Estimating movement potential with individual-based models to estimate conservation action efficiency

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Abstract

Human land use and climate change can disrupt movement of terrestrial animals and therefore degrade movement potential of a population over a landscape. Quantifying and mapping movement potential can support management decision-making by identifying and locating movement barriers. Once identified, resulting negative impacts may be addressed. Tools are needed to forecast movement potential to evaluate the efficiency of conservation measures. In this study, we used a spatially explicit individual-based model previously developed for the southernmost caribou population in Quebec (Canada) to test the impact of climate change and road restoration actions on the caribou movement potential. We built several scenarios for future landscapes by combining climate change scenarios with different levels of road restoration. We predicted caribou movement on these landscapes and evaluated the effect of climate change and road restoration on caribou movement potential. Climate change impacts reduced caribou movement potential and only a complete removal of all secondary roads inside the protected areas was able to fully compensate for climate change impacts. Spatially explicit individual-based models coupled with landscape scenarios that derive movement potential can be an effective management tool to anticipate movement patterns for endangered species. They are useful to predict climate change impacts and evaluate the potential efficiency of conservation measures.

Keywords: Atlantic Gaspésie caribou, fragmentation, landscape restoration, movement model, protected area, road, spatially explicit individual, based model

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