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ABSTRACT BOOK

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from Deforestation and forest Degradation plus the conservation, sustainable management and enhancement of forest carbon stocks (REDD+) in order to mitigate climate change. Policies aimed at achieving REDD+ objectives will have major impacts on future land use and resulting land cover, both inside and outside forest areas, which in turn affect biodiversity. Countries in both regions have committed both to supporting the achievement of the goals of the Convention on Biological Diversity (CBD), including the Aichi Biodiversity Targets in its Strategic Plan, and to addressing and respecting the safeguards developed by the UNFCCC to minimise social and environmental risks and enhance the benefits of REDD+ . Therefore, understanding how different policies may influence land use and biodiversity is essential to informed decision-making and identifying REDD+ policies that can help safeguard biodiversity.

We are assessing the potential impacts of REDD+ policies on biodiversity in Brazil and the Congo Basin by using an economic land use model (GLOBIOM), to project future land use and changes in land cover under different scenarios. The biodiversity impact of the different scenarios is then explored by assessing the locations of projected land use change in relation to ecological regions, nationally and regionally identified priority areas for biodiversity conservation and species ranges. The effect of potential differences between ecoregions in land use policies and their application are explored. The impacts on species depend on both their habitat requirements and their distributions relative to different types of land use change.

The different assessments of impacts on biodiversity can in combination inform both REDD+ and biodiversity policies. In Brazil, both the implementation, and the impacts, of the Forest Code differ between Amazonia and other biomes. This therefore has implications for the species living in the different biomes. Analysis of the impacts on threatened species of different assumptions regarding the implementation of the forest code can inform the classification of species threat status. It also allows an assessment of the compatibility of these different scenarios with achievement of Aichi Biodiversity Target 12 on reducing extinction of threatened species. In the Congo Basin two important future scenarios relate to the contribution of protected areas and forest concessions to reducing deforestation. The assessment results highlight that not only is the current network of protected areas unevenly distributed across the different ecological regions, but also the impact of their enforcement on deforestation varies between ecological regions. Expanding the network and strengthening the effectiveness of existing protected areas to support REDD+ objectives would also contribute to achieving Aichi Biodiversity Target 11.

P-2214-15

Multi-Temporal cover patterns using Landsat TM in the Tapajós National Forest and its surroundings: a case study

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Brazil's Tapajós National Forest (Flona Tapajós) — a designated Conservation Unit (CU) under the Sustainable Use Group created by Decree No. 73,684 (February 1974) — measures approximately 527,000 hectares (ICMBio, 2012). This CU has undergone constant changes in usage patterns and ground cover, especially in its surroundings, due to activities related to agriculture, livestock and timber harvesting. In June 2012, Federal Law No. 12,678 reduced the area of Tapajós Flona by approximately 4% of its original size. These areas began to be called buffer zones. According to Batista et al. (2013), this reduction may lead to possible threats in the maintenance of goods and services that Flona offers, provoking with the passing of years changes in the livelihoods of surrounding communities, thus increasing pressure on the protected area. Therefore, the aim of this work was to identify and map spatial distribution patterns of use and ground cover after the alterations in the landscape using data from spatio-temporal remote sensing sources. Satellite images from the TM sensor and the Landsat-5, from July and August of 1989, 2005 and 2009 were used. Digital processing was performed: atmospheric correction; geometric correction; mosaic; classification, post-classification and definition of use classes and land cover. We used the Geographic Information System (GIS) ArcGIS v.9.3 to construct thematic maps of the study-case, along with the following procedures: conversion of classified images to vector format for calculating the areas of thematic classes adopted this work; assembly and manipulation of geographic database and map algebra to detect changes between the years studied.In Flona Tapajós and its surroundings, between 1989 and 2005, the areas with Native Forest (NF), Regeneration (R), Recent Deforestation (RD) and Exposed soil (ES) that remained unchanged comprised respectively 62, 3, 2 and 2%. The altered areas (17%) underwent their most drastic changes in areas with NF (9%) and in 2005 were identified as R (2%), RD (3%) and ES (4%), while (2%) areas belonging to class RD had not been removed, reaching stage R 2005. The remaining 6% suffered conversion between ES and RD (Table 1). In the period 2005-2009, the areas with NF, R, RD and ES that remained unchanged comprised 61, 6, 3 and 6% (Table 2) respecitvely. It is noteworthy that 11% belonged to Water bodies in both periods. In the period 1989-2005 there was a 11% reduction in NF areas. In the second period, this reduction was approximately 1%. On the other hand, the area (R) made up only 4.4% in 1989 and grew to 7.6% in 2005, reaching about 11% of the area in 2009.Areas with RD represented 5% in 1989 and 7% in 2005 and 2009, indicating that the «Government Programme Zero Deforestation in the Amazon» shows evidence of consolidation in Flona Tapajós and its surroundings. This fits with the trend in ES, which went from 4% in 1989 to 19% in 2005 and 2009. It is noteworthy that, despite the reduced fragments located within Flona Tapajos, its environment, in particular its buffer zone, underwent a robust process of human disturbance. From the results, we concluded: Between 1989 and 2005 there was a higher percentage of loss patterns in the Native Forest than occurred from 2005 to 2009 and the patterns remained stable; the method of assessment of natural and non-natural landscapes can support the understanding of the observed dynamics of use and coverage. In addition, the assessment provides support for analysis of the effects of fragmentation in this landscape. The spatiotemporal dynamics in Flona Tapajós and its surroundings indicates the importance of legally protected areas for the conservation of goods and services offered by the people as part of the Amazon Forest Strategy. In integration with other information and analysis, these dynamics may uncover possible threats to the maintenance of goods and services that sustain the biodiversity of the region.

P-2214-16

Scenario analysis of the main drivers forces threatening the conservation of the Tapajós National Forest, Brazilian Amazon

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Several public policies were released in an attempt to integrate the Amazon to the other regions of Brazil in the 1960s. Amongst the main engagements on infrastructure, the government built ports, hydroelectric facilities, and opened highways such as the Transamazônica (BR 230), Cuiabá-Santarém (BR 163) and Belem-Brasilia (BR 316), triggering an aggressive process of landscape transformation and deforestation. At the same time, however, the government instituted legally protected areas in the region, such as the Tapajos National Forest (FLONA), in 1974. The road was extended in 2012 and is now part of a regional complex, between two major highways in the region. The Tapajós National Forest suffers influence of the Transamazônica highway (BR-230) in the South, and the Cuiabá- Santarém highway (BR-163) located in its Earsten side, which leads to Santarém and Itaituba. Despite all the pressures generated by its surroundings, the protected area has presented suitable conservation indicators. However, it is noteworthy that the west side of Pará concentrates the greatest number of projects, as the seven hydroelectric power plants, the Cargo Transhipment Stations (ETC), and also the paving of highways BR-163 and BR-230. Thus, the spatiotemporal analysis intends, not only to provide a description of changes over time, but also to point out future trends and identify higher-pressure areas. This study addresses efforts to investigate landscape changes in the Tapajós National Forest and its surroundings, which covers a total area of 19,627 km², including the municipalities of Belterra, Santarém, Aveiro, Rurópolis, and Placas. The literature review supported the selection of change drivers.

Considering the infrastructure, we selected roads, municipal offices, land tenure (settlements, Conservation Units and Indigenous Lands) and localities. Biophysical elements included climate variables such as rainfall and annual water deficit, altimetry and slope. All variables were crossed with land use data made available by the project TerraClass (INPE) for 2008 and 2010. For each municipality was sought information on crop, livestock and plant extraction through production to subsidize economic data provided by the results of spatial analysis process. Data were spatialized by using the geostatistics analysis, modeling and scenario generation were operated in the DINAMICA software that provided a detailed analysis for each vector element of change in the landscape, in addition to its role in the spatial dynamics of the study area.

The results showed that amongst the variables used as landscape transformation vectors, the roads appear to be the main drivers of change in every scenario, which means a change in the forest with different production systems. Taking into account the total area analysed, sites from Rural Settlement present more probability for transitions. The remaining areas with most probability for transitions are those with the lowest declivity values, who use agricultural machinery on the yearly cultivation of soy and corn. The remaining transitions follow the deforestation pattern, known as fishbone, along the Transamazonica highway. Inside the National Forest, the road that connects the São Jorge Community to the Tapajós across the Forest, at the Km 67 on Highway 163, is a major anthropic pressure. The evidence to this fact is that in 2012 this community was no longer under the control of ICMBio. In the map, the yellow and red dots indicate the places with higher chance of changing in the year 2030. According to the map, there are two zones of concern: the South side of FLONA, for the settlements controlled by INCRA (National Institute of Colonization and Agrarian Reform); the West side, where the Santarem-Cuiabá road is being renewed. The South side is a major concern for biological conservation given the intense use of the soil by farmers from the Settlements. The altitude, intense rainfall rates, the areas for settlements, and the predicted scenario for the year 2030 are elements that strengthen the need of Integrated Crop-Livestock-Forestry Systems to relieve the pressure on the south side of the Tapajós National Forest. Based on the results, we conclude that the emancipation of the São Jorge Community entails a further loss in the total area of FLONA for 18 years scenario, therefore leading to a threat for this Conservation Unit. In addition, it is recommended that the ICMBio should have a more strict access control to the Tapajós River.

P-2214-17

On the need to integrate microclimates and thermal limits when forecasting warming tolerance of organisms

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The impact of warming on the persistence and distribution of ectotherms is often forecasted from their warming tolerance—inferred as the difference between their upper thermal limit and habitat temperature, which is usually taken as the macroclimate temperature. Ectotherms, however, are thermally-adapted to their microclimates, which can deviate substantially from macroscale conditions. Ignoring microclimates can therefore bias estimates of warming tolerance. We compared warming tolerance of a leaf miner insect across its ontogeny when calculated from macro- and microclimate temperatures. We used a heat balance model to predict experienced microclimate temperatures from macroclimate, and we measured thermal limits for several life stages (egg, larval stages 4 and 5, and pupae). The model shows a concomitant increase in microclimate temperatures and thermal limits across insect ontogeny despite they all experience the same macroclimate. Consequently, warming tolerance, as estimated from microclimate temperature, remained constant across ontogeny. When calculated from macroclimate temperature, however, warming tolerance was wrong by over 7-10°C depending on the life stage. Therefore, large errors are expected when predicting persistence and distribution shifts of ectotherms in changing climates using macroclimate rather than microclimate.

P-2214-18

Inferring the effect of climate change on dispersal-limited species in the Brazilian Atlantic rainforest with collection data and targeted field sampling

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Inferring the effect of global change is especially difficult in tropical biodiversity hotspots. These places shelter a large and poorly known part of the world's biodiversity, with many species that cannot track environmental changes due to their limited dispersal ability. Tropical hotspots are also submitted to the fastest man-induced environmental changes. Therefore, even strongly targeted field samplings cannot be fast and comprehensive enough to provide knowledge for taking management and conservation decisions. Sampling needs to be completed by data already obtained and accumulated for decades in Museum collections. Better than being simply supplementary, these data are often critically complementary, since they represent the only available information for parts of natural ecosystems that are already largely destroyed, allowing for composing more real models of species requirements and distributions. We carried out a study to understand the effect of climate change on one of the most remarkable hotspots of biodiversity, the Brazilian Atlantic rainforest, fragmented in thousands of remnants, and extending on more than 3000 km from Nordeste to Uruguay. Our goal was to evaluate the ability of dispersal-limited and poorly-known species to survive climate change and also to assess how much collection data from Natural History Museums complement a targeted field sampling. We focused on one model organism, the saprophagous insect genus Monastria Saussure, 1864 (Dictyoptera, Blaberidae) endemic of the whole rainforest hotspot, abundant but still poorly known, dispersal-limited and unable to track climate change.

We conducted a targeted field sampling by visiting 67 locations distributed all over the Atlantic rainforest in geographical and altitudinal extremes and including all forest physiognomies, and by also sampling "secondary" forests and areas with other land uses. This was complemented with specimens from collections from 13 Natural History Museums. We used the Species Distribution Model (SDM) MaxEnt to model present and future potential habitats based on sets of 19 Bioclim climate variables. For current climate, we used the data from 1950-2000 provided by Worldclim. The habitat modeled with collection data nicely overlaps in 89% that obtained with targeted field sampling. It covered almost the entire range of the 19 climate variables assessed with targeted samples, which shows how useful it can be to consider it.

In order to assess the amount of habitat available for Monastria in future climate we used two climatic models for 2050 and 2070, derived from climate surfaces IPCC - HadGEM2-ES and MIROC5 (http://www.worldclim.org, IPCC 2007). For each model applied to pooled data sets, we used two outputs (RCP 4.5 and 8.5), representing roughly a pessimistic and optimistic greenhouse scenario according to CO2 emissions. We already know from previous studies that the Monastria with apterous females is unable to move between remnants of primary forest by using inhospitable matrix (grasslands, diverse plantations) or "secondary" forests where it is never found. We then searched the extent of forest remnants that are capable to host Monastria now and in the projected future climates. Our results point for a critical situation in which a maximum of 4% of the present distribution area will fit Monastria's habitat requirements in the near future. This calls attention to the need for considering the most frequent case of dispersal-limited species in relation to habitat connectivity when evaluating the potential effect of climate