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## **Recasting the role of birds within an ecosystem service framework: what do population dynamics indicate?**

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Bird population trends are a widely adopted and broadly accepted proxy of the status of wider biodiversity health, and management for their conservation has had a significant influence on the development and design of UK and European biodiversity policy. With justification and support for conservation policy and management strategies increasingly focusing on the role of biodiversity in ecosystem function and the provision of key services and goods, there appears to be a growing perception that the role and importance of birds needs to be recast within this broader framework. As a result, management for bird conservation is increasingly being described and promoted as a mechanism for delivering ecosystem services. However, evidence to support the tacit assumption that there is a positive relationship between bird population trends and the flow of ecosystem services and goods, which often underpins this assertion, is at best limited. Here we present the results of two modelling exercises to test this, exploring how the response of farmland birds to land-use and land-management change relates to the impact of those changes on a range of both taxonomic groups and ecosystem services.

In the first example, we use predictions of the response of farmland birds, mammals, butterflies, pollinators and broadleaved weeds to a series of land-use change scenarios in agroecosystems to explore the merit of birds as indicators of wider biodiversity and, by extension, the ecosystem services it supports. In the second example, we explore how predicted trends of farmland bird species relate directly to the delivery of key provisioning, regulating and cultural services. Based on land-use patterns within a study site of Marston Vale, Bedfordshire, UK, we modelled crop yield, biomass and renewable energy production capacity, soil C, recreational opportunity and landscape heterogeneity at 1 × 1-km square level and compared this with predicted population growth rates of farmland bird species at the same spatial scale.

Both sets of analyses suggest that the strength and direction of any relationship between bird population trends and the health of wider biodiversity or delivery of ecosystem services is highly variable and, therefore, that the value of birds as indicators of these is limited. We stress that these results should not detract from the intrinsic value of birds, the ecosystem services they deliver directly or the role they have played in driving conservation policy and management. However, they do serve to emphasize the need to be realistic, objective and explicit about the role management for bird conservation can play in the delivery of ecosystem services.