TORONTO INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SCIENCE AND CLIMATE CHANGE · Vol. 1 No. 1 (2026)

Habitat Connectivity Corridors for Boreal Forest Wildlife Amid Fragmentation Pressures

Laura Bennett
Faculty of Forestry, University of British Columbia, Vancouver, Canada
l.bennett@example.org

Mikael Andersson
Department of Wildlife, Fish and Environmental Studies, Swedish University of Agricultural Sciences, Umeå, Sweden
m.andersson@example.org

DOI: 10.5281/zenodo.0000000

Abstract *— Boreal forest landscapes subject to expanding resource extraction and infrastructure development face increasing habitat fragmentation, raising concern for wide-ranging wildlife species dependent on landscape-scale connectivity. This study evaluates the effectiveness of proposed habitat connectivity corridors intended to link fragmented boreal forest patches across a region experiencing active forestry and energy sector development. Using species movement data collected through GPS collar tracking of a focal large mammal species alongside landscape resistance modeling based on land cover and disturbance density, we assess whether currently designated corridor zones align with observed animal movement pathways. Findings indicate partial alignment, with several designated corridors receiving limited actual use while unprotected alternative pathways showed disproportionately high movement activity, suggesting that corridor designation processes may have underweighted fine-scale terrain and disturbance avoidance behavior evident in tracking data. We propose a revised corridor prioritization approach incorporating movement-derived resistance surfaces alongside conventional habitat suitability criteria. These findings highlight the value of integrating empirical movement data into connectivity planning processes rather than relying primarily on habitat suitability mapping, with direct relevance for conservation planning in actively developing boreal landscapes.*

Index Terms *— habitat connectivity, boreal forest, wildlife corridors, forest fragmentation, landscape conservation*

I. INTRODUCTION

Boreal forest landscapes across regions experiencing active resource extraction face escalating fragmentation, threatening wide-ranging species that depend on landscape-scale connectivity for seasonal movement, dispersal, and genetic exchange [1]. Habitat corridors are widely promoted as a mitigation strategy, but their designation has often relied on habitat suitability mapping rather than empirical movement evidence [2].

GPS collar tracking technology has expanded opportunities to validate corridor designations against actual animal movement pathways, yet such validation remains uncommon in operational conservation planning [3]. Discrepancies between designated corridors and realized movement corridors could undermine connectivity conservation investments [4].

This study evaluates the alignment between currently designated boreal forest connectivity corridors and observed movement pathways of a focal large mammal species, using landscape resistance modeling informed by empirical tracking data.

II. RELATED WORK

Corridor prioritization frameworks have traditionally combined habitat suitability layers with expert-derived resistance surfaces, producing designations that are logistically tractable but rarely validated against telemetry data. Recent movement ecology research has demonstrated that empirically derived resistance surfaces frequently diverge from suitability-based surfaces, particularly in landscapes with heterogeneous disturbance patterns, though few studies have directly compared designated corridors against tracking-derived pathways at operational planning scale. Complementary evidence from adjacent literature further situates these dynamics within the broader field [5]. Related methodological precedents also inform the analytical choices adopted here [6].

III. METHODOLOGY

GPS collar data from a focal large mammal species were collected across a boreal region experiencing active forestry and energy sector development, alongside landscape resistance layers constructed from land cover classification and disturbance density metrics.

A. Movement-Derived Resistance Surface Construction

Step selection functions were fitted to the collar data to estimate resistance values associated with land cover types and disturbance proximity, producing a movement-derived resistance surface that was then compared spatially against currently designated corridor boundaries to assess alignment.

IV. RESULTS

Table 1 summarizes corridor alignment outcomes across four designated corridor segments, reporting the proportion of tracked movement events falling within each designated boundary.

Two segments showed limited overlap with observed movement, while unprotected alternative pathways nearby captured disproportionately high movement activity.

V. DISCUSSION

The partial alignment findings suggest that corridor designation processes underweighted fine-scale terrain and disturbance avoidance behavior evident in tracking data, particularly for segments B and D. This has direct implications for con-

Table 1. Alignment between designated corridors and tracked movement

Corridor Segment	Designated Length (km)	Movement Overlap (%)	Alternative Pathway Use (%)
Segment A	18	62	12
Segment B	24	31	47
Segment C	15	55	21
Segment D	21	28	53

servation resource allocation, as protection efforts focused on low-overlap segments may deliver limited connectivity benefit relative to investment in the alternative pathways animals actually use. Incorporating movement-derived resistance surfaces alongside conventional suitability criteria offers a more empirically grounded prioritization approach, though tracking data collection costs remain a practical constraint for widespread application.

VI. CONCLUSION

Empirical movement data should be integrated into corridor planning processes rather than relying primarily on habitat suitability mapping. A revised prioritization approach incorporating movement-derived resistance surfaces is recommended for actively developing boreal landscapes facing similar fragmentation pressures.

REFERENCES

[1] L. Fahrig, ”Effects of habitat fragmentation on biodiversity,” Annu. Rev. Ecol. Evol. Syst., vol. 34, pp. 487-515, 2003.

[2] S. C. Sawyer et al., ”Placing linkages among fragmented habitats: do least-cost models reflect how animals use landscapes?” J. Appl. Ecol., vol. 48, no. 3, pp. 668-678, 2011.

[3] T. Avgar et al., ”Integrated step selection analysis: bridging the gap between resource selection and animal movement,” Methods Ecol. Evol., vol. 7, no. 5, pp. 619-630, 2016.

[4] P. Beier and R. F. Noss, ”Do habitat corridors provide connectivity?” Conserv. Biol., vol. 12, no. 6, pp. 1241-1252, 1998.

[5] J. R. Squires et al., ”Combining resource selection and movement behavior to predict corridors for Canada lynx,” Anim. Conserv., vol. 16, no. 5, pp. 508-518, 2013.

[6] S. E. Nielsen et al., ”Modeling grizzly bear habitats in the Yellowhead ecosystem,” Ecol. Model., vol. 199, no. 1, pp. 51-63, 2006.