

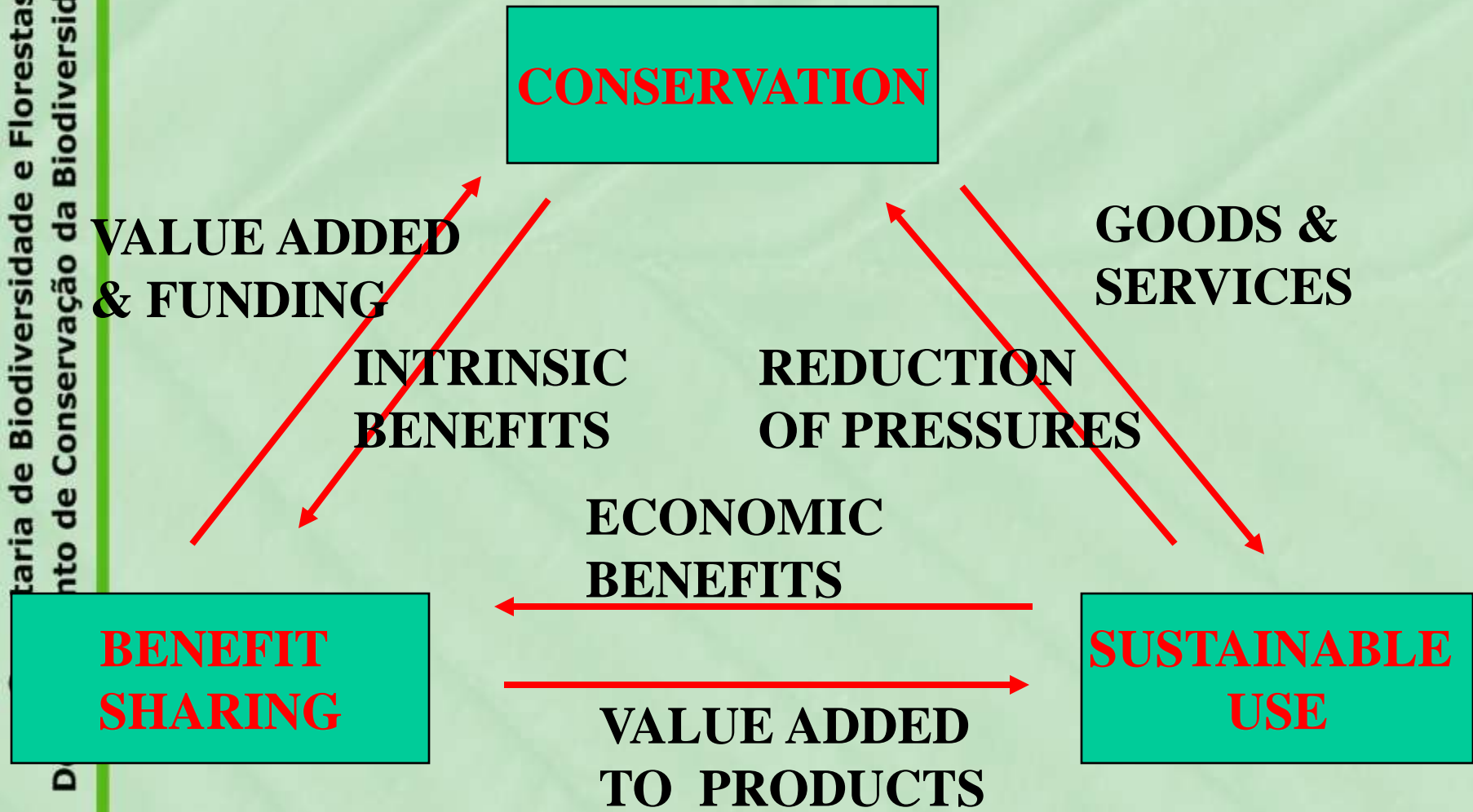
# Challenges to Monitor and Forecast Biodiversity Loss in Brazil

Braulio Ferreira de Souza Dias

Director, Department for Biodiversity Conservation,  
Ministry of the Environment, Brazil

“Modelling Biodiversity Loss in Brazil with the GLOBIO3 Model” March 24-26, 2009 Rio de Janeiro

# RELATIONSHIP BETWEEN THE THREE OBJECTIVES OF THE CBD



# Strategic Plan of the CBD [COP Decision VI/26] & Action Plan adopted at the Sustainable Development Summit in Johannesburg (2002)

“Parties commit themselves to a more effective and coherent implementation of the three objectives of the Convention, to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.”

# HOW MANY SPECIES ARE THERE IN OUR PLANET? 1, 10 or 100 millions?

S  
S  
E  
N  
C  
H  
I  
R  
I  
G  
O  
L

LOG SIZE OF ORGANISMS

INSECTS

Ministério do Meio Ambiente - MMA

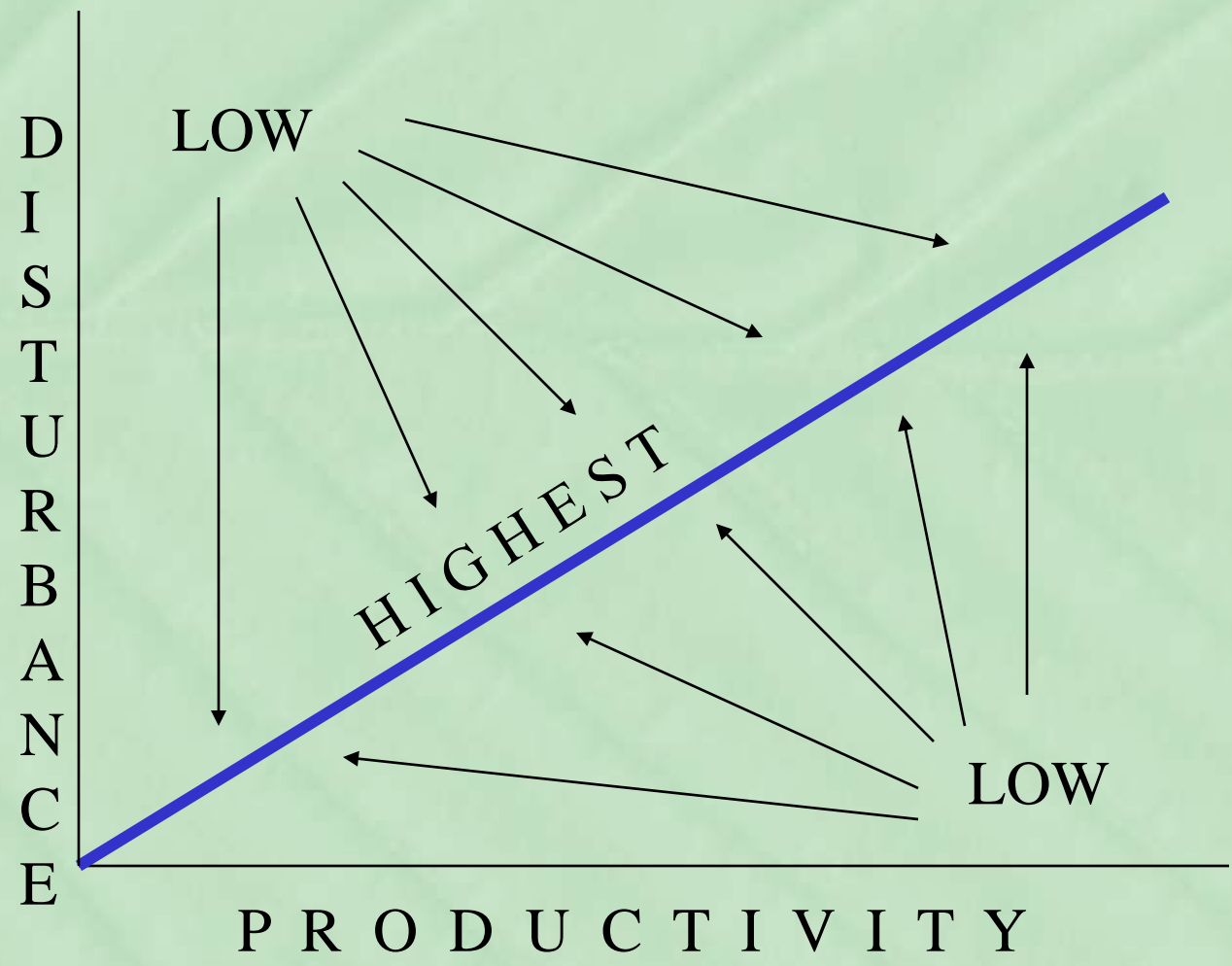
Secretaria de Biodiversidade e Florestas - SBF

Departamento de Conservação da Biodiversidade - DCBio

# TYPES OF BIODIVERSITY

- Number of different biological types  
[RICHNESS or COMPLEXITY]
- Relative abundance of biological types  
[EQUITABILITY or HETEROGENEITY]
- Degree of difference between biological types  
[ex.: TAXONOMIC DISTANCE,  
BETA DIVERSITY or COMPLEMENTARITY]
- Mixture of biological types  
[COMPOSITION]
- Number of interactions among biological types  
[ex.: PLEIOTROPIC EFFECTS, ECOLOGICAL  
WEB]

# DETERMINANTS OF BIODIVERSITY



# DETERMINANTS OF BIOLOGICAL DIVERSITY

- Productivity or Availability of Resources (energy, water, substrate and nutrients)
- Disturbance Regime and Perturbation (cosmic, tectonic, climatic, biological, anthropic)
- Intensity of Biotic Interactions (competition, predation, mutualism, symbiosis)
- Sexual Reproduction (recombination)
- Original Stocks and Dispersal Opportunities (history, barriers, distances)
- Socio-economic Factors (land use and urbanization/industrialization)

# CHALLENGES FOR SCIENCE AND TECHNOLOGY

- REDUCE UNCERTAINTIES
- MAKE PREDICTIONS
- OFFER SOLUTIONS



DISTURBANCE and PERTURBATION  
are dependent of time/space scales

DISTURBANCE refers to any change  
that alters the current state of a  
system

PERTURBATION refers to changes  
outside the NORMALITY of a system  
[=stress new to the ecosystem or stress  
beyond normal range, for a given  
time/space scale]



**Map of  
Continental  
Biomes of  
Brazil  
Escale:  
1: 5.000.000  
IBGE & MMA**



# Map of Ecoregions in Brazil (Source: IBAMA, 2003)



Ministério do Meio Ambiente - MMA

Secretaria de Biodiversidade e Florestas - SBF

Departamento de Conservação da Biodiversidade - DCBIO

# The Brazilian National Biodiversity Strategy and Action Plan – recent policy instruments

- Principles, general guidelines, components and goals – Decree 4339, of August 22, 2002
- Structure, composition and mandate of PRONABIO & CONABIO – Decree 4703, of May 21, 2003
- Biodiversity Priority Areas for the Brazilian Biomes – Decree 5092, of May 21, 2004 and MMA Instruction 126, of May 27, 2004, updated by MMA Instruction 9, of January 23, 2007
- Priorities and Guidelines for the Action Plan to implement the National Biodiversity Policy – CONABIO Decision 40, of March 2006
- National Biodiversity Targets for 2010 – CONABIO Resolution 3, of December 21, 2006

# National Biodiversity Policy Decree 4339, of August 22, 2002

- 19 principles,
- 10 general guidelines,
- 7 components,
- 27 major goals and
- 285 specific goals

# National Biodiversity Policy - Components

- 1 - Biodiversity Knowledge
- 2 - Biodiversity Conservation
- 3 - Biodiversity Components Sustainable Use
- 4 - Biodiversity Monitoring, Evaluation, Prevention and Impact Mitigation
- 5 - Access to Genetic Resources and to Associated Traditional Knowledge and Benefit Sharing
- 6 - Education, Public Awareness, Information and Publicity about Biodiversity
- 7 - Legal and Institutional Strengthening for Biodiversity Management

# Guidelines and Priorities of the Action Plan to Implement the National Biodiversity Policy (PAN-Bio)

2006



Ministério do Meio Ambiente

**Diretrizes e Prioridades do Plano  
de Ação para Implementação da  
Política Nacional da Biodiversidade**  
**PAN - Bio**

# National Biodiversity Program and Commission – Decree 4703/2003

- National Biodiversity Program – PRONABIO, revised objectives and biomes: Amazon, Pantanal, Cerrado, Caatinga, Atlantic Forest, Pampas, Coastal & Marine Zone
- National Biodiversity Commission – CONABIO, mandate: to coordinate CBD and PNB implementation
- National Biodiversity Commission – CONABIO, composition: 10 government & 10 non-governmental members (meets regularly every two months)



# Biodiversity: the unknown

- Currently about 200,000 species are known from Brazil
- A conservative estimate suggests this represents less than 10% of the total species richness of the country
- Current estimates put the total number of species on earth ranging from 1 to 100 million - an uncertainty of 2 orders of magnitude
- A recent study on the bacteria found on the forest canopy of our Atlantic Forest discovered that only 3% is known to science

Assessment of  
the Scientific  
Knowledge on  
the Brazilian  
Biodiversity  
[updated edition]  
MMA, 2006

# Avaliação do Estado do Conhecimento da Biodiversidade Brasileira

Coordenadora: Thomas Lewinsohn



# RICHNESS OF BRAZIL'S BIODIVERSITY

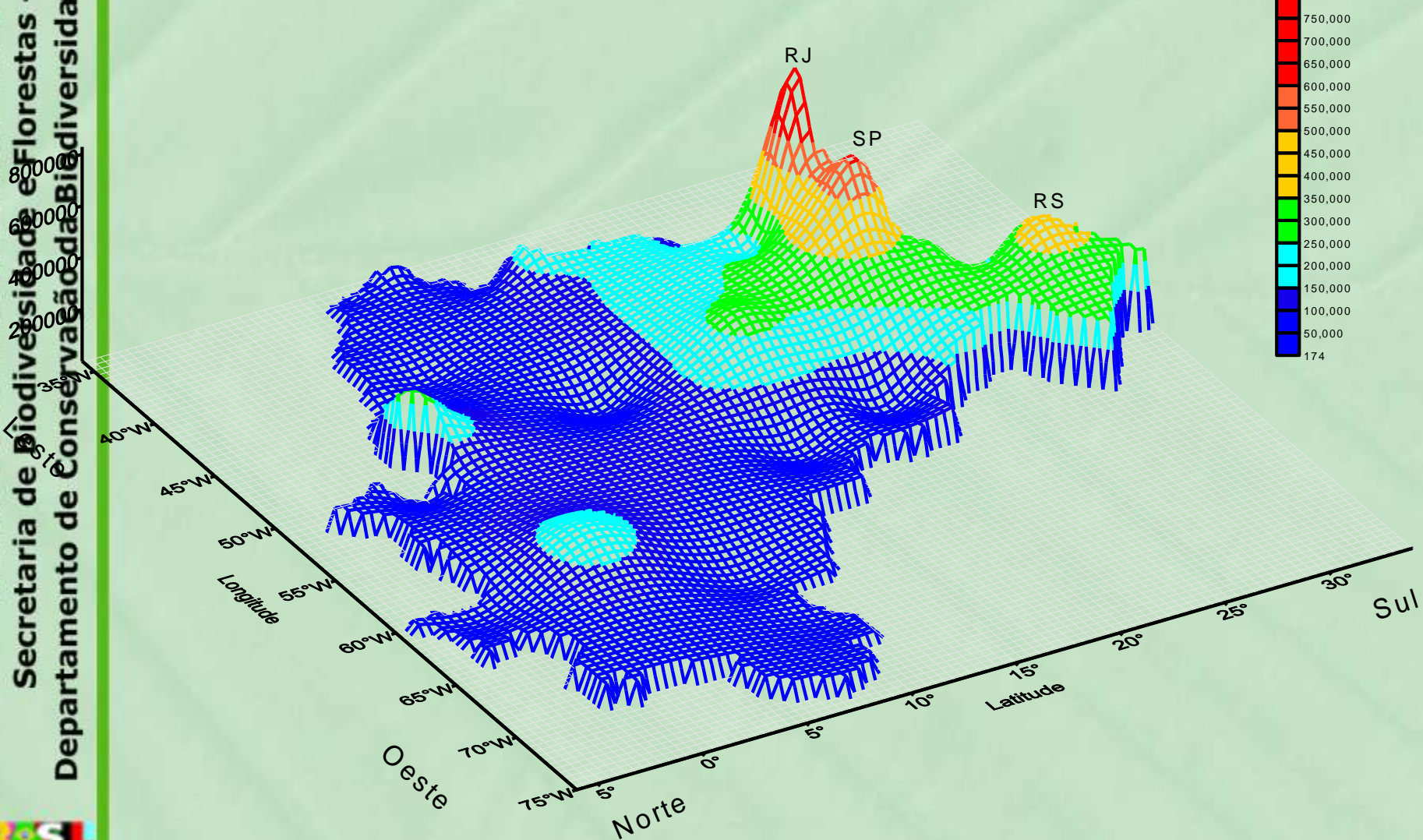
Source: Lewinsohn & Prado, 2000

TAXON	KNOWN	ESTIMATED
VIRUS	350	55.000
BACTERIA	400	136.000
FUNGI	13.000	205.000
ALGAE	10.000	55.000
PLANTS	47.500	52.000
PROTOZOANS	3.500	27.000
ANIMALS	132.000	1.337.000
TOTAL	207.000	1.867.000

# Distribution of plant specimens in Brazilian Herbaria Source: SHEPHERD, 2000

Acervo total de exsicatas por estado

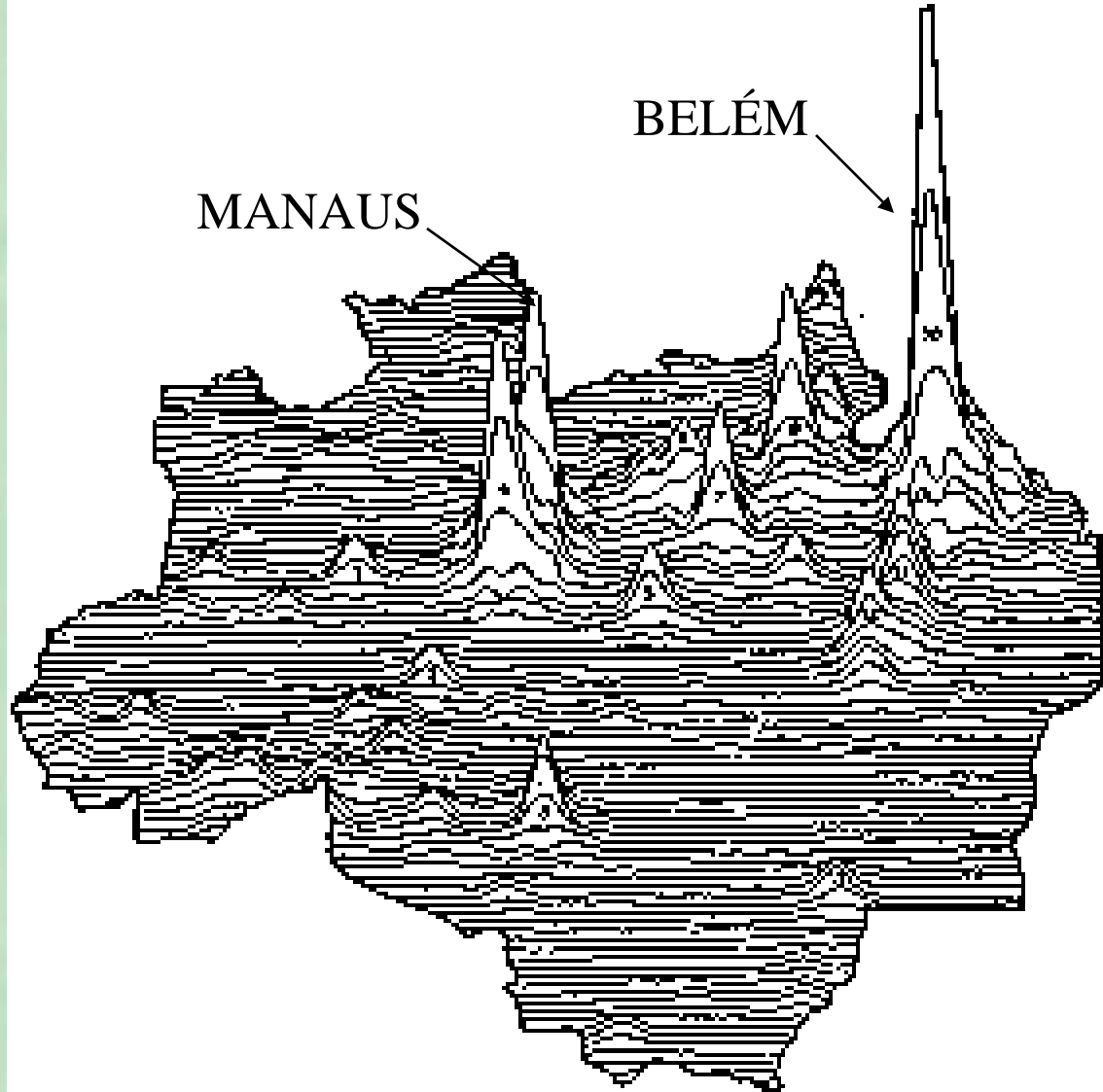
Ministério do Meio Ambiente - MMA  
Secretaria de Biodiversidade e Florestas - SBF  
Departamento de Conservação da Biodiversidade - DCBio



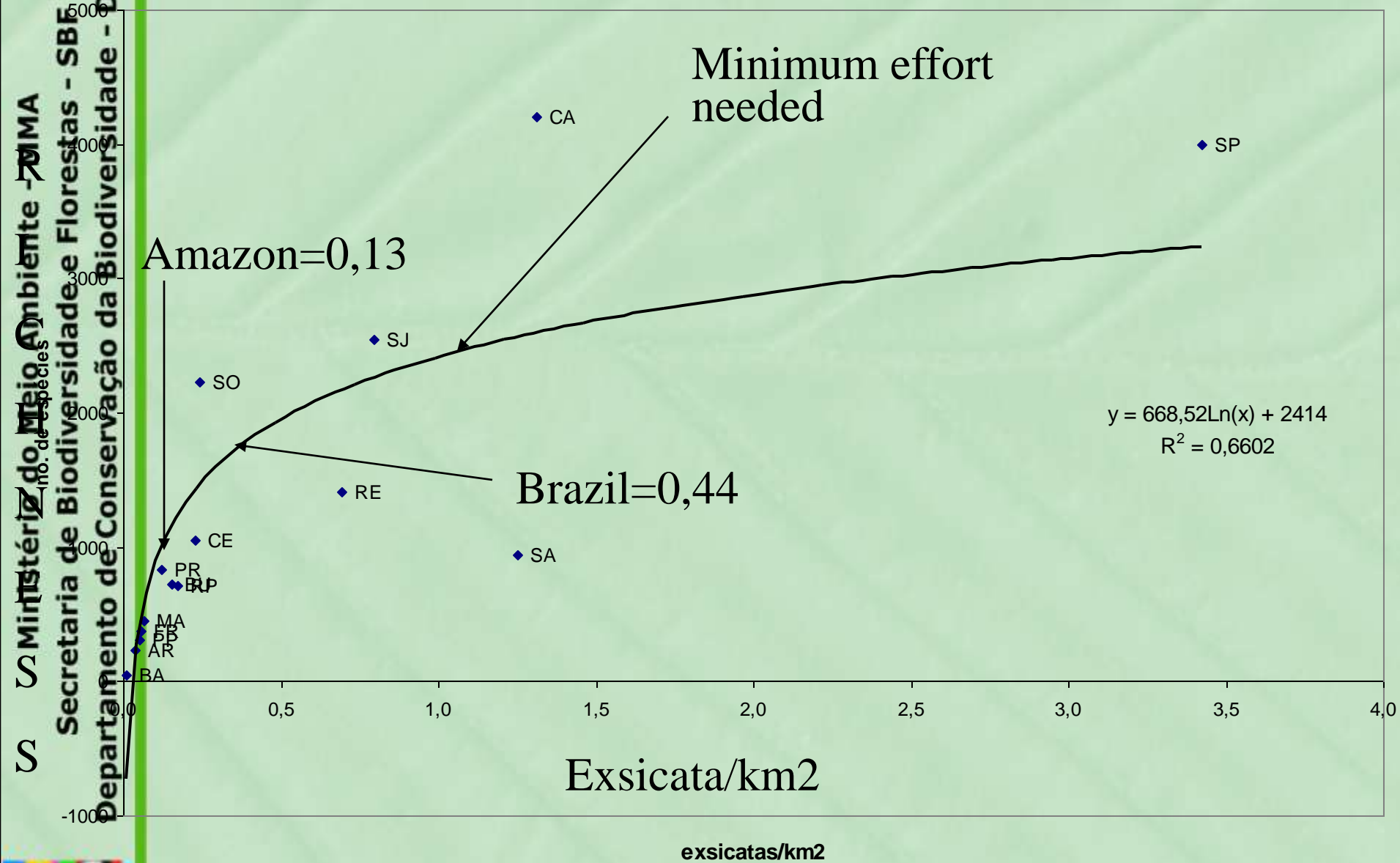
# DENSIDADE DE COLETA DE PLANTAS

Fonte: Nelson, 1991

Plant  
Sampling  
effort in the  
Brazilian  
Amazon



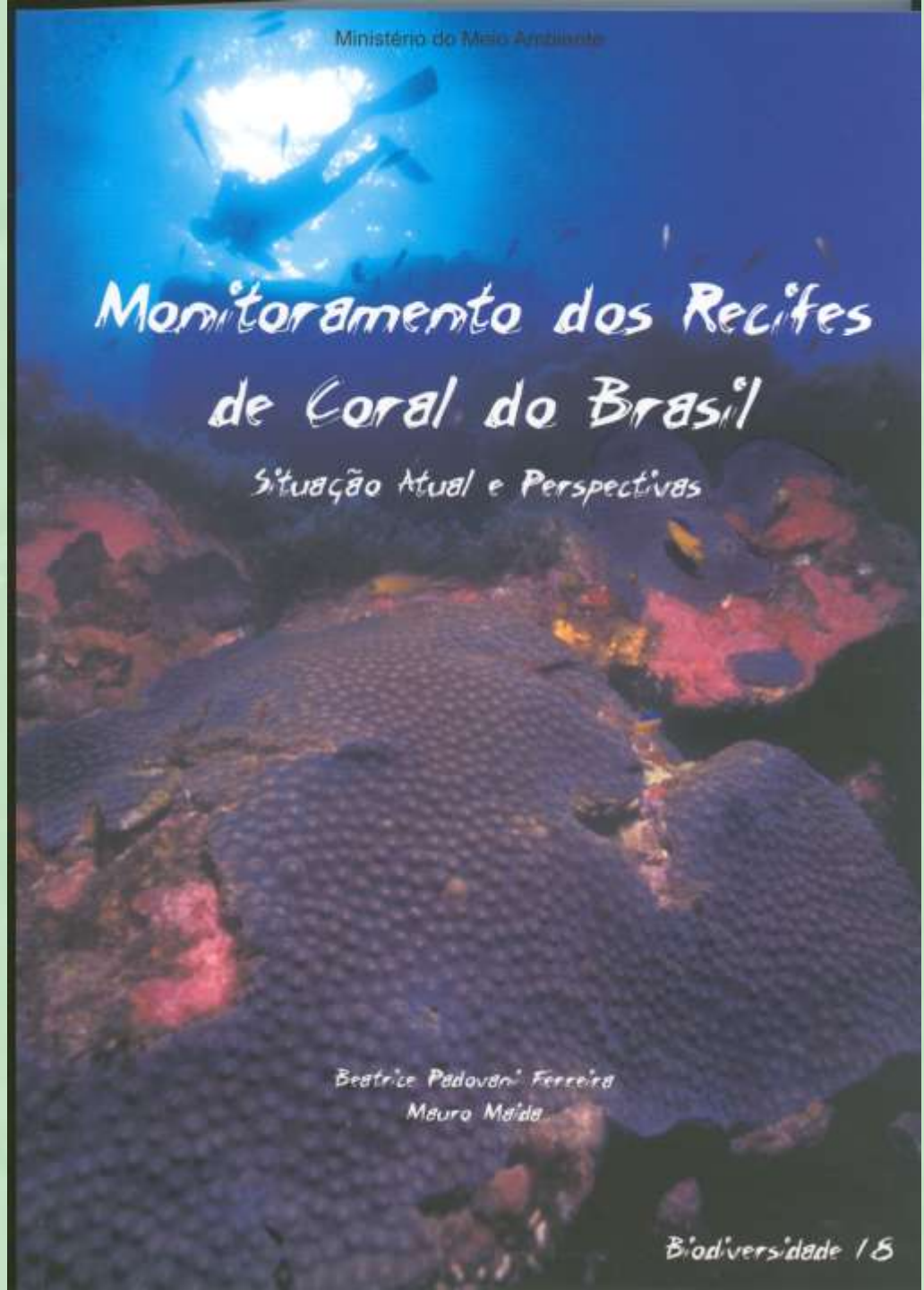
no. de espécies e densidade de coletas



# Monitoring of Coral Reefs in Brazil:

## Current Situation and Perspectives

MMA, 2006



# Monitoramento dos Recifes de Coral do Brasil

*Situação Atual e Perspectivas*

Beatrice Padovani Ferreira  
Mauro Maida

# Brazilian Bibliography on Pollination and Pollinators

MMA, 2006

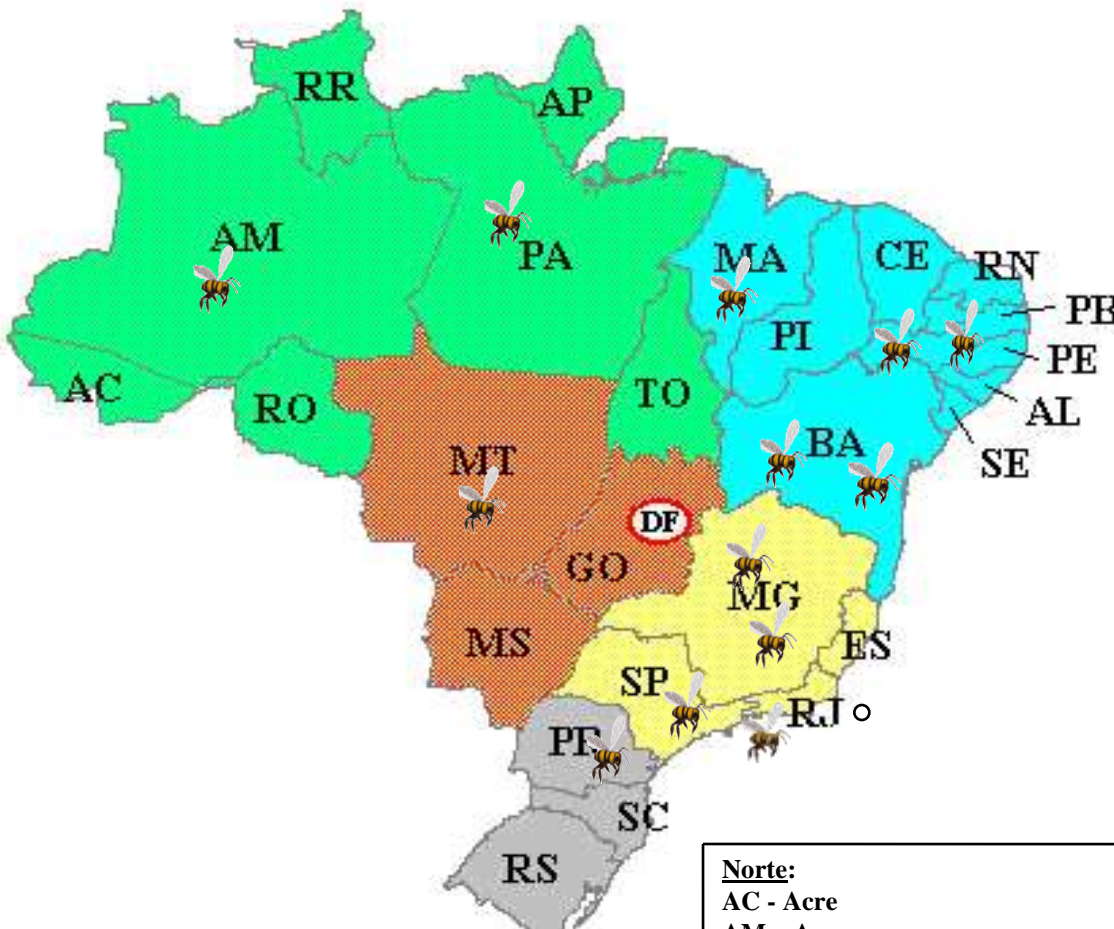


Ministério do Meio Ambiente

## Bibliografia Brasileira de Polinização e Polinizadores







- 1 Subproj. Paraná
- 1 Subproj. São Paulo
- 1 Subproj. Rio de Janeiro
- 2 Subproj. Minas Gerais
- 2 Subproj. Bahia
- 2 Subproj. Pernambuco
- 1 Subproj. Maranhão
- 1 Subproj. Mato Grosso
- 1 Subproj. Amazônia
- 1 Subproj. Pará

Regiões

- Norte
- Nordeste
- Centro Oes-e
- Sudeste
- Sul

## Pollinators Management Projects supported by MMA in the years 2004-2006



**Norte:**

- AC - Acre
- AM - Amazonas
- AP - Amapá
- PA - Pará
- RO - Rondônia
- RR - Roraima
- TO - Tocantins

**Nordeste:**

- AL - Alagoas
- BA - Bahia
- CE - Ceará
- MA - Maranhão
- RN - Rio Grande do Norte
- SE - Sergipe
- PB - Paraíba
- PE - Pernambuco
- PI - Piauí

**Centro Oeste:**

- DF - Distrito Federal
- GO - Goiás
- MS - Mato Grosso do Sul
- MT - Mato Grosso

**Sudeste:**

- ES - Espírito Santo
- MG - Minas Gerais
- RJ - Rio de Janeiro
- SP - São Paulo

**Sul:**

- PR - Paraná
- RS - Rio Grande do Sul
- SC - Santa Catarina

# BRAZILIAN BIODIVERSITY

## ASSESSMENT AND IDENTIFICATION OF PRIORITY AREAS

## AND ACTIONS FOR CONSERVATION, SUSTAINABLE USE AND BENEFIT SHARING OF THE BIODIVERSITY IN THE BIOMES OF BRAZIL

MMA, 2002

[www.mma.gov.br/  
biodiversidade](http://www.mma.gov.br/biodiversidade)

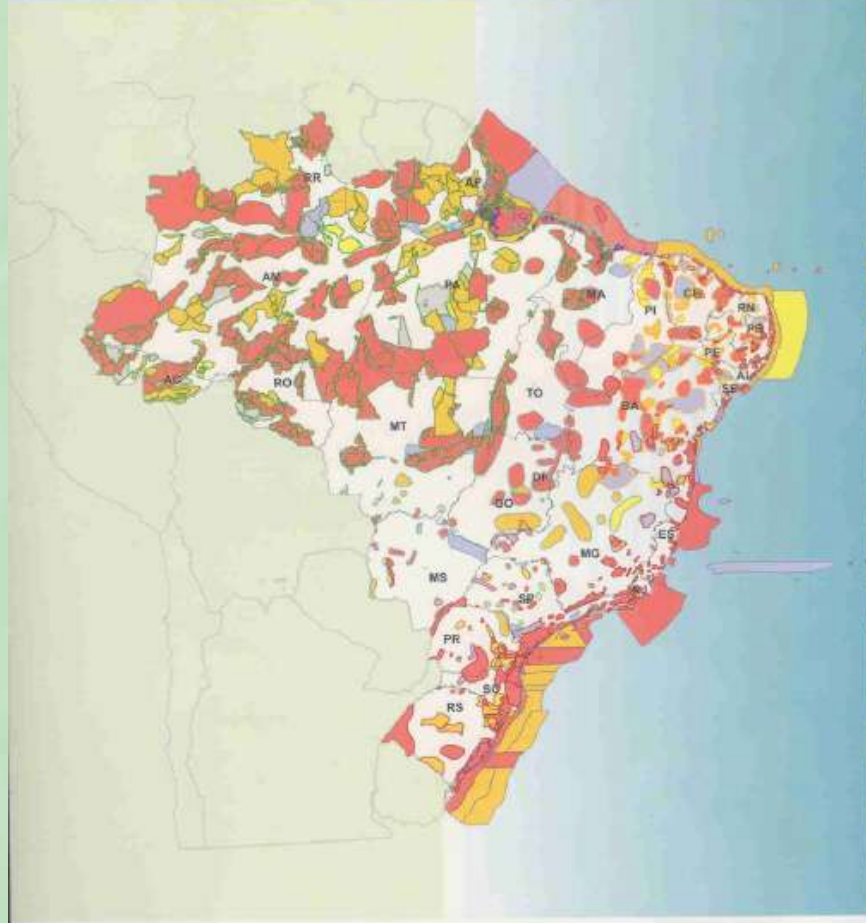


# Priority Areas for Conservation, Sustainable Use and Benefit Sharing of Biodiversity in Brazil

MMA, 2003

Wall Map +  
interactive CD

ÁREAS PRIORITÁRIAS PARA A CONSERVAÇÃO,  
UTILIZAÇÃO SUSTENTÁVEL  
E REPARTIÇÃO DE BENEFÍCIOS DA  
BIODIVERSIDADE BRASILEIRA



Projeto de Conservação e Utilização Sustentável  
da Diversidade Biológica Brasileira - PROBIO  
Secretaria de Biodiversidade e Florestas



Ministério do Meio Ambiente - MMA  
Secretaria de Biodiversidade e Florestas - SBF  
Departamento de Conservação da Biodiversidade - DCBio

# Biodiversity in the Brazilian Amazon

## ISA & Estação Liberdade, 2004

# BIODIVERSITY IN THE BRAZILIAN AMAZON



Instituto Socioambiental · Instituto de Pesquisa Ambiental da Amazônia  
Grupo de Trabalho Amazônico · Instituto Sociedade, População e Natureza  
Instituto do Homem e Meio Ambiente da Amazônia · Conservation International

# Priority Areas for Conservation, Sustainable Use and Benefit Sharing of Biodiversity in Brazil - update

**CONABIO Deliberation n 39, of December 14 2005**, approved the methodology for the revision process:

- Map of Brazilian Biomes (IBGE, 2004);
- Systematic Conservation Planning:
  - objectivity and efficiency;
  - memory keeping of the priorities identification process;
  - broader stakeholder participation and consensus building;
  - all existing Protected Areas (SNUC) were considered as priority areas;
- Technical meetings in each Biome (11 meetings)
  - definition of conservation and sustainable use targets;
- Data Processing (Conservation Planning Software C-Plan & MARXAN)
  - generation of maps of biological importance;
- Regional consultation meetings in each Biome (13 meetings)
  - identification of priority areas and actions, and urgency;

+1022  
 endemic or  
 threatened  
 species  
 targets

Targets used for the Savannas biomes:  
 128 landscape units & 6 unique ecosystems  
 51 areas for keeping ecosystem services

#### 4. Reuniões Técnicas

##### Alvos

CERRADO e PANTANAL

- Alvos de Biodiversidade:  
 Plantas e vertebrados endêmicos e/ou ameaçados

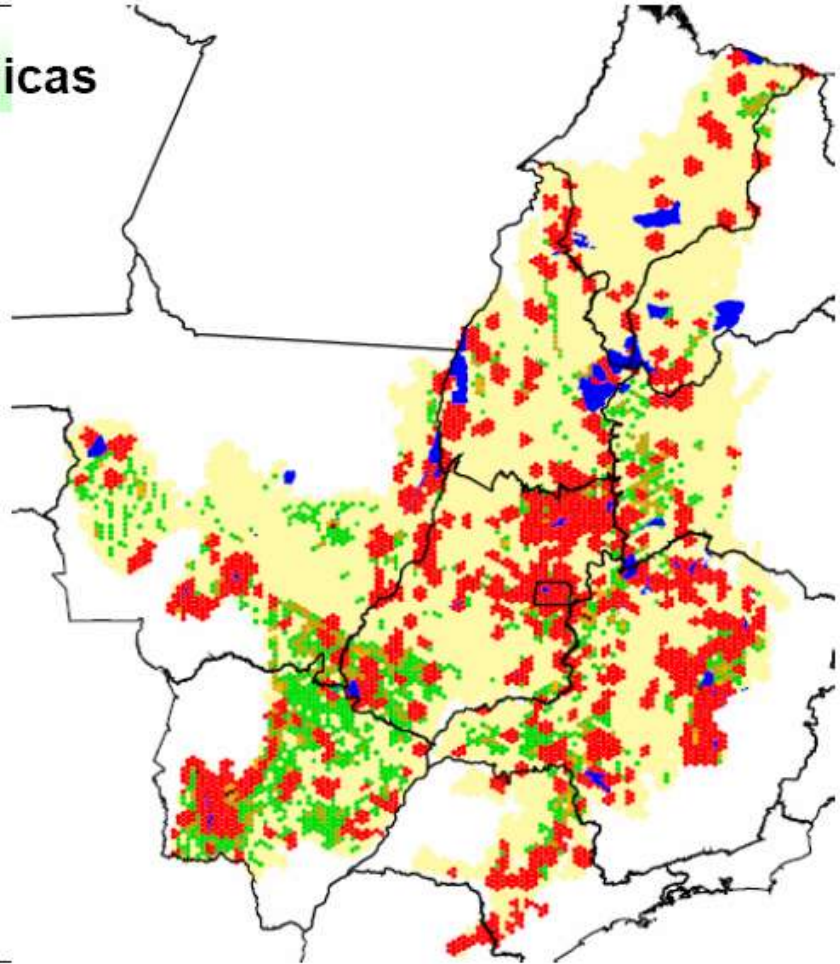
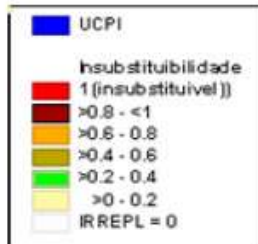


Cerrado	spp	Pantanal	Spp
Plantas	443	Plantas	75
Peixes	50	Peixes	3
Anfíbios	80	Anfíbios	18
Répteis	127	Répteis	54
Aves	56	Aves	28
Mamíferos	70	Mamíferos	18

# Map of areas of biological importance

## 4. Reuniões Técnicas Mapa de Importância Biológica

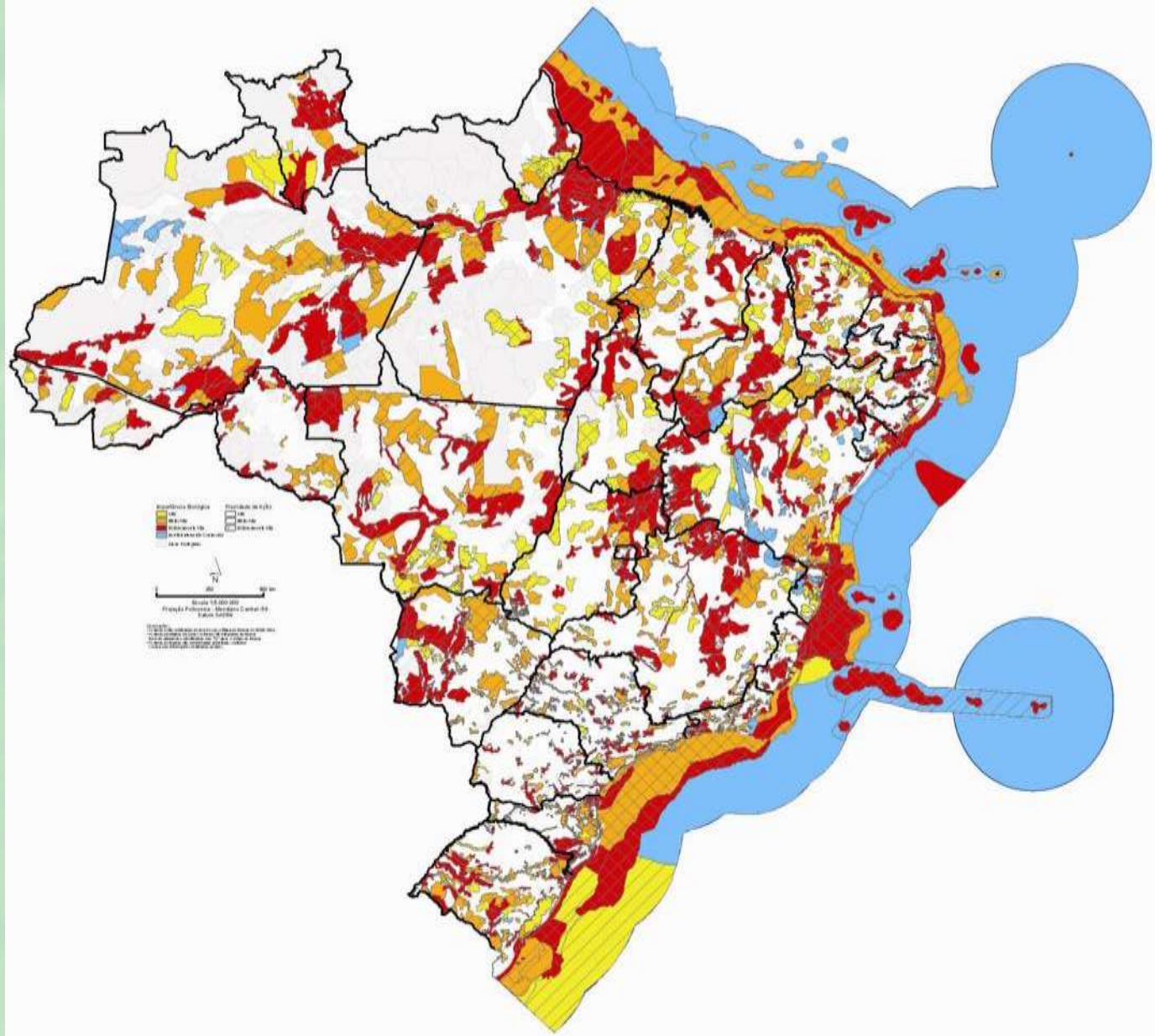
### CERRADO



Map of  
Priority Areas  
for  
Conservation,  
Sustainable  
Use and  
Benefit  
Sharing of the  
Brazilian  
Biodiversity.

Updated 2007

Obs.: Not  
including  
areas already  
protected







**Ministério do Meio Ambiente  
Secretaria de Biodiversidade e Florestas**

**“Seminário para Definição de Metas  
Nacionais de Biodiversidade para 2010”**

**20ª Reunião Ordinária da CONABIO**  
Brasília, 24 e 25 de outubro de 2006

# National Biodiversity Targets Seminar

Issues covered by the Roundtables:

- Pressures on the Brazilian Biodiversity (deforestation, fires, fragmentation, alien invasives)
- State of the Biomes (vegetation)
- State of the Fauna and Flora (threatened and overexploited species)
- Responses for Conservation (protected areas, species & genetic resources conservation)
- Responses for Sustainable Use and Benefit Sharing

# National Biodiversity Targets Seminar

Information requested to all invited speakers to provide on their theme/parameter:

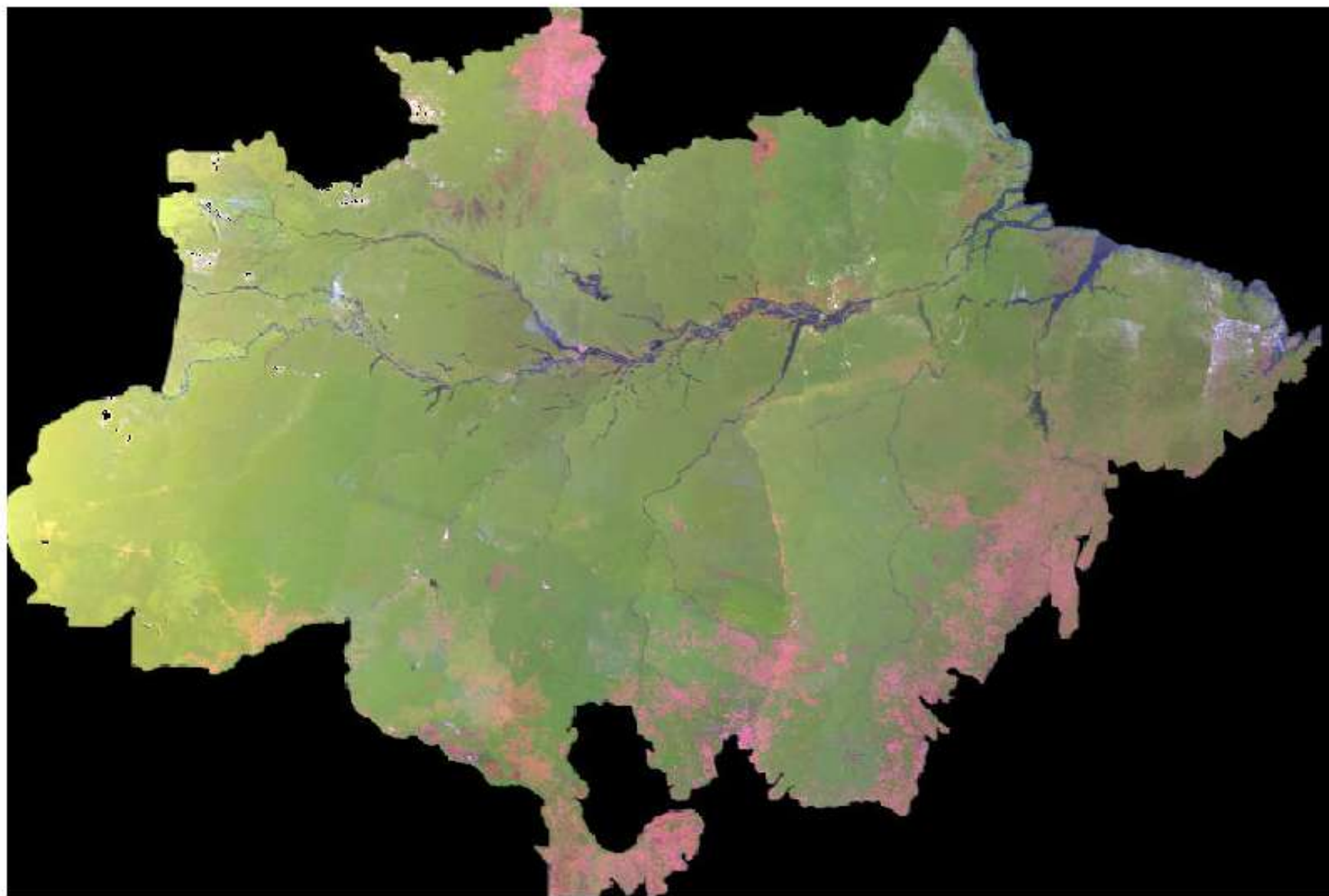
sources of information available in Brazil (their geographic and temporal coverage, data quality and limitations);

- status (quantified) of the theme/parameter in Brazil in 2002 (baseline), biome by biome and total;
- average annual increment/reduction of the theme/parameter in Brazil at the turn of the millenium (baseline), biome by biome and total;
- indicate probable/possible targets for the theme/parameter in Brazil in 2010 under three scenarios (pessimistic, intermediary/business-as-usual and optimistic), considering the global target adopted by the CBD for the theme/parameter.

# National Biodiversity Targets for 2010 (CONABIO Resolution 3/2006):

- The National Biodiversity Committee – CONABIO adopted, as Resolution 3/2006, a set of 51 National Biodiversity Targets for 2010, including 14 targets for conservation, 13 targets for sustainable use, seven targets for impact mitigation, eight targets for access and benefit sharing, three targets for research, three targets for education and information and three targets for financing and technology transference.
- Available at [www.mma.gov.br/PortalBio](http://www.mma.gov.br/PortalBio)

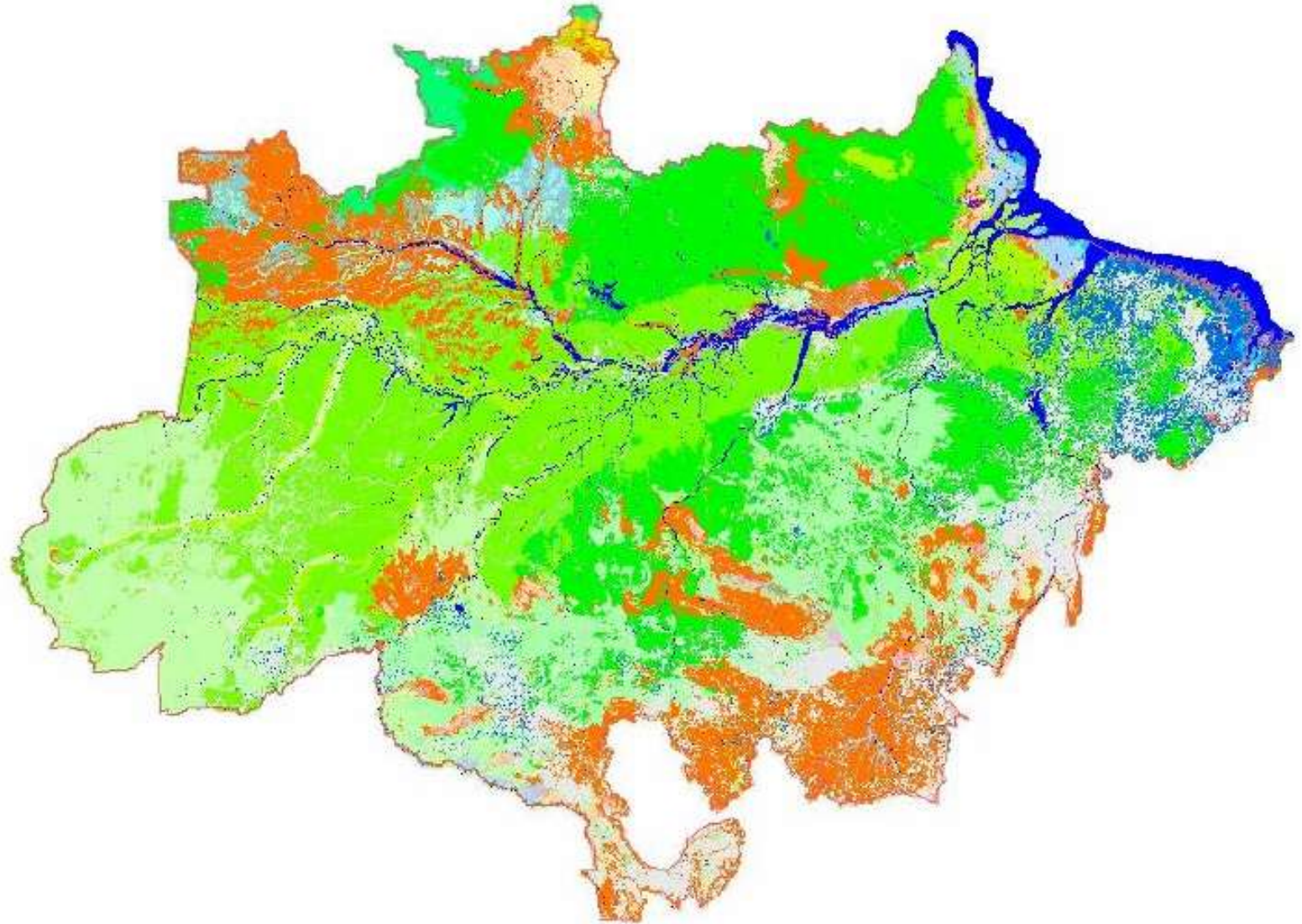
# Mosaico de Imagens 2002

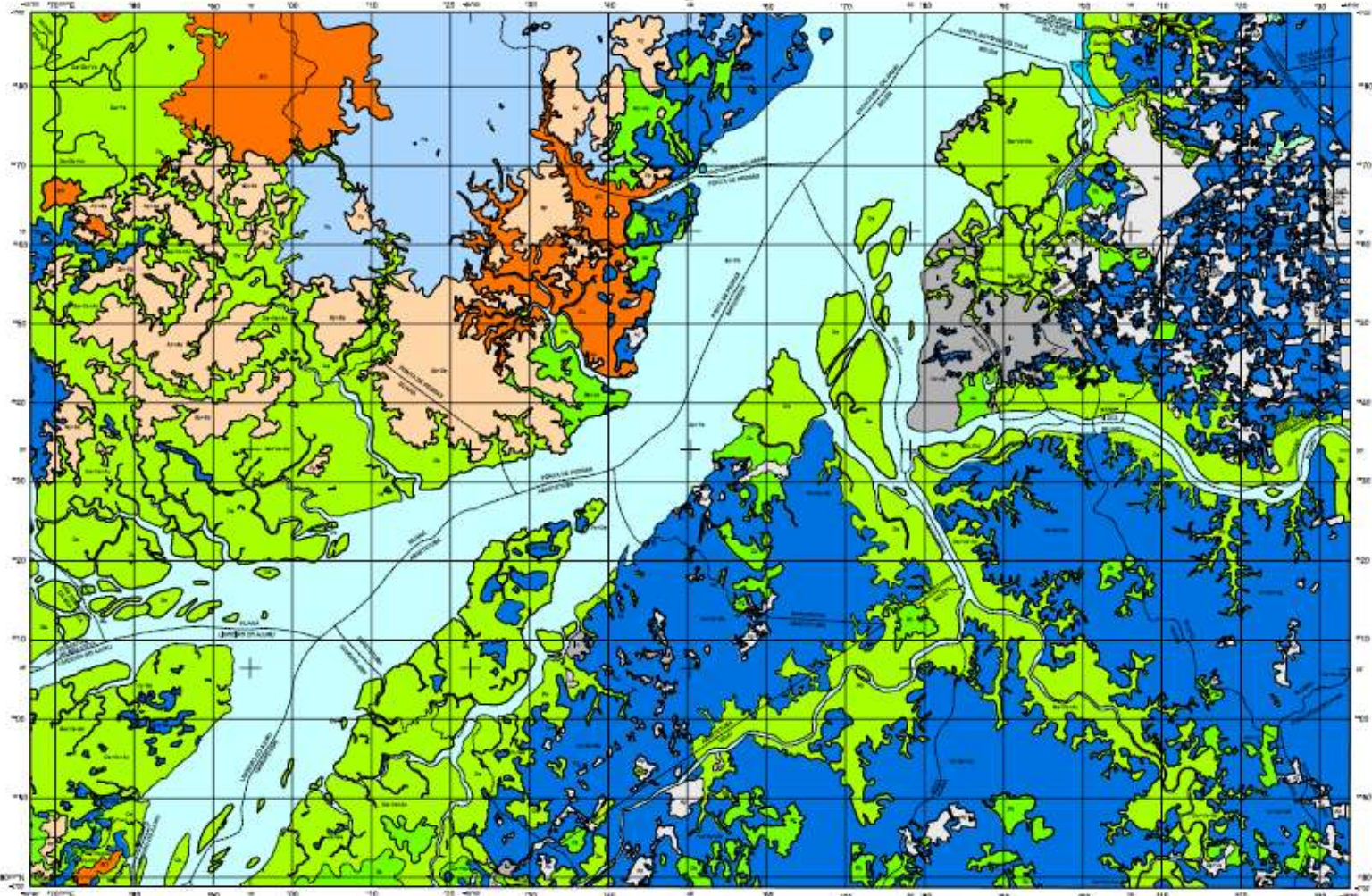


# Biodiversity: Vegetation Cover

- The Brazilian Ministry of Environment commissioned a wall-to-wall mapping of vegetation cover of all the Brazilian biomes for the baseline year of 2002 at the publication scale of 1:250.000 based on Landsat images (PROBIO Project in partnership with Brazilian research institutes and universities) – all the 610 maps produced are freely available online for download at [www.mma.gov.br/PortalBio](http://www.mma.gov.br/PortalBio)

# Mosaicos





- REGIÃO FITOGEOGRÁFICA**
- Área Verde - D**
- Área Verde - D
  - Área Verde - D
- Área Verde - A**
- Área Verde - A
  - Área Verde - A
  - Área Verde - A
- Área Verde - M**
- Área Verde - M
  - Área Verde - M
- Área Verde - O**
- Área Verde - O
  - Área Verde - O
- Área Verde - C**
- Área Verde - C
  - Área Verde - C
- Área Verde - L**
- Área Verde - L
  - Área Verde - L
- Área Verde - S**
- Área Verde - S
  - Área Verde - S
- Área Verde - T**
- Área Verde - T
  - Área Verde - T
- Área Verde - F**
- Área Verde - F
  - Área Verde - F
- ÁREA DE FORMAÇÃO VEGETAL - P**
- Área de Formação Vegetal - P
  - Área de Formação Vegetal - P
- ÁREA DE FORMAÇÃO VEGETAL - S**
- Área de Formação Vegetal - S
  - Área de Formação Vegetal - S
- REPERTE VEGETAL - V**
- Reperete Vegetal - V
  - Reperete Vegetal - V
- ÁREA ANTRÓPICA**
- Área Antrópica
  - Área Antrópica
- ÁREA DE TROPICISMO**
- Área de Tropicismo
  - Área de Tropicismo

**LOCALIDADES**

**CAPITAL DO ESTADO**

**LIMITES**

Estado

Município

Distrito

**ELEMENTOS DE HIDROGRAFIA**

Rio

Canal

Represa

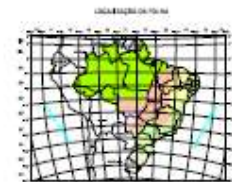
Reservo

**COBERTURA VEGETAL DOS BIOMAS BRASILEIROS**

(ano base 2002)

Escala 1:250.000

IBGE

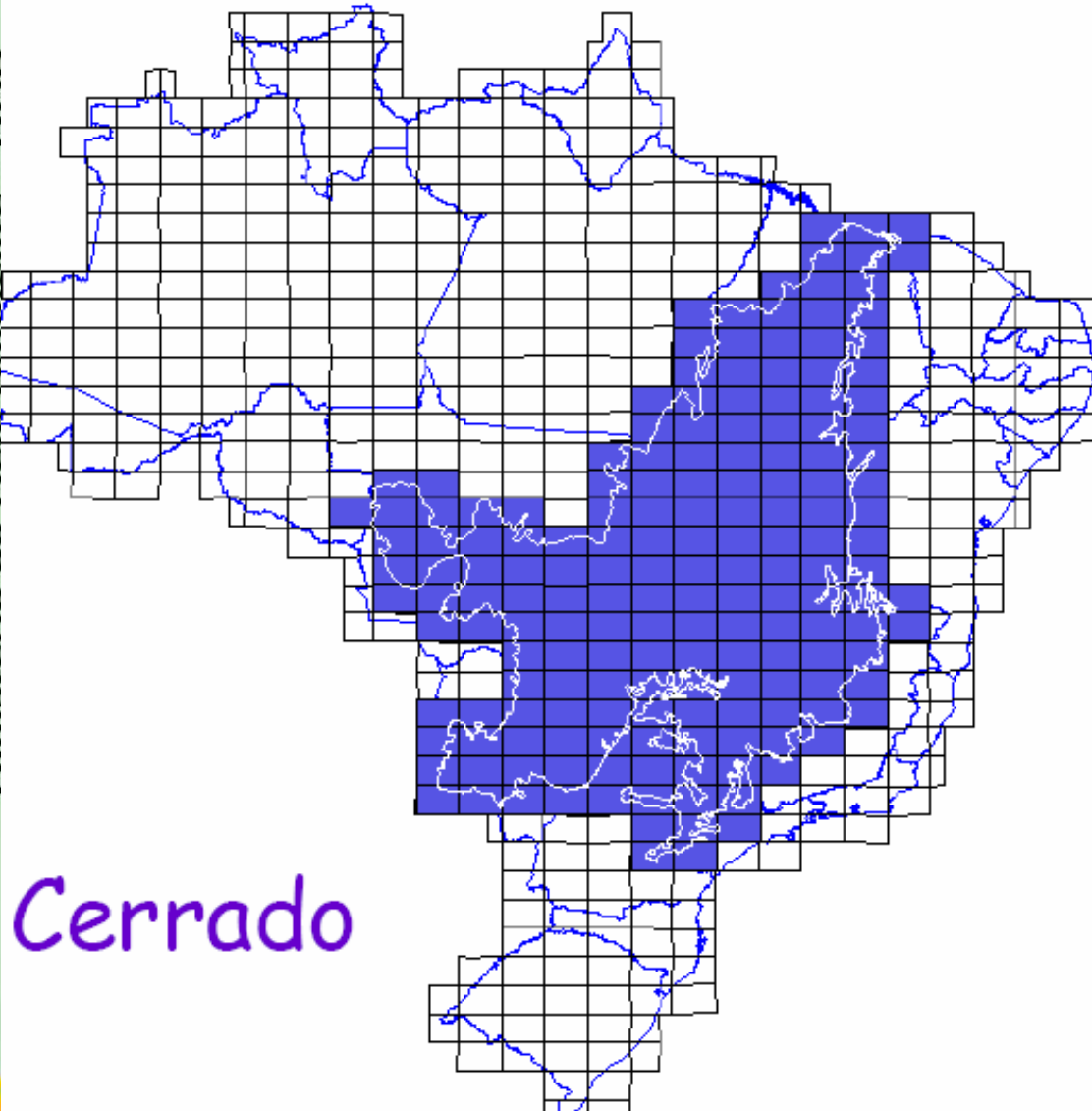


**LEGENDA DE CORES**

Verde Claro	Verde Médio	Verde Escuro
Verde Muito Claro	Verde Muito Médio	Verde Muito Escuro
Verde Branco	Verde Preto	Verde Cinza





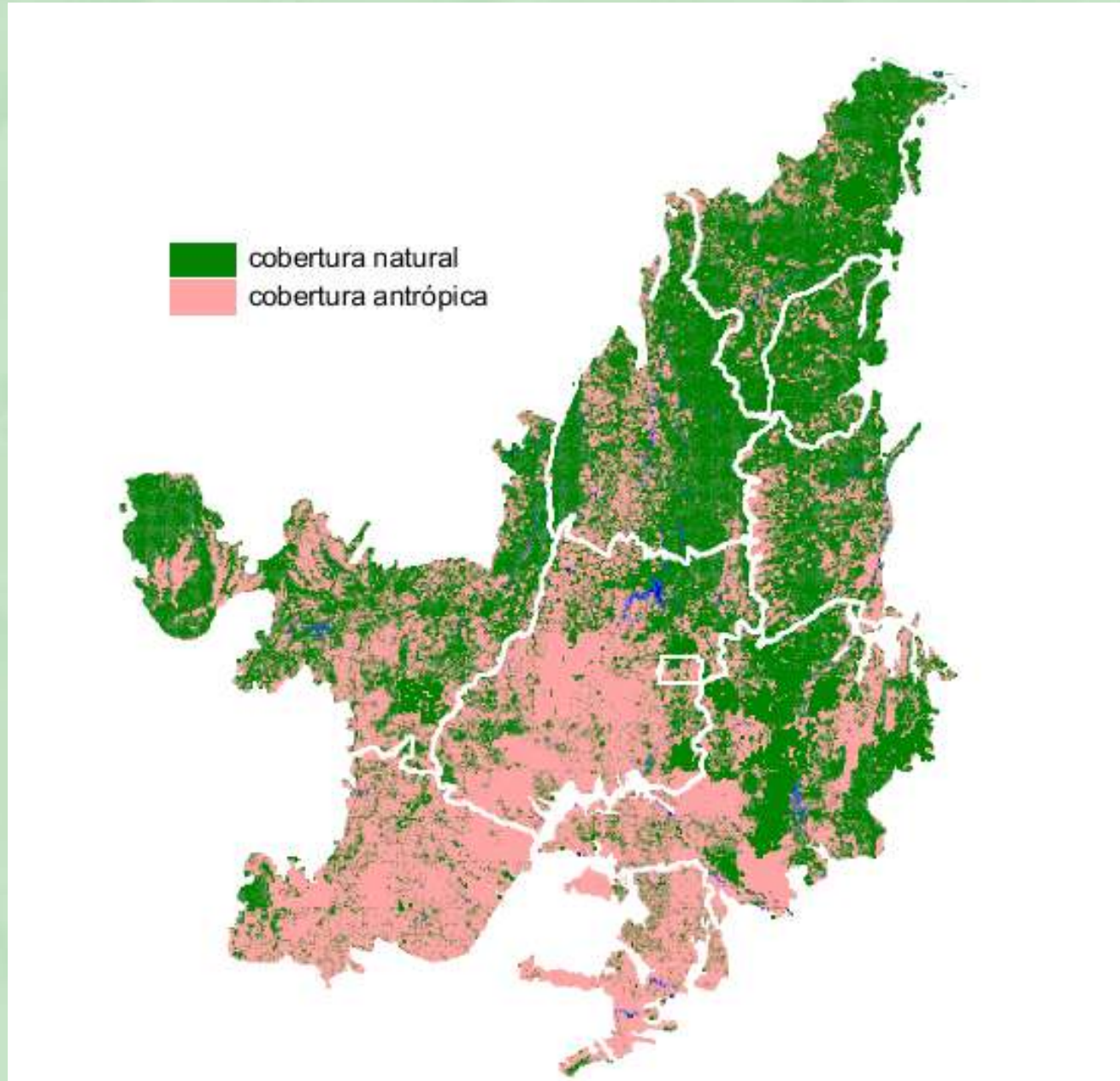


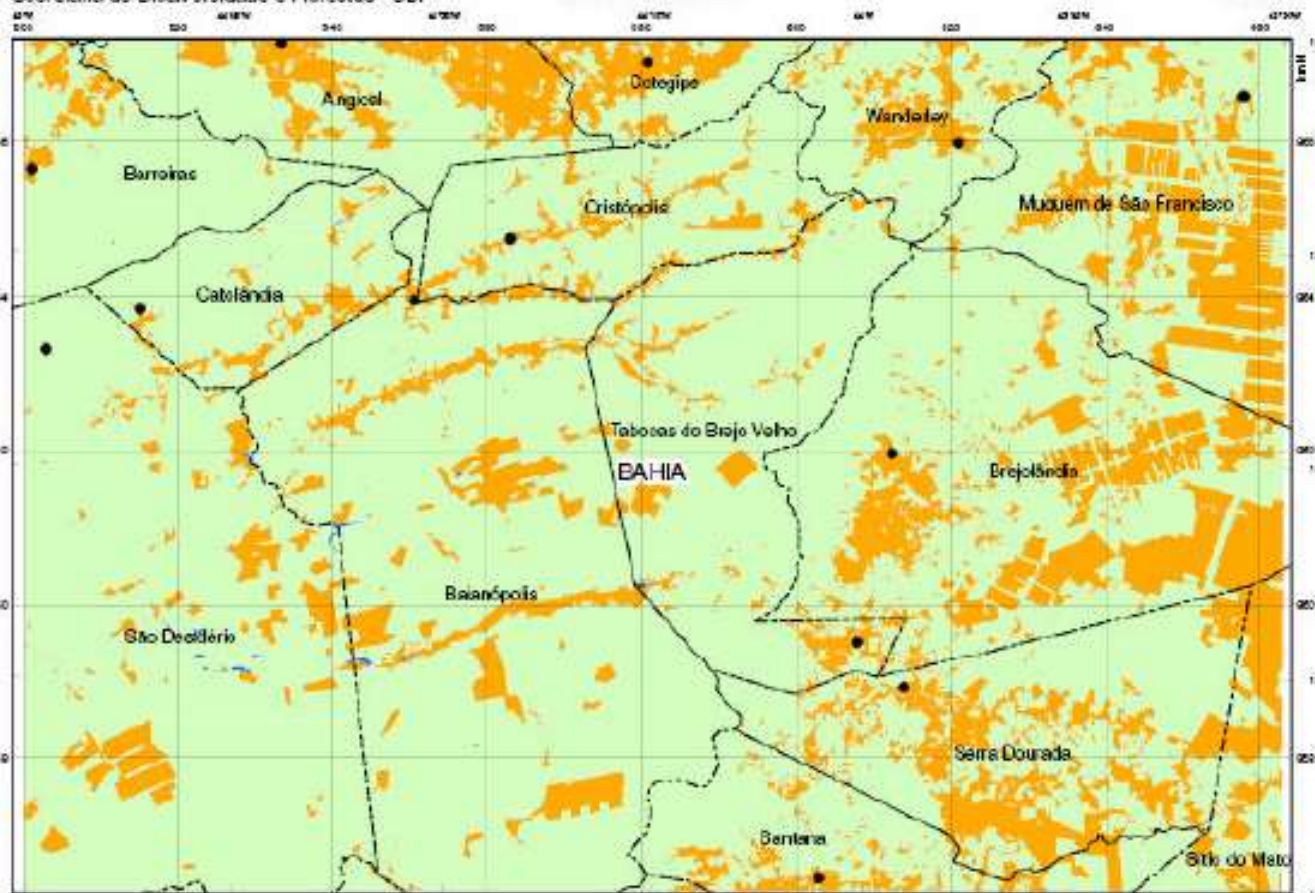
Cerrado

117 cenas  
Landsat  
(ano-base: 2002)

172 cartas  
1:250.000

## Cobertura Vegetal do Bioma Cerrado em 2002 (MMA 2007)





LEGENDA

- Área antropizada
- Área natural
- Massa d'água
- Sede municipal
- Limite municipal

APOIO TÉCNICO E SUPERVISÃO:



APOIO:



INSTITUIÇÕES PARCEIRAS:



Universidade Federal de Uberlândia



UFG

ARTICULAÇÃO DA FOLHA

SD-20-Y-D	SD-20-Z-C	SD-20-Z-D
SD-20-Y-E	SD-20-Z-A	SD-20-X-D
SD-20-Y-F	SD-20-Z-B	SD-20-X-E

COBERTURA VEGETAL  
DOS BIOMAS BRASILEIROS

(ano base 2012)



SISTEMA DE PROJEÇÃO UTM  
DATUM HORIZONTAL: SAD 69

2006

LOCALIZAÇÃO DA FOLHA



Carta elaborada a partir da interpretação de imagens Landsat/ETM+, ano-base do 2012, como parte das atividades do Projeto de Conservação e Utilização Sustentável da Diversidade Biológica Brasileira - PROUD do MMA e da iniciativa "Levantamento dos Remanescentes da Cobertura Vegetal dos Biomas Brasileiros", financiada pelo Banco Mundial/GERTEcon Nacional e em parceria com o CNPq.

# Monitoring the Brazilian Biodiversity

- MMA is supporting the establishment of a National Center for Biodiversity Monitoring and Forecasting at the Chico Mendes Institute for Biodiversity Conservation
- MMA is supporting IBAMA to monitor deforestation in all of the Brazilian continental biomes outside the Amazon (to complement INPE's work)
- MMA hopes to establish a National Network for Biodiversity Monitoring involving the main institutions operating in Brazil
- MMA hopes such a network will be part of a global network on biodiversity monitoring, such as the GEO BON

# MMA needs better scientific tools to support decision making processes

- How much biodiversity might be lost with continuing land use change and climate change?
- What is the potential impact of public policies on biodiversity loss?
- Where are the most vulnerable areas to biodiversity loss?
- Are we making progress to implement national and global targets in Brazil?
- Are conservation policies effective?

# GEO BRASIL 2

- Explore main environmental agendas (water resources, forests, biodiversity, etc.)
  - Consolidate information on environmental policy instruments
  - Consolidate information on the relevance of the environmental agendas to sustainable development
  - Generate potential future scenarios
- 
- MMA is preparing a White Paper on Biodiversity

## The objective of this workshop:

- Assess the feasibility of using the GLOBIO3 model to generate scenarios for Brazil and its biomes
- Can GLOBIO3 be an useful tool to help support decision making in Brazil?
- Do we have the necessary data sets in the right format to run the GLOBIO3 model for Brazil?
- Can we use the GLOBIO3 model to assess progress towards the 2010 Biodiversity Target in Brazil?
- Can we use the GLOBIO3 model to assess the potential impacts of major infrastructure projects and the expansion of agriculture, pastures and biofuels in Brazil?
- Can we use the GLOBIO3 model to assess the potential impacts of climate change and land use change in Brazil?

## The objective of this workshop:

- Do we have enough biodiversity data in Brazil to calibrate the GLOBIO3 parameters to our conditions?
- Can we validate the (current and past) scenarios produced with GLOBIO3 in Brazil with biodiversity data collected in the field?
- Are there Brazilian institutions and researchers willing to be our partners to implement GLOBIO3 modelling in Brazil?
- Do we have sufficient standardized data to run the GLOBIO3 model for all of Brazil or should we run it on a biome by biome approach?
- What should be the next steps to implement the GLOBIO3 model in Brazil?



## The Structure of this Workshop:

- Day One – WCMC (UNEP's World Conservation Monitoring Centre) and PBL (Netherlands Environmental Assessment Agency) introduce the PROBIO3 model and provide context
- Day Two: Roundtables of Brazilian institutions on existing data and modelling experiences in Brazil
- Day Three: Conclusions and next steps

Obrigado!

[www.mma.gov.br/PortalBio](http://www.mma.gov.br/PortalBio)