Combining connectivity and habitat suitability models as decision-making tools: a case study in the south of France

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Abstract

Landscape connectivity, the degree to which a landscape impedes or promotes flows among resource patches, is an essential characteristic to maintain species long-term viability. Connectivity results from the interaction between landscape characteristics (composition and spatial organization of landscape elements) and the capacity of movements of the organisms considered. The spatial elements that influence the landscape connectivity is a central question in conservation ecology with direct implications for land planning. From broad-scale to fine-scale, movements across the landscape matrix are a key ecological process that influences the distribution, the survival, and maintenance of animal populations, especially in fragmented and heterogeneous anthropo-ecological systems. Here, we present preliminary results of spatially explicit habitat connectivity analysis. We analyzed the habitat suitability and the connectivity of the landscape using a set of animal species selected based on their sensitivity to structural and functional connectivity. We used Species Distribution Models (SDMs) in combination with connectivity analysis based on graph theory. The output maps of SDMs were validated by a combination of statistical assessment and expert knowledge. Least-cost corridor analysis was used to develop a resistance map in relation to weighted distance and the probability of connectivity index used to measure the level of connectivity in the landscape matrix. The methodology was applied in a study site located in the south of France, which includes the Etang of Thau and the terrestrial lands adjacent to it. This site is of particular ecological interest due to the presence of several protected areas, and an application interest due to the pressures from development and the upcoming implementation of territorial coherence program. The landscape-based approach used represents an example of decision-making tools useful for stakeholders but also will highlight the necessity to use connectivity models as a complement of SDMs.

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