Ranking Transportation Structures by their Potential to Facilitate Wildlife Passage: A Connectivity Modeling Approach

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Introduction

Wildlife movement is impeded by barriers in the landscape, including road infrastructure. We aim to highlight areas of the road network that are important for wildlife connectivity and determine which transportation structures should be prioritized for improvements to promote wildlife passage. We will rank 6,317 VTrans-managed transportation structures by their connectivity value for eight species. We present an example analysis for one species, American marten.

Figure 1. Placing a game camera under a Route 9 bridge to detect wildlife use. Data will be used to model wildlife connectivity.

Objective I: Statewide connectivity analysis

We used a circuit theory approach to model marten movement as the flow of electricity through a circuit[1]. Existing data on marten occurrence and landscape resistance were used to developed a connectivity map with the Omniscape tool (Fig. 2)[2,3,4]. To rank structures by their connectivity value, we averaged the amount of current within a 1600 m buffer around each transportation structure.

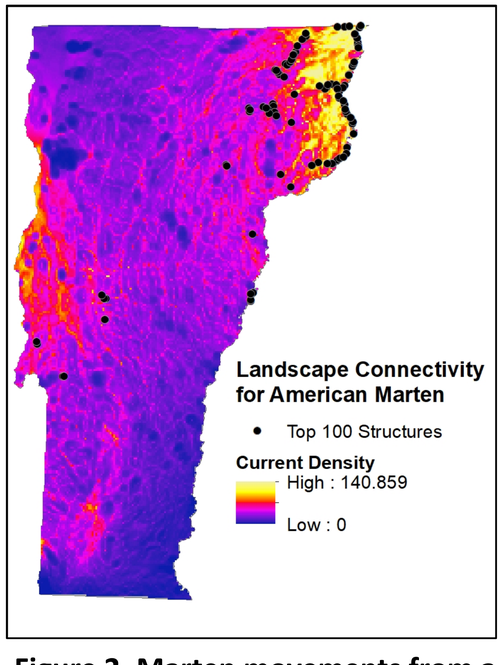

Figure 2. Marten movements from a circuit analysis with the 100 highest ranking structures for connectivity.

Objective II: Structure-scale connectivity analysis

The second stage of analysis occurs at each individual transportation structure. Here we combined data on marten occurrence and 0.5 m Lidar landcover data with expert-assigned resistance values to produce a connectivity map for each structure (Fig. 3). For marten, this has been tested at 25 of the top 100 structures identified in the statewide connectivity analysis, and those structures have been ranked again according to their fine-scale connectivity value within 50 m of the structure.

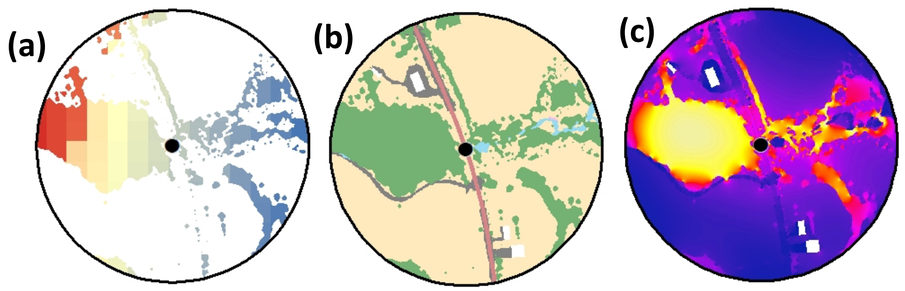

Figure 3. Inputs for the structure-scale analysis, within a 200m radius of a structure : a) map of marten occurrence probability, b) map of landscape variables with assigned resistance values, and c) output connectivity map showing areas of high movement flow in yellow.

Conclusions and Next Steps

We developed an approach to rank transportation structures according to their connectivity value at a broad statewide scale and a detailed structure scale using a combination of wildlife data and models, expert opinion, and fine-scale land cover information. This analysis will be completed for several species such as bear, moose, and deer and incorporated into a Terrestrial Organism Passage Screening Tool for VTrans (completion 2021). Our research will inform decisions on transportation structure management and provide information to maximize connectivity for wildlife across the road network.

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