UPPER PARAGUAY RIVER BASIN NATURAL VEGETATION COVER

Monitoring alterations in vegetation cover and land use in the Upper Paraguay River Basin Brazilian Portion

Period of Analysis: 2002 to 2008

Bacia do Alto Paraguai
Conservação e Sustentabilidade

Introduction

The Upper Paraguay River Basin encompasses international frontiers and occupies an area of 620,000 km², 60 % of which lie in Brazil, 20% in Bolivia and 20% in Paraguay. The Pantanal – the largest inundated area on Earth- lies in the lowland floodplain of the basin and is surrounded by highland plateaus on the Brazilian and Bolivian sides.

To gain a better understanding of the dynamics of vegetation cover and land use patterns of part of that vast territory, five Brazilian non-governmental organisations – CI-Brazil - Conservation International, ECOA, Fundación AVINA, SOS Pantanal Institute and WWF-Brasil – joined forces to conduct a study designed to map land use patterns in the region for the period 2002 to 2008.

The group was able to count on a considerable contribution from research staff attached to Embrapa Pantanal who participated in several stages including the phase of methodological adaptations and especially, in the validation of the results, using fieldwork information. The project only contemplated the part of the basin that lies within Brazilian territory and which is divided between the states of Mato Grosso, with around 40% of the basin area and Mato Grosso do Sul, with the larger portion.

The results of the mapping reveal clear differences in the dynamics of land use processes between the highland areas and the floodplain where the Pantanal is located. The highland areas are characterised by the extensive presence of agricultural and livestock-raising activities while in the flood plain the cattle ranching is of more extensive, less intensive nature and puts less pressure on the original vegetation cover. In the highland region, natural vegetation now covers only 42% of the area whereas in the lowland flood plain the percentage is almost 87%.

The study results show that it is perfectly feasible to harmonise productive activities and the natural environment, provided the activities are adapted to environmental conditions and produce the lowest possible impact on biodiversity and other ecological services provided by the ecosystems. The present conserved condition of the Pantanal not only represents an immense natural capital in the upper Paraguay basin but it is also a good example of production processes being properly adapted to the environment where they take place.

That scenario is totally different to the one that prevails in the highland region of the basin where the consequences of a series of grandiose plans for developing Brazil's central region, that encompassed the Pantanal and the Cerrado biome have shown themselves in the form of land settlement and land use processes that have ignored the intimate natural connection between the high plateau regions of the basin and the great lowland flood plain. The most glaring and notorious example of such consequences can be found in the Taquari River basin.

If there are no changes made to current land settlement and land use policies and the environmental degradation that is now going on in the highland areas of the basin is not stopped, then the future of the Pantanal and its immense natural capital will be seriously at risk. The Pantanal needs to be protected.
The Pantanal cannot be addressed in isolation. The highlands must be taken into account because it is there that the springs and headwaters of the rivers that flow into and form the Pantanal are to be found.

We believe that this study can contribute to joint planning of land settlement and land use processes by the governments of the two Brazilian states that share the Pantanal – Mato Grosso and Mato Grosso do Sul – and that it may also provide supporting information to enable a greater degree of integration of the Ecological and Economic Zoning processes and the State Water Resource Management Plans of those states. Furthermore, the institutions that have been responsible for the mapping project hope that it will be made full use of in the discussions on a national policy for the Pantanal that takes into due consideration the highland plateaus surrounding it.

Institutional Articulation of the Project

The project was made feasible by means of a partnership formed by the following non-governmental organisations:

CI-Brazil / Conservation International
Ecoa – Ecologia e Ação
Fundación AVINA
SOS Pantanal Institute
WWF-Brasil

Technical staff of the partner institutions, Embrapa Pantanal, SOS Mata Atlântica and ArcPlan, the company responsible for executing the project, defined the methodologies, carried out the work and validated the results.

General Characteristics of the Project

The mapping project was carried out in the Brazilian portion of the Upper Paraguay River Basin which encompasses the floodplain region known as the Pantanal and the headwaters of the rivers that lie in the highland plateaus where the predominant vegetation is Cerrado as shown in the figure below:

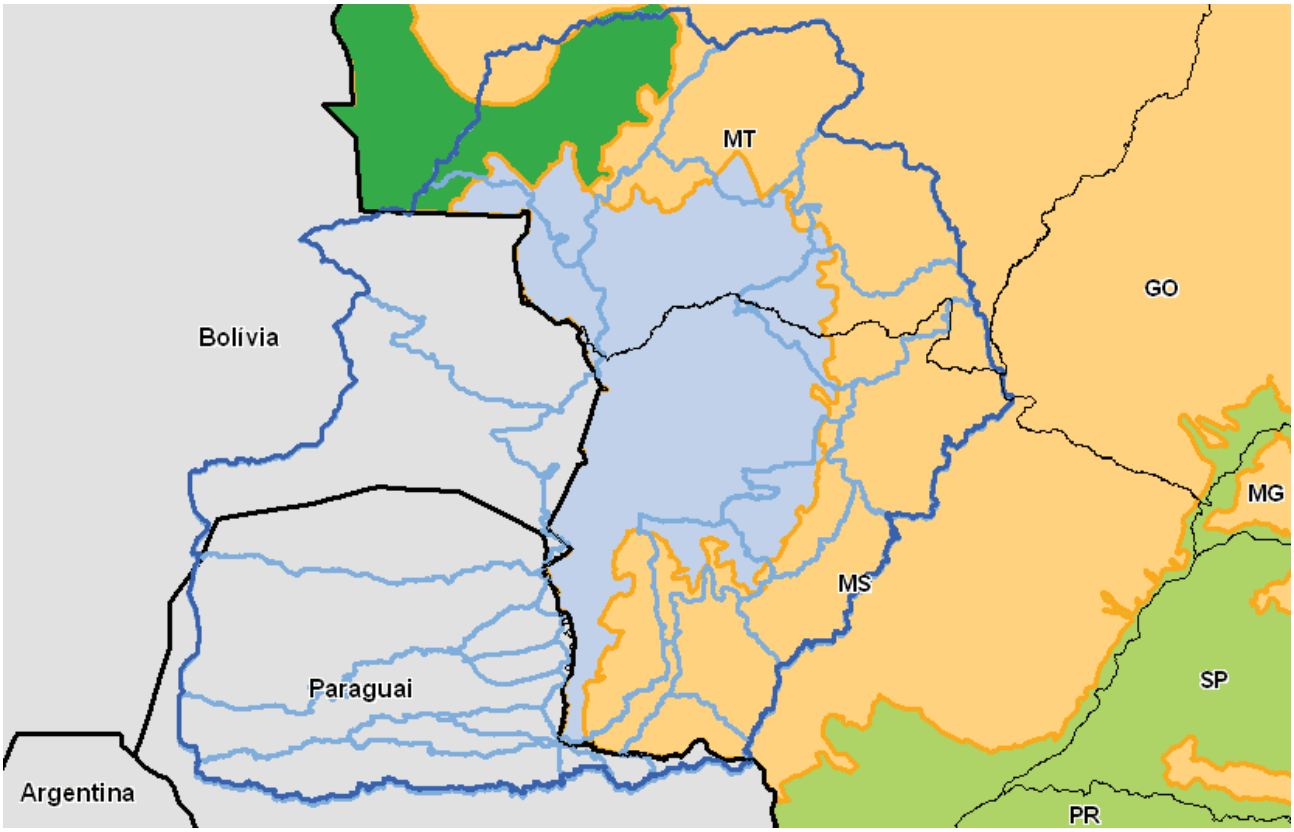

Fig. 1 - Upper Paraguay River Basin outlined in dark blue and the divisions between sub-basins in light blue. The area in solid light blue marks the Pantanal biome, in dark green the Amazon biome and in orange, the Cerrado biome, according to the IBGE 2004 biomes map.

Project Objectives and Products

The overall aim of the project was to produce technical information obtained by monitoring natural vegetation cover and land use in the and make it readily available to support public policy-making in the federal, state and municipal spheres and enable adequate management of the Basin.

A complementary objective was to make a database available to researchers and other interested parties with spatial data on land use that will support research efforts and analyses and thereby contribute towards consolidating a more extensive body of knowledge concerning the area of the project.

Among project products are an executive summary which sets out some preliminary analyses of the results, the mapping in shapefile format that was produced on the basis of the monitoring carried out for the period 2002/2008, and a consolidated technical report with full details of project procedures and results.

Brief Description of the Methodology

First, all the available studies and data on the project area needed to further the work were compiled.

The criteria to be adopted in the work of interpreting the images and the classification categories and legends to be adopted were defined in technical meetings between project staff and specialists from the academic world and from Embrapa Pantanal. One of the most important concepts that underpinned the interpreting work was to consider natural grassland used as pasture to be considered as a category of natural area. An area was only held to be 'anthropised' when it had been converted from some other category into pasture as in the case of planted pastureland.

Probio (Programme for the Sustainable Use of Brazilian Biological Diversity) 2002 project data was selected as the principal reference material. The first stage of the project involved a thorough revision and enhancement of detail of Probio data using a scale of 1:50,000, and the very same images used in 2002. The vector base was then compared with the Landsat TM for 2008 and the changes in land use observed were duly interpreted.

Validation of the data interpretation made use of high-resolution images and the interpretation key was also validated in the field in excursions made by car, boat and plane. After data interpretation had been completed technical meetings were held with specialists appointed by Embrapa Pantanal and they made a further contribution to the validation and correction of the interpretations.

The analysis to determine the degree of accuracy of the mapping using CBERS HRC images with a spatial resolution of 2.5 metres showed an accuracy of 96% without identifying any monitoring errors for the period 2002/2008.

Analysis of Results

The results of the mapping was a set of information on the present situation of the Basin (Base year 2008) and on the evolution of changes in vegetation cover and land use in the area for the period 2002 to 2008.

The results underscore the strong differences in settlement and land use patterns between the highland plateau region of the basin where the headwaters of all the major Pantanal rivers are to be found and only 41,8% of the natural vegetation remains; and the lowland floodplain usually known as the Pantanal which still retains 86,6% of its natural vegetation.

The 2008 data shows that the most common anthropic use made if the Basin area is for raising cattle, an activity that occupies 11.1% of the anthropic area of the floodplain area and 43.5% anthropic area in the highland plateaus. Agriculture only occupies 0.3% of the floodplain and 9.9% of the highlands.

Results also show that from 2002 to 2008, 3,666 km² of natural vegetation were converted to anthropic use in the floodplain, representing 2.4% of the total floodplain area and 2.9% of its total natural area. In the highlands 8,796 km² of natural vegetation were converted to anthropic use, corresponding to 4% of the total area of the highlands and 9.7% of their natural vegetation cover.

Next Steps

Project results will be made available to federal, state and municipal government institutions, to non-governmental organisations, and academic and research institutions in activity in the region.

Reports setting out all the processed data and the complete mapping in shapefile format together with all the satellite images used will also be made readily available. As a result, institutions with access to the information will be able conduct analyses in greater depth and contribute to creating a more solid understanding of the processes in course in the region.

The database produced will also serve as base for future monitoring of vegetation cover and land use in the Upper Paraguay River Basin and can be periodically reviewed and revised to incorporate criticisms and suggestions of partner entities conducting such reviews.

It is hoped that the work undertaken has contributed towards a deeper understanding of the dynamics of processes occurring in the region and that such understanding will in turn be transformed into actions to support conservation and to regulate sustainable land use.

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Bacia
do Alto Paraguai
Conservação e Sustentabilidade

Articulation of the Project

Presented by:

CONSERVAÇÃO INTERNACIONAL BRASIL

20 anos ecoa

AVINA

Pantanal SOS

WWF Brasil

Support

Embrapa Pantanal

SOS MATA ATLÂNTICA

Execution

ArcPlan