Institute for Management & Innovation
UNIVERSITY OF TORONTO
MISSISSAUGA

Best Managment Practices for Future Wind Development in Canada's Grasslands

Mary-Kate Pizzuti
mk.pizzuti@mail.utoronto.ca
Supervisor, Andrea Olive

Introduction & Background

The demand for energy is increasing, and Canada's emissions will continue to trend upward if renewable, clean energy is not rapidly adopted. In particular, mitigation of greenhouse gas (GHG) emissions is of urgent need to reduce the effects of climate change on biodiversity.

In 2015, Canada ratified to the Paris Agreement and confirmed its commitment to reduce GHG emissions by 30% below 2005 levels by 2030 (Maciunas & de Lassus Sain-Genies, 2018). Later that year, Canada submitted its 2020 Biodiversity Goals and Targets including the conservation of 17% of terrestrial areas and inland water, and 10% of coastal marine areas. As of 2020, only 12.5% of Canada's land and inland water areas were conserved (Canada, 2021).

Preventing degradation of these important areas, which include habitat for species at risk, is one of Canada's vital means of conserving biodiversity and maintaining terrestrial ecosystem services.

As Canada does shift from fossil fuels to renewable energy sources that incorporate broad spacial landscapes, these changes come with their own environmental trade-offs. Canada's prairies have strong and consistent winds, making it a particularly well-suited area for wind energy development (Fargione et al., 2012).

Renewable energy and wildlife conservation a not incompatible goals, as many ecological concerns surrounding wind energy can be avoided, minimized, or mitigated.

Research Questions

1) How does wind energy development impact wildlife in the grasslands ecosystem?

2) What are the best management practices for future wind energy developers in the grasslands ecosystem?

Methodology

Literature Review

- Narrative Approach

- Researched and analyzed the impacts on biodiversity by onshore wind energy development and the effective mitigation methods that have been studied and reported on in various literature

Case Study Analysis

- Analyzed the case of two wind farms that were planned to operate in the grasslands of Saskatchewan

- Chaplin Lake Wind Farm Project (failed) and Blue Hill Wind Farm Project (successful), are of particular importance due to their situation within areas of the grasslands that are highly diverse, contain critical ecosystem habitats and breeding ranges, and also encompass powerful wind energy potential

- Multiple data sources were examined to understand the position of the various players and stakeholders such as local ENGO's, naturalists, local media, and the provincial government

Impacts and Best Management Practices for Mitigation Techniques

Phase	Impacts	Mitigation Strategy	Best Management Practice	Target species
Siting/ Planning	Direct mortality, habitat fragmentation and displacement, decrease species carrying capacity	Avoidance	Avoid siting near sensitive areas and vital habitats used for nesting, foraging, migration.	All groups and species of birds, bats- applied emphasis on endangered species and those more vulnerable to collision.
		Avoidance	Siting in marginalized landscapes	All wildlife taxa
		Avoidance	Avoid migration corridors	Ungulates
Construction	Behavior changes, displacement, noise disturbance, avoidance of habitat, shifts in habitat use	Avoidance	Implement nondevelopment buffer zones to separate infrastructure from lekking, nesting and brooding areas. Bury low- and medium power lines (discourage raptor perching)	Greater sage-grouse and greater prairie-chicken
		Minimization	Maintain and enhance woody vegetation to provide cover	Elk and mule deer
		Minimization	Restrict construction and traffic during sensitive time periods such as breeding and mating seasons, minimize road networks, and minimize fencing/ use wildlife friendly fencing where applicable	Ungulates and mammals
Operation	Direct collision mortality, acoustic masking, decrease breeding success	Minimization	Curtailment during sensitive seasons, when threatened species are present, and when collision prone species are observed	Birds
		Minimization	Acoustic deterrents	Birds
		Minimization	Ultrasonic deterrents	Bats
		Minimization	Curtailment during low wind conditions, and immediately after sunset	Bats
		Minimization	Increase cut-in speed	Bats
		Minimization	Shutdown turbines on demand during selective at risk periods	Birds and bats
		Minimization	Remove carcasses near turbines and reduce prey availability within wind farm	Scavenging birds
		Minimization	Increasing blade visibility through painted patterns or UV paint	Birds and bats that do not look down when flying
Decommissioning	Direct collision mortality, avoidance behaviors, decrease breeding success, noise disturbance	Avoidance	Repower old towers and remove towers with high mortality rates	All birds and bats
		Minimization	Replace smaller blades with larger ones and decrease rotor speed	Birds
		Minimization	Avoid during times of wintering, parturition, and other sensitive life stages	Ungulates and prairie grouse
Habitat Enhancement Measures- All phases	Unavoidable environmental damage from facility impacts during all phases of a wind farm	Compensation	Luring species vulnerable to collisions away from turbines through increasing availability of prey/ food offsite through artificial feeding stations	Scavenging birds
		Compensation	Artificial nesting platforms	Scavenging birds
		Compensation	Create fallows, hedgerows, bat-boxes, and new roosting habitats	Bats
		Compensation	Quantify impact using science-based tools to establish offset sites that maximize conservation value and biological value lost by development	All wildlife taxa

Conclusion

- As the demand for energy grows, the abundance of clean energy development and infrastructure has unavoidably begun to infringe on remaining wildlife and their habitat (Shaffer et al., 2019)

- The direct and indirect impacts of wind facilities on wildlife are a global issue

- Understanding these effects is crucial for facilitating the ability of provinces to make scientifically-informed decisions about the relative cost-benefit of various low-carbon energy solutions

- The application of adaptive management principles, the mitigation hierarchy, and the precautionary principle are common tools and strategies that should be applied carefully to the planning and management processes

- Applying these tools will work to ensure an equilibrium is met to permit low-carbon energy and safeguard significant wildlife species

References

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