

Potential impacts of Wuskwatim Hydro Project on boreal biodiversity

Dr. Erin Bayne

Department of Biological Sciences

University of Alberta

Canada & Biodiversity

- Biodiversity can be defined as "the full spectrum of plants and animal life across ecosystems including: genetic diversity, species diversity, landscape diversity and ecosystem diversity."
- Canada is a signatory to the 1992 Rio Convention on Biological Diversity

Areas of concern

- Boreal caribou
- Boreal birds
- Invasion by non-native species

Woodland caribou

- Woodland caribou are a non-migratory species that exist in scattered herds at low densities in peatland environments
- Behavior is a “spatial separation” strategy for avoiding areas where predators such as wolves are common
- Threatened species in Canada with declines tending to be the most severe in areas of high linear feature density

McLoughlin et al. 2003. J. Wildl. Manage. In Press

Caribou & linear features

- At all times of the year caribou are less likely to use areas near linear features in Alberta
- Caribou particularly avoid roads but also avoid narrow features such as pipelines and seismic lines)
- Avoidance could be because they are sensitive to human activity but likely they are avoiding areas of high predator activity and/or abundance

Dyer et al. 2001. Avoidance of industrial development by woodland caribou. *J. Wildl. Manage.* 65:531-542.

Wolves & linear features

- Wolves use linear features to move from uplands into peatlands
- Radio-collared wolves are closer to linear features than expected by random chance in Alberta
- Wolves travel ~3X faster on linear features than in surrounding forest

• James and Stuart Smith 2000. J. Wildl. Manage 64:154-159

Coyotes & linear features

- Coyotes are not native species in the boreal forest
- Coyotes in boreal forest are ~3 times more abundant in areas with high densities of linear features & cutblocks in Alberta
- Coyotes use linear features to move in the landscape much like wolves, increasing their encounter rate and access to prey

• Bayne and Boutin 2004. SFMN Final Report - Confidential

Deer & linear features

- Deer are becoming increasingly common in boreal forest
- Deer in boreal forest are ~4 times more abundant in areas with higher densities of linear features & cutblocks in Alberta
- Increased deer means increased predators which increases predation risk on native species like moose and caribou

• Bayne and Boutin 2004. SFMN Final Report - Confidential

Human access

- Linear features often become travel corridors for people resulting in increased hunting/ fishing/ and overall levels of disturbance to areas
- Human caused mortalities of caribou in Alberta are 174m closer to linear features than would be expected by random chance

Boreal birds

- Boreal forest has highest diversity of breeding birds in North America (over 300 species)
- ~40% short-distance migrants, 40% long-distance migrants, and 20% resident species
- Means that 80% of all birds are under federal protection through the migratory birds act

Legal issues

- Of these species, 21 breed only in the boreal forest of Canada meaning we have an extremely high level of international responsibility
- Decline of long-distance migrants an area of particular concern with international implications
- Several legal challenges recently around whether Environment Canada is enforcing the migratory birds act

Habitat loss

- Removal of native vegetation will result in loss of habitat for forest specialists
- Depending on the types of forest the powerline removes, could result in loss of habitat for ~8,000 birds.
- Some species will benefit from the new habitat created by the powerline but these will tend to be generalist species of low conservation concern

Direct mortality

- Collisions between powerlines and migrating birds are likely to occur
 - North American estimates range from 10's of thousands to 174 million birds annually
- Electrocution of birds nesting or perching on towers, particularly birds of prey

Edge effects

- Effects of powerline can reach substantially beyond the EDGE of the linear corridor itself
- Edge is the place where plant communities meet or where successional stages or vegetative conditions within plant communities come together
- Edge Effects – Changes in the ecological processes at the interface of two plant communities relative to the core/interior of the individual communities

Types of edge effects

- Birds react to altered vegetation structure at some distance from powerline caused by microclimate differences
 - Increased wind speed results in greater blow down resulting in an opening of the canopy reducing suitability for forest interior species and increasing quality for edge species
 - Higher evapotranspiration reduces the moisture content of the leaf litter / soil resulting in reduced abundance of insect food for breeding birds
 - General consensus that effect width is about 3-5 times the height of the canopy

Altered predator – prey relationships

- Edges often used as movement/ invasion corridors by predator species resulting in reduced nesting success for birds nesting near edges
- Power poles often used as observational perches by predators and species such as brown-headed cowbird (invasive species in boreal forest)

Effects on bird movement

- Some forest songbirds are less willing to cross gaps in the forest > 50 m wide
- Limited gap crossing ability is assumed to be a response to increased predation risk
- Such behavior can affect dispersal patterns of juveniles which can have significant effect on population dynamics

Invasion of other non-native species

- Linear features often become point source establishment locations for non-native plants and insects
- Non-native species disperse along linear features by wind and human transport (particularly on machines)
 - Exotic earthworms
 - Noxious weedy plants

Summary

- Powerline will result in habitat loss and edge effects for animals like birds
- Magnitude of habitat loss depends on how wide an “edge effect” is considered
- Changes in normal predator-prey relationships should be expected and will increase with the cumulative effect of > numbers of powerlines
- Canada’s Biodiversity Strategy identifies invasive species as a key threat to its ability to fulfill the terms of the Rio declaration