

Species viability in dynamic landscapes: Seeking robust spatial-temporal habitat configurations to guide land-use change

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The quality of landscapes in terms of biodiversity conservation depends on the amount and spatial-temporal arrangement of suitable habitats for species. This quality is not static: natural processes as well as socio-economic activities cause landscapes to be dynamic in space and time. Intensively used landscapes need to fulfill multiple services, like economic development and biodiversity conservation. When space is scarce, the fulfillment of these services can collide in areas desired for development, while being valuable for biodiversity. Conservation through a network of protected areas only, is insufficient in these landscapes with small and scattered protected areas in a matrix of intensely used land, as they lack resilience to disturbances. To obtain resilient ecosystem networks in such landscapes, off-reserve measures for biodiversity conservation are required. Dynamic conservation approaches, such as tradable permits, can be a robust and cost-effective supplement to protected areas if the spatial-temporal habitat dynamics that they create are within acceptable limits for species of conservation concern. While the application of dynamic conservation approaches is on the rise, proper assessment of the impact of land use change on species persistence and ecosystem resilience is limited. In this study, that is part of the ESF project EcoTRADE, we assess what knowledge is required for cost-effective application of dynamic conservation approaches, and we review the literature for available knowledge on species persistence in changing landscapes. Our results indicate that the majority of studies focus on evolutionary questions (e.g. what species properties provide better survival probabilities in changing landscapes), while conservation management requires guidelines about the level and type of dynamics acceptable in intensively used landscapes. Such guidelines are a prerequisite for cost-effective conservation in changing landscapes: Functionally framed in a dynamic conservation approach it facilitates the identification of areas where impact from economic development is minimal, and areas where restoration efforts are expected to return most biodiversity benefit. For a tradable permit market, such information is necessary to be able to design market rules that result in functional, robust ecosystem networks.