Measuring non-Euclidean movement patterns in structured habitat networks using spatial capture-recapture models

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Abstract: Movement underpins much of evolutionary and ecological theory, and is often the result of complex relationships between organisms and their environments. Unless studied in isolation, however, animal movements are typically assumed to be symmetric irrespective of landscape heterogeneity (the Euclidean assumption), or asymmetry is incorporated using resistance surfaces that are defined *a priori*. Recently developed spatial capture-recapture (SCR) methods offer the flexibility to relax the Euclidean assumption and specify realistic models of animal movement while simultaneously estimating population density. Here we describe how observations of individuals' movements can be used to estimate landscape resistance using a least cost path approach. The method is developed using simulations that resemble a species with movement associated with, but not restricted to, a stream network. We then apply our model to SCR data collected from a population of American mink *Neovisonvison* - a riparian habitat specialist. Our results suggest that, encouragingly, density estimates are insensitive to mis-specification of the movement model (Euclidean vs. ecological distance), yet the Euclidean assumption does result in biased inference about movement, specifically estimates of home-range shape and size. While primarily developed for inference about density, estimating ecological distance using SCR models provides an important and powerful tool for understanding how movement patterns are influenced by highly structured habitat networks, and thus provide a more realistic understanding of movement ecology, resource selection and landscape connectivity.