The Pacuare Reserve Landscape: Land Cover Change and Implications for Biodiversity Conservation in Costa Rica

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Abstract

Habitat loss due to land use change (LUC) has been identified as the main cause of global environmental change, responsible for biodiversity decline and the deterioration of the ecological processes. In tropical regions, habitat loss and fragmentation have been driven by processes of LUC such as deforestation, agricultural expansion and intensification, urbanisation, and globalisation. The objective of this research was to determine the effects land use change on the process of habitat loss and the patterns of fragmentation in the surrounding landscape of the Pacuare Reserve (PR) in the Caribbean lowlands of Costa Rica. The PR is a private protected area of 800 ha surrounded by an agricultural landscape with a history of over 150 years of Musaceae monocultures (bananas and plantains) and pasture lands. Landsat satellite images from 1978 to 2020 were used to conduct a temporal analysis of LUC around the PR (years: 1978, 1986, 1992, 1997, 2001, 2015 and 2020). Patterns of change were explored using fragmentation metrics and new connectivity routes were drawn from the PR to other protected areas using the least cost path method. Overall, forest cover decreased during the study period at a rate of -4.8 % per year during the period of 1992–1997. In the year 2001 it reached its lowest cover and then increased at a mean annual rate of 1.6 %. A mean overall accuracy of 93 % was obtained for the land classification process. A clear fragmentation pattern was observed, as shown by a decreased in forest mean patch area and largest patch index and by the increase in patch density. Although forest cover increased in the last decade, fragmentation metrics suggest this recover happened in a spatially scattered manner, due to agricultural land abandonment. Connectivity maps showed the importance the already established coastal biological corridor has on the movement of species to and from the PR, however it also evidenced the lack of connectivity of this particular forest remnant to other inland protected areas and the need to promote restoration projects in the agricultural matrix.

Keywords: Biological corridors, connectivity, land use change

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