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Loss and fragmentation of native forest in Entre Rios, Argentina: impact of future scenarios on bird populations

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Agricultural activities are one of the main causes of biodiversity loss on a global scale. In Entre Rios, Argentina, agricultural expansion has resulted in loss of habitat and increased spatial heterogeneity, which has increased in recent decades. An alternative to reconcile production with biodiversity conservation and their habitat it is to predict the impact of agricultural expansion on natural environments by evaluating feasible future land use scenarios and their impact on biodiversity. The objectives of this work were to analyze loss and fragmentation of native forest in Entre Rios between 1986 and 2008; to predict loss and fragmentation 2030 considering current land use trends and two possible land use change scenarios (one of them, native forest conservation and other characterized by reevaluation of raising cattle in native forest); and to evaluate their effects on bird populations. Our study design consisted of three agricultural landscape mosaics (30x30 Km) with different degree of forest fragmentation, where the area and spatial configuration of forest from satellite images were estimated. We then generated land use change models and scenarios using a Boosted Regression Trees approach and Land Change Modeler module in Idrisi. Models were validated through comparison maps and evaluating landscape dynamic, model performance and prediction accuracy. Additionally, we linked the different scenarios to the response of four bird species to forest fragmentation. Forest area in our study mosaics decreased by 30% between 1986 and 2008, number of patches increased by 22% and mean average size of remaining fragments was reduced by 30%. Deforestation rate was mainly explained by distance to locations, routes and fractal dimension. Modeled scenarios showed a trend towards a simplification of the landscape and a continuing transition of native forest to agriculture. According to these scenarios, avian species most sensitive to fragmentation tend to be restricted to large and interconnected patches, while more generalist species would not be as affected by fragmentation processes. Implementing land use policies and territorial planning aimed at mitigating the predicted negative impacts would have a substantial effect on deforestation rates and bird populations. The forest conservation scenario would reduce these processes to levels similar to those recorded in 2008. Our results highlight the importance of modeling future scenarios to understand the effect of the factors involved in land use change, to predict potential negative impacts on forest bird communities and to guide management and conservation policies.

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