
Incorporating ecological processes into biodiversity models alters the projected effectiveness of alternative management response options

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Abstract

Biodiversity outcomes under global change will be influenced by a range of ecological processes, and these processes are increasingly being considered in models of biodiversity change. Accounting for these processes could influence our understanding of which management responses to global change pressures are likely to be most effective, though the importance of these effects remains unclear. Here I demonstrate how the suitability of alternative management options to promote the retention of biodiversity can change dramatically when fundamental ecological processes are considered. We developed and applied both species-level and metacommunity semi-mechanistic modelling approaches, for a variety of taxonomic groups in different regions of Australia. Incorporating key processes (dispersal, community assembly, plasticity, genetic adaptation) not only altered the projected outcomes for species and communities, but also changed the identification of the most effective management response to retaining biodiversity into the future. While these new modelling techniques advance our capacity to account for ecological processes in biodiversity projections, a key challenge for future research will be to identify the suitable level of complexity for semi-mechanistic biodiversity models, to best balance realism and tractability.

Keywords: biodiversity, metacommunity, modelling, scenarios, tropical forest, restoration, configuration, protected areas, genetic adaptation

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