

Exploring alternative frameworks for ecological realism in spatial models of landscape change

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Integrating faunal responses into predictive models of land-use change is challenging because (i) species-specific responses are highly variable and it is impractical to model the response of every species, (ii) models of species richness may not capture changes in species composition, and (iii) most fauna models examine patch-level responses yet land-use change is a landscape-level process. Consequently, information on fauna in multi-disciplinary models tends to be either overlooked or overly simplified. We contend that predicting the consequences of land-use change requires landscape-level inference, in which ‘whole landscapes’ are considered as the unit of study, rather than focusing on individual landscape elements. Here, we explore an approach for incorporating faunal responses in spatial models that addresses the challenges listed above by searching for groups of species (‘landscape functional response groups’) that respond to similar landscape properties (e.g., landscape configuration or land-use composition).

We used models of species incidence ($N = 100$ species) in 24 ‘landscapes’ (each 100 km²) to identify landscape functional response groups relating to: (1) extent and configuration of native vegetation; (2) extent and composition of native vegetation; and (3) extent of native vegetation and dominant agricultural land-use. These groups provide a useful link between land management and ecosystem sustainability because they identify groups of species that respond to changes in particular landscape properties, and provide insight into how land-use change may affect species assemblages. We suggest coupling quantitative models of landscape functional response groups with projections of land cover change may provide a sound ecological basis for informing spatial models of land-use change.