



## Does afforestation increase bird nest predation risk in surrounding farmland?

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### ABSTRACT

Afforestation of agricultural land is increasingly used to deliver environmental benefits, but their effects on biodiversity remain poorly understood. This paper tests the hypothesis that afforestation changes predation processes in surrounding farmland, examining how the characteristics and landscape context of forest plantations affect predator (birds and mammalian carnivores) and key prey (rabbits and hares) abundances, and bird nest predation rates in Iberian cereal-steppes. Lagomorphs and predators were surveyed in fallow fields around 50 forest plantations, where predation rates were estimated using artificial nests set at 0, 100, 200 and 300 m from the forest edge. Recent plantations structurally similar to sparse (oak) or dense (pine) shrublands were associated with the highest hare and rabbit abundances, respectively, whereas both species avoided landscapes with high eucalyptus cover. In contrast, mature eucalyptus plantations showed strong positive effects on typical nest predators such as corvids and carnivores. Open farmland fragmentation favoured the abundance of lagomorphs and carnivores. Despite these effects and the high predation rate on artificial nests (49%), there was neither evidence for increased predation near plantation edges nor higher predation in fields with more lagomorphs and predators. However, predation tended to increase with cover by young oak plantations and overall forest plantation cover, to decrease with eucalyptus cover at both the local and landscape scales, and to peak in landscapes with intermediate edge densities. These results suggest that afforestation may have strong effects on bird nest predation rates by changing landscape composition and configuration, rather than by inducing local increases in predator and prey populations. Nevertheless, increased abundances of generalist predators associated with forest plantations may still be considered of conservation concern, thus supporting the recommendation for strongly restricting afforestation in areas important for open grassland birds. Where this is unavoidable, monitoring should be undertaken to provide early signals for bird population declines associated with predator increases, eventually triggering conservation action such as predator exclusion or removal.

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### 1. Introduction

Afforestation of former arable land is often used to deliver environmental benefits such as natural habitat restoration (Santos et al., 2006), reductions in soil erosion and surface runoff (García-Ruiz et al., 1996), and improvements in water quality (Hansen et al., 2007). Climate change has further increased the interest for large scale afforestation, as a tool to reduce atmospheric concen-

trations of carbon dioxide (Niu and Duiker, 2006). However, fears have been expressed that afforestation could negatively impact on biodiversity (Caparrós and Jacquemont, 2003; Stoate et al., 2009), mostly by replacing grassland, cropland and shrubland habitats of high conservation relevance with forest plantations inhabited with widespread species (Díaz et al., 1998; Shochat et al., 2001; Oxbrough et al., 2006). Afforestation also changes the amount and configuration of open habitats at the landscape scale, and may result in fragmentation and edge effects outside the area actually planted with trees (Ries et al., 2004; Ewers and Didham, 2006). Information to assess such effects is generally lacking (but see Bieringer and Zulka, 2004; Reino et al., 2009), but is essential to ensure that afforestation programmes do not adversely impact on biodiversity.

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