Guiding decision-making to mitigate lynx-vehicle collisions using spatially-explicit individual-based models

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Abstract

Large carnivores are wide-ranging species, highly mobile and live in human-dominated landscapes where habitat destruction and fragmentation are important threats. In parallel, the terrestrial transportation network is getting denser and acts as a barrier for the movement of these animals as well as it increases the risk of collisions. The Eurasian lynx (Lynx lynx) is no exception and its populations in the Vosges and Jura mountains in France are at risk, with vehicle collision being the main source of mortality.

Transportation planners and land managers need models to assess the current situation and the consequences of potential future management actions. Integrating previous works on the Eurasian lynx, we developed a spatially explicit individual-based model to estimate lynx population viability. The model simulates lynx movement and demography accounting for its habitat and the risk of collision with cars and trains. The model is implemented with the new R package NetLogoR (http://netlogor.predictiveecology.org/) which provides classes and functions to easily create spatially explicit individual-based models in the R platform.

We show how to run different scenarios (e.g., adding a new road segment, reducing traffic in a specific area, or adding a road overpass) and assess the changes in lynx viability compared to the business-as-usual scenario. Overall, we provide new modelling tools to guide decision-making to mitigate wildlife-vehicle collisions.

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