other citizens are voicing concerns about climate change and the potential dangers of oil spills to coastal ecosystems. Further north, however, a terrestrial ecosystem is already shifting in response to development decisions within Alberta's oil sands region.

For many Canadians, the term "oil sands" conjures images of expansive open pit mines and tailings ponds, yet the most extensive industrial "footprint" in this boreal forest landscape comes from a network of narrow, linear disturbances called seismic lines. These cut lines are paths cleared for exploring underground oil reserves, creating vast trail networks that stretch across much of Alberta and northeastern BC. While the land area directly disturbed by a given seismic line is small, collectively these long corridors divide the forest into smaller habitat patches and create thousands of kilometres of forest edges. When seismic lines are considered alongside other industrial features – including well pads, roads, forestry cutblocks, and other infrastructure – the cumulative effects of these disturbances produce an unfamiliar landscape that boreal wildlife must

navigate.

While environmental concerns about the oil sands are not new, alarm bells are now sounding loudly for woodland caribou, an iconic species facing dramatic declines across the boreal forests of Alberta, BC, and much of Canada (leading to its designation as a threatened species under the federal Species at Risk Act). Industrial land transformation has fragmented caribou habitat while facilitating the northward expansion of white-tailed deer, which in turn provide food for growing populations of grey wolves – caribou's chief predator. Seismic lines further exacerbate this effect by providing "highways" for wolves to move more quickly, and hunt more effectively, in caribou habitat. Many biologists predict that these intense pressures will wipe out woodland caribou in coming decades, unless urgent conservation measures are implemented. Indeed, governments, industry, Indigenous communities and others are taking action to protect caribou, but the effectiveness of these actions is not yet known. Furthermore, changes on the landscape that affect caribou – both the industrial impacts and their mitigation – are also likely to affect a wide range of boreal wildlife that interact with caribou and their habitats, including not only wolves and deer, but many other iconic Canadian species such as moose, lynx, bears, and beavers. Understanding how caribou conservation fits within this broader tapestry of boreal forest ecosystems is

a key challenge for wildlife ecologists and managers.

This challenge is being taken up in UBC Forestry's Wildlife Coexistence Lab ("WildCo") by Dr Cole Burton, postdoctoral researcher Dr Joanna Bugar, and MSc student Erin Tattersall, who are using networks of camera traps to explore these complex wildlife community dynamics. A first step in assessing community relationships and conservation status is the development of accurate population counts. For nearly all boreal mammal species, documenting the number of individuals in a population remains a difficult task. The WildCo team has been combining camera trap data with new statistical models to simultaneously estimate abundance for a whole suite of interacting species, rather than following the typical, narrow focus on only 1 or 2 species of concern. Though caribou have been the primary focus for conservation efforts, providing a broader view allows us to understand which other species are sensitive to industrial impacts in the boreal, or which adapt well to disturbance.

Recent studies by Dr Burton and colleagues have shown that a wide-range of mammal species respond to industrial disturbances in northern Alberta, to the point that these anthropogenic effects are meeting or exceeding the effects of natural habitat variation. Documented responses have been highly variable across species, providing signals of wildlife "winners"

and “losers” in these changing landscapes. For instance, wolves, coyotes, lynx, white-tailed deer, snowshoe hares, and red squirrels were all positively associated with higher levels of human disturbance in one oil sands study area. Conversely, moose, black bears, red foxes and fishers were detected less often in more disturbed habitats. Many of these responses stem from changes in the forest structure: industrial disturbances convert mature forests into early seral vegetation, to the benefit of some species and the detriment of others. Similarly, linear disturbances like seismic lines may be preferred for movement or foraging by some species, while being avoided as risky by others. Improved understanding of these different responses, and of their consequences for species interactions, will be important in anticipating the community-level effects of continued industrial development.

Another key challenge is to understand how the boreal mammal community will respond when government and industry attempt to mitigate the impacts of development. For example, in response to concerns over caribou declines, several energy companies have initiated programs designed to restore seismic lines within caribou habitat. The goal is to reduce use of these lines by caribou predators and competitors, and thus return them to their natural state, through active replanting and protection of natural regeneration. One such effort is the Algar Caribou Habitat Restoration Program, situated with the range of the Algar caribou herd, about

70 km southwest of Fort McMurray along the Athabasca River. Led by members of Canada’s Oil Sands Innovation Alliance, this initiative involved hundreds of kilometres of mounding and tree planting to create movement barriers for predators and promote regeneration of vegetation to entice caribou and discourage their competitors (eg, deer and moose). Simply carrying out such restoration in this remote, boggy landscape is quite an accomplishment, but the critical question is whether it has the desired effect on caribou and other members of the boreal mammal community.

The WildCo team is studying the effectiveness of this project by monitoring wildlife responses to restoration across the Algar landscape. They are comparing the frequency of animal activity – as measured by camera trap photographs – on the restored seismic lines relative to unrestored lines, naturally regenerating lines, and off-line forest habitats. Three years after the restoration treatments were undertaken, and 2.5 years into monitoring, the camera trap data suggest that the restoration efforts are having some, but not all, of the expected effects. For example, wolves are using the most open (unrestored) seismic lines much more frequently than other line types, yet they don’t appear to be strongly deterred by the movement barriers created by active restoration. White-tailed deer, on the other hand, are using the restored lines much less frequently, perhaps because they provide less of the attractive early seral forage. So far, the team has seen

some evidence that caribou are using the restored lines more frequently, but the effect is small at this stage of the recovery process. The key question is whether these emerging effects will be strong and fast enough to reduce predation rates sufficiently to allow caribou populations to recover. A rigorous monitoring program, such as the one being developed by WildCo and its partners, is critical to evaluating the success of conservation efforts and informing management attempts to maintain healthy boreal forest ecosystems.

The current attention devoted to conserving woodland caribou is well warranted, both by federal and provincial policies, and by the species’ iconic status in Canadian culture. Nevertheless, a myopic focus on one species, without adequate consideration of the dynamics of other interacting species, could not only cause caribou conservation efforts to fall short, but could also leave our boreal forest ecosystems in disarray. A more holistic view should also extend to society’s conversations about energy development and forest resource management. Decision makers need to acknowledge the diversity of stakeholders, and consider the consequences of the interconnectivity we create and the relationships we alter. To truly debate the outcomes of resource development requires an understanding of all players on the landscape, including those without voices.

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Woodland caribou (camera trap photo)



Wolf (camera trap photo)