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A distribution-oriented approach to support landscape connectivity for ecologically distinct bird species

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Abstract

Managing landscape connectivity is a widely recognized overarching strategy for conserving biodiversity in human-impacted landscapes. However, planning the conservation and management of landscape connectivity of multiple and ecologically distinct species is still challenging. Here we provide a spatially-explicit framework which identifies and prioritizes connectivity conservation and restoration actions for species with distinct habitat affinities. Specifically, our study system comprised three groups of common bird species, forest-specialists, farmland-specialists, and generalists, populating a highly heterogeneous agricultural countryside in the southwestern Iberian Peninsula. We first performed a comprehensive analysis of the environmental variables underlying the distributional patterns of each bird species to reveal generalities in their guild-specific responses to landscape structure. Then, we identified sites which could be considered pivotal in maintaining current levels of landscape connectivity for the three bird guilds simultaneously, as well as the number and location of sites that need to be restored to maximize connectivity levels. Interestingly, we found that a small number of sites defined the shortest connectivity paths for the three bird guilds simultaneously, and were therefore considered key for conservation. Moreover, an even smaller number of sites were identified as critical to expand the landscape connectivity at maximum for the regional bird assemblage as a whole. Our spatially-explicit framework can provide valuable decision-making support to conservation practitioners aiming to identify key connectivity and restoration sites, a particularly urgent task in rapidly changing landscapes such as agroecosystems.

Introduction

The ability of organisms to move through a landscape is a fundamental determinant of population persistence [1]. This is particularly true in human-impacted landscapes as successful movements may counteract the impacts of habitat loss and fragmentation by, for example, enabling organisms to forage over multiple habitat patches, rescuing populations from local extinction and promoting the colonization of new habitat patches [2–4]. Maintaining or