

QuickNotes

Science Summaries from fRI Research

Is virtual fence technology likely to reduce caribou-vehicle collisions in Alberta?

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Caribou face a multitude of threats, with human activity shifting home ranges and disrupting migration, and human activity and climate change altering habitat. Roads are a threat to caribou. In west-central Alberta, Highway 40, connecting Grande Prairie, Grande Cache and Hinton, is a two-lane highway with an average speed limit of 100 km/h and an annual average of 1,300 vehicles/day. This highway transects the À La Pêche caribou range; the herd must cross the highway twice a year to move between summer and winter habitat. Road traffic accidents are a source of caribou mortalities, reaching 32 individuals struck by vehicles in 1991 and 1992 alone.

The Aseniwuche Winewak Nation started a stewardship program called Caribou Patrol in 2012 in response to declining caribou populations, as caribou are an important cultural keystone species for the Nation. The Caribou Patrol conducts road patrols along Highway 40 during the fall and spring À La Pêche migrations, and periodically throughout the remainder of the year, looking for caribou on the road and diverting them off the road or alerting drivers to slow down. The success of Caribou Patrol is admirable but has a key limitation: the patrol only operates during daylight hours to maintain the safety of its patrollers. Therefore, a virtual fence operating in lowlight and nighttime hours could work in tandem with Caribou Patrol operating during daylight.

The virtual fence is a non-physical deterrent system designed to warn or deter animals from entering a road when vehicles approach, especially at night, dawn, and dusk. These devices are intended to be semi-permeable, as they do not have traditional full-height physical barriers and allow for movement during times with no traffic. They consist of posts along either side of the road (staggered ~25m apart). Sensors detect approaching vehicle headlights, which activate flashing amber and blue LED strobe lights as well as sounds to create a perceptual fence.



Objectives

We conducted a comprehensive literature review to assess the feasibility and challenges of applying a pilot virtual fence project for the À La Pêche caribou population within the Highway 40 wildlife corridor in Alberta, Canada.

Recommendations and next steps

The benefits of virtual fences are that they are more cost-effective than traditional fencing projects, they have the potential to be semi-permeable and enable natural movement patterns when vehicles are not present, there is a lower

physical footprint, and they can be flexible as ecological conditions change. The first peer-reviewed experimental application of the virtual fence technology to reduce roadkill, for wallabies and padamelon (a small marsupial), was a three-year trial in northern Tasmania, Australia. Fox et al.ⁱ concluded that the virtual fence reduced roadkill rates by ~50% for the target species but did not remove the risk of animal vehicle collisions altogether. However, Candy et al.ⁱⁱ ran a second trial in Tasmania in 2020, and found minimal differences in roadkill rates when the fence was switched on. Other Australian trials have found minimal effectiveness of the virtual fence for wombats and kangaroos. Virtual fence technology was deployed as part of the EU LIFE SAFE-CROSSING (LIFE17NAT/IT/464) project (life.safe-crossing.eu) across 36.5 km in Europe (Romania, Italy, Spain) between 2020 and 2022, targeting several species. The project team evaluated the efficacy of the virtual fence via 1) the number of road kills before and after the installation of the system along the road segment covered by the virtual fence and 2) reactions of animals recorded via camera traps and thermal camera imaging sessions. However, the efficacy of the virtual fence was not quantified statistically.

The effectiveness of virtual fences appears to vary by target species, road characteristics, and climatic conditions. In Canada—especially in Alberta—environmental conditions are highly variable. Road characteristics play a critical role in the efficacy of a virtual fence. Trials of the virtual fence have shown the fence performs better on straight road segments, where animals can detect and respond to the stimuli before reaching the road itself. On curved and steep roads (like sections of high collision frequency on Highway 40), animals have less time to react as they encounter the road (and vehicles) more suddenly, and as vehicle headlights will trigger the device at closer distances. Snow is present for roughly six months of the year (October through April), a period that overlaps with key caribou migration seasons. When these systems fail or perform inconsistently, such as during poor visibility and in adverse weather, collision risk increases, making it more dangerous for people and wildlife. Further, the scientific rigor of the pilot studies has been contested, and habituation of the deterrence stimuli by wildlife can undo the initial decreases in collision mortalities. Studies have shown that deer can habituate to reflectors in as little as five days. A similar risk exists for the virtual fence where repeated exposure to light and sounds, without negative consequences to reinforce a behavioural pattern, could reduce the efficacy of the deterrence and eventually result in habituation.

A pilot study assessing the functionality of virtual fence technology under environmental conditions typical of northern latitudes, combined with monitoring wildlife behavioural responses (specifically ungulates and caribou), would provide important information for evaluating the applicability and effectiveness of this technology long-term in northern systems.

Related

For a copy of the full literature review, contact the virtual fence project lead Chantelle Bambrick at cbambrick@friresearch.ca

ⁱ Fox S, Potts JM, Pemberton D, Crosswell D. 2018. Roadkill mitigation: trialing virtual fence devices on the west coast of Tasmania. *Australian Mammalogy*. 41(2):205–211. <https://doi.org/10.1071/AM18012>

ⁱⁱ Candy, S. G., J. A. Bunker, and B. Englefield. 2024. A Trial of a Virtual Fence to Mitigate Roadkill on an Unsealed Rural Road in Tasmania, Australia. *Animals* 14:1641.

