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Abstract

Numerous species have been pushed into extinction as an increasing portion of Earth's land surface has been appropriated for human enterprise. In the future, global biodiversity will be affected by both climate change and land-use change, the latter of which is currently the primary driver of species extinctions. How societies address climate change will critically affect biodiversity because climate-change mitigation policies will reduce direct climate-change impacts; however, these policies will influence land-use decisions, which could have negative impacts on habitat for a substantial number of species. We assessed the potential impact future climate policy could have on the loss of habitable area in biodiversity hotspots due to associated land-use changes. We estimated past extinctions from historical land-use changes (1500–2005) based on the global gridded land-use data used for the Intergovernmental Panel on Climate Change Fifth Assessment Report and habitat extent and species data for each hotspot. We then estimated potential extinctions due to future land-use changes under alternative climate-change scenarios (2005–2100). Future land-use changes are projected to reduce natural vegetative cover by 26-58% in the hotspots. As a consequence, the number of additional species extinctions, relative to those already incurred between 1500 and 2005, due to land-use change by 2100 across all hotspots ranged from about 220 to 21000 (0.2% to 16%), depending on the climate-change mitigation scenario and biological factors such as the slope of the species–area relationship and the contribution of wood harvest to extinctions. These estimates of potential future extinctions were driven by land-use change only and likely would have been higher if the direct effects of climate change had been considered. Future extinctions could potentially be reduced by incorporating habitat preservation into scenario development to reduce projected future land-use changes in hotspots or by lessening the impact of future land-use activities on biodiversity within hotspots.

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Associated Project:
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