

ALOS

K&C Initiative
An international science collaboration led by JAXA

Mapping Public Forests in Brazil

Dr. Humberto N. de Mesquita Jr.

Executive Manager - National Register of Public Forests

humberto.mesquita-junior@ibama.gov.br

1. What is Brazilian Forest Service
2. What means National Register of Public Forests
3. Forest Map
4. Forest Inventory

ALOS

K&C Initiative
An international science collaboration led by JAXA

1. Brazilian Forest Service

1. Brazilian Forest Service (SFB)

- **It was created by federal law in March 02nd, 2006:**

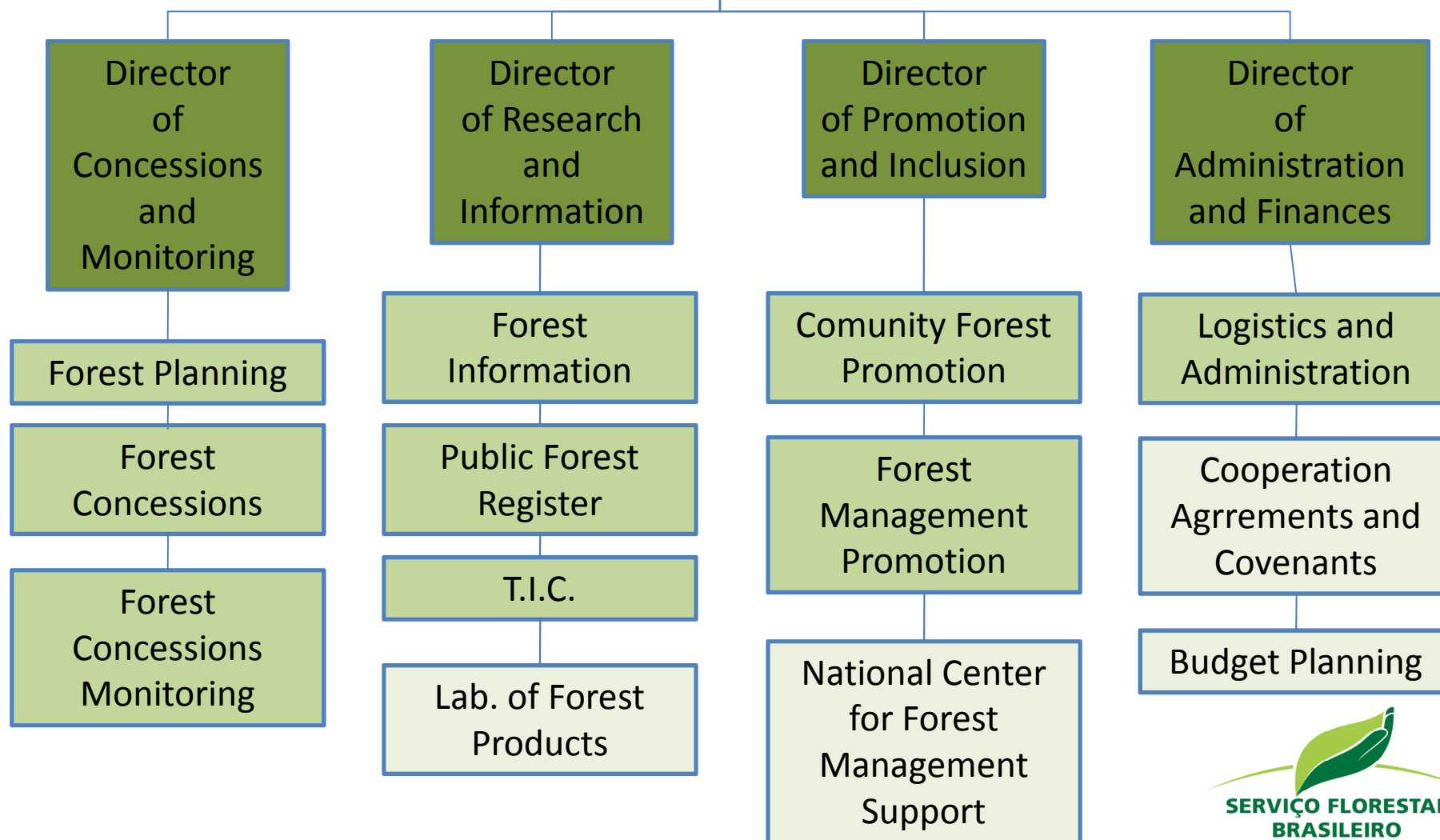
The Brazilian Forest Service (SFB) has the mission to reconcile the use and conservation of forests, valuing them for the benefit of present and future generations, through the management of public forests, construction of knowledge, capacity building and provision of specialized services.

- **Under Ministry of Environment**

1. Brazilian Forest Service (SFB)

- **Federal Law 11.284 March 02nd, 2006**
 - Public Forest Definition: Natural or Planted Forests, located on the Brazilian Biomes, in the public lands under the control of Federal, State, Municipal, Federal District or indirect administration entities.
- **Art. 14, § único**
 - Institution of Nacional Register of Public Forests

Brazilian Forest Service

General
Director

2. National Register of Public Forests

2. Nat. Register of Public Forest

- **Primary source of information about forest and public forest**
 - Planning, Concessions, Information and Concessions Monitoring depends on the Geographical Database.
- **The main steps of registering**
 - Identification – georeferenced polygons of forest on public land.
 - Delimitation – Recognition of the forest on the property legal documentation.
 - Demarcation – Polygon materialization on the field

2. Nat. Register of Public Forest

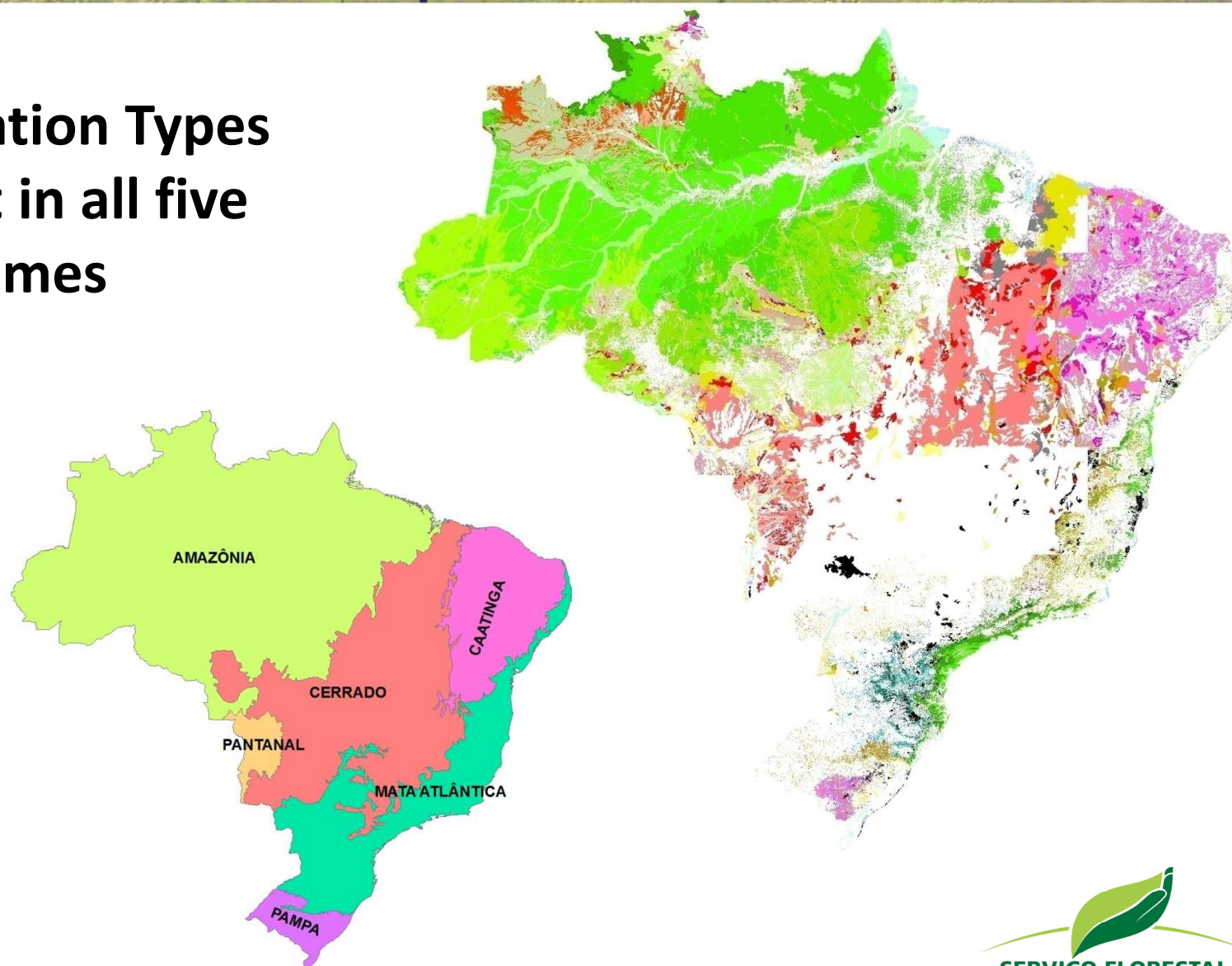
- **Concept of Natural Forest (internal resolution)**
 - *Define the Brazilian vegetation types and formations that represents Forest Vegetation in Brazil, to identification purposes and other providences.*
 - *Based on: National Forest Inventory 1966, RADAM project 1971 (airborne SLAR, partnership with USA), 1993 Oficial Vegetation Map of Brazil, 2004 Oficial Map of Brazilian Biomes*

ALOS

K&C Initiative
An international science collaboration led by JAXA

58 Vegetation Types of Forest in all five biomes

- Floresta Ombrófila Densa, Alto-Montana
- Floresta Ombrófila Densa, Montana
- Floresta Ombrófila Densa, Submontana
- Floresta Ombrófila Densa, Terras Baixas
- Floresta Ombrófila Densa, Aluvial
- Floresta Ombrófila Aberta, Montana
- Floresta Ombrófila Aberta, Submontana
- Floresta Ombrófila Aberta, ; Floresta Ombrófila Al
- Floresta Ombrófila Aberta, Aluvial
- Floresta Ombrófila Mista, Alto-Montana
- Floresta Ombrófila Mista, Montana
- Floresta Ombrófila Mista, Submontana
- Floresta Ombrófila Mista, Terras Baixas; Floresta O
- Floresta Ombrófila Mista, Aluvial
- Floresta Estacional Semi-decidual, Alto-Montana
- Floresta Estacional Semi-decidual, Montana
- Floresta Estacional Semi-decidual, Submontana
- Floresta Estacional Semi-decidual, Terras Baixas; F
- Floresta Estacional Semi-decidual, Aluvial
- Floresta Estacional Decidual, Montana
- Floresta Estacional Decidual, Submontana
- Floresta Estacional Decidual, Terras Baixas
- Floresta Estacional Decidual, Aluvial
- Campinarana, Florestada
- Campinarana, Arborizada
- Campinarana, Arbustiva
- Savana, ; Savana, Florestada
- Savana, Arborizada
- Savana Estépica, ; Savana Estépica, Florestada
- Savana Estépica, Arborizada
- Estepa, Arborizada; Estepa, Arborizada
- Formações Pioneiras, Formações Pioneiras com Influência Marinha;
- Formações Pioneiras, ; Formações Pioneiras, Influência Fluvio-marim
- Formações Pioneiras, Com Influência Fluvial e/ou Lacustre; Formaç
- Refúgio Vegetacional, Alto-Montano
- Refúgio Vegetacional, Montano; Refúgio Vegetacional, Montano
- Refúgio Vegetacional, Submontano; Refúgio Vegetacional, Subm
- Ecótono, Floresta Ombrófila Densa e Floresta Ombrófila Mista
- Ecótono, Floresta Ombrófila e Floresta Estacional
- Ecótono, Campinarana e Floresta Ombrófila
- Ecótono, Savana e Floresta Ombrófila; Ecótono, Savana e Floresta O
- Ecótono, Floresta Estacional e Floresta Ombrófila Mista
- Ecótono, Savana e Floresta Ombrófila Mista
- Ecótono, Estepa e Floresta Ombrófila Mista
- Encrave, Savana e Floresta Estacional Semi-decidual; Ecótono, Sav
- Ecótono, Savana, Savana Estépica e Floresta Estacional
- Ecótono, Savana Estépica e Floresta Estacional
- Ecótono, Estepa e Floresta Estacional
- Ecótono, Savana e Floresta Estacional Decidual; Encrave, Savana e F
- Ecótono, Savana Estépica e Floresta Estacional Decidual
- Ecótono, Savana e Savana Estépica Arborizada; Ecótono, Savana e S
- Ecótono, Floresta Ombrófila Densa e Formações Pioneiras
- Ecótono, Floresta Estacional Semi-decidual e Formações Pioneiras
- Ecótono, Floresta Estacional Decidual e Formações Pioneiras
- Savana/Formações Pioneiras (Refúgio), ; Ecótono, Savana e Form
- Ecótono, Savana Estépica e Formações Pioneiras; Ecótono, Savana E
- Vegetação Secundária, Savana Estépica; Vegetação Secundária, Flor
- Reflorestamento, Região de contato entre Floresta Estacional e Estep



2. Nat. Register of Public Forest

- **Public Land Information**

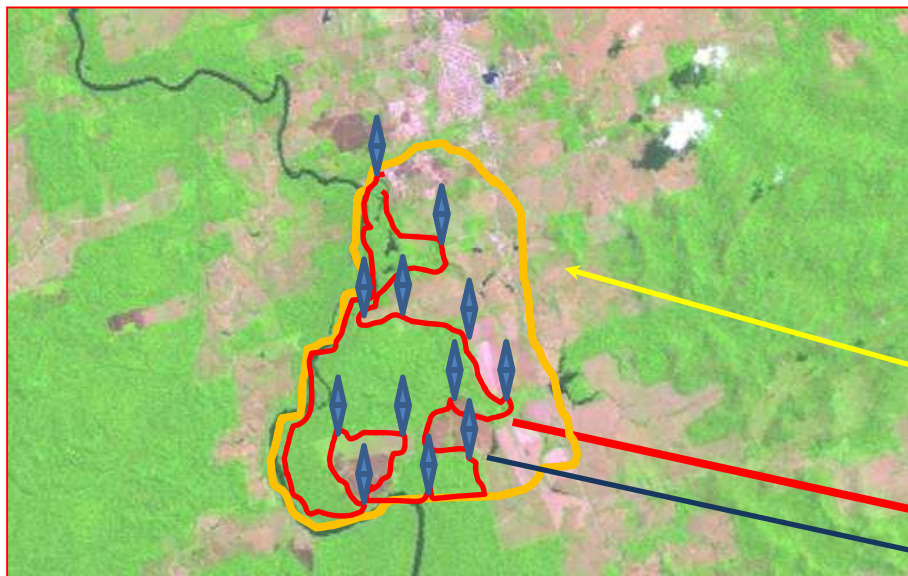
- *Conservation Units*
- *Extractives Reserves/Sustainable Development Reserves*
- *Land Settlements*
- *Indigenous Territories*
- *National Forests*
- *Other type of Conservation Units*
- *State Public Forests*
- *And other public lands*

2. Nat. Register of Public Forest

- **Natural Forest for Legal Purposes**

- *Forest Vegetation in Brazil, on the status of March 02^{sd}, 2006.*
- *To be achive and registered by satellite information that can prove the existence of forest on March 02sd, 2006.*
- *That base map of Brazilian Forests will be used us a reference to continuously evaluating the status of all Brazilian Forests.*
- *To identification of Public Forests comparing with public land location.*

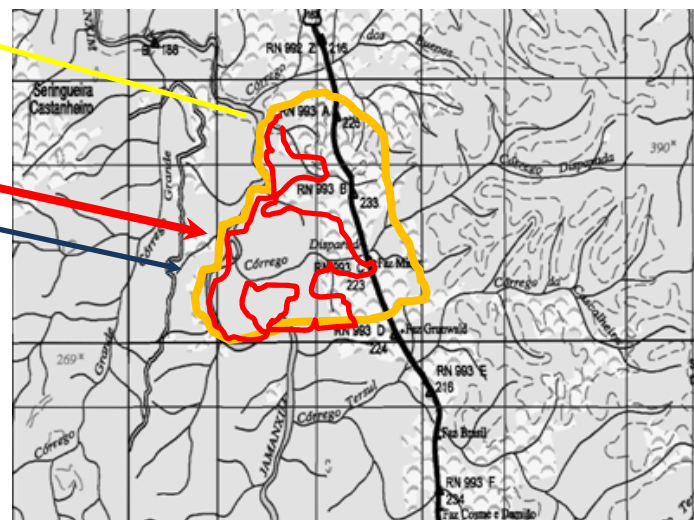
2. Nat. Register of Public Forest



PUBLIC FOREST IDENTIFICATION
NI-22--PA11201

FIELD MATERIALIZATION
(DEMARICATION)

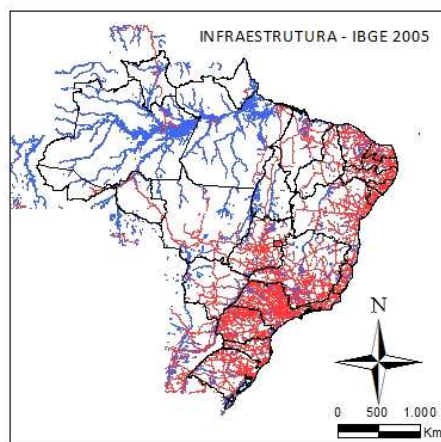
FLOREST BY SATELLITE
IMAGES ON SEPTEMBER
2006
+
PUBLIC LAND



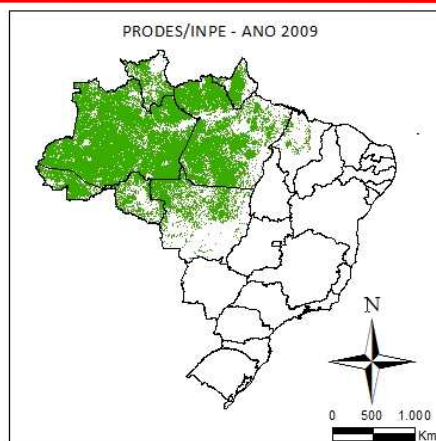
Delimitation of the
public land

2. Nat. Register of Public Forests

**Data Source from the
Managers of the Public
Land
(FUNAI, INCRA, ICMBio)**

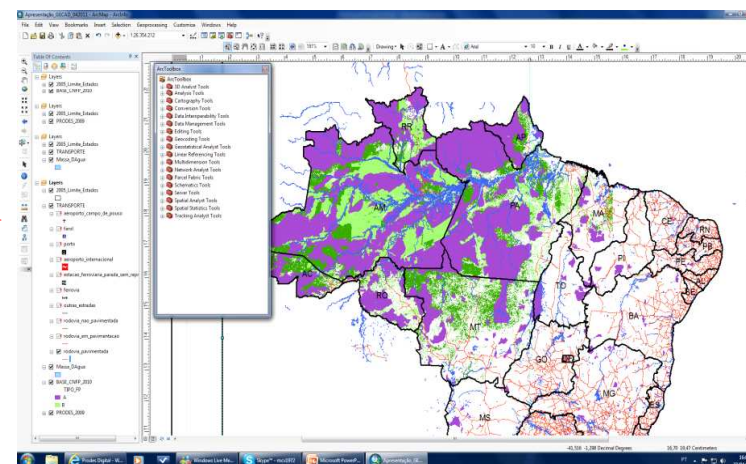


**Spatial Data
infrastructure
(IBGE)**



**Florestal Map
PRODES (INPE)**

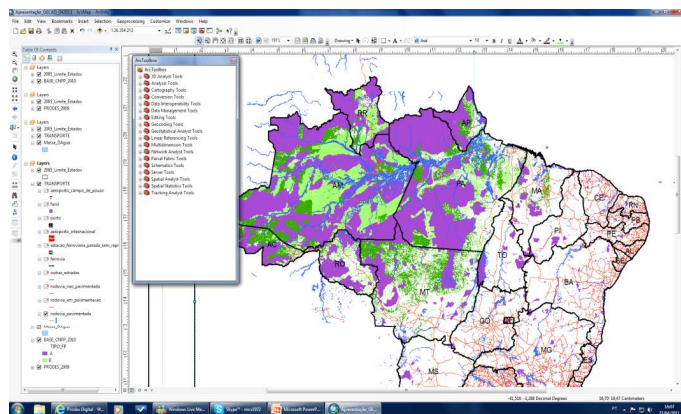
**Overlay Operators by
Geoprocessing (based on the law,
The Forest Management Act)**



ALOS

K&C Initiative
An international science collaboration led by JAXA

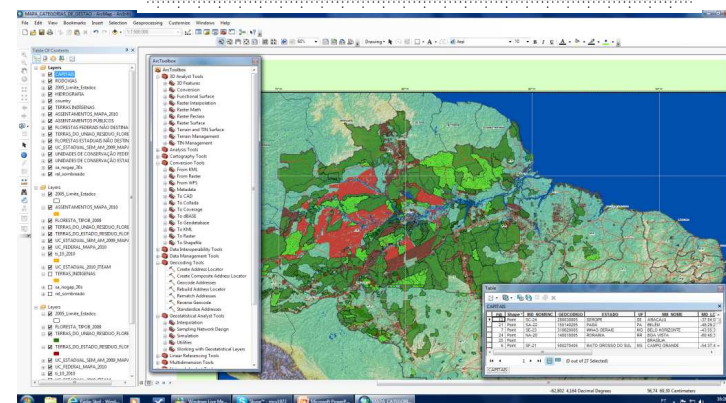
2. Nat. Register of Public Forest



Base de dados
geográficos do
Cadastro Nacional de
Florestas Públicas

Atualização do Mapa
anual do Cadastro
Nacional de Florestas
Públicas

Classificação dos dados ,
cálculos e estimativas.



2. Nat. Register of Public Forests

Geodetic Marks
Implantation in the
Field



Vertice Signing

Signs of Demarcated Land



2. Nat. Register of Public Forests

Descriptive Memorial of Vertices Location and Rotes

Formal Presentation for Legal Documentation
of the Public Forest



MEMORIAL DESCRITIVO

Imóvel: FLORESTA NACIONAL SARACÁ-TAQUERA

UNIDADE DE MANEJO FLORESTAL III (UMF III)

Município: ORIXIMINÁ

Estado: PARÁ

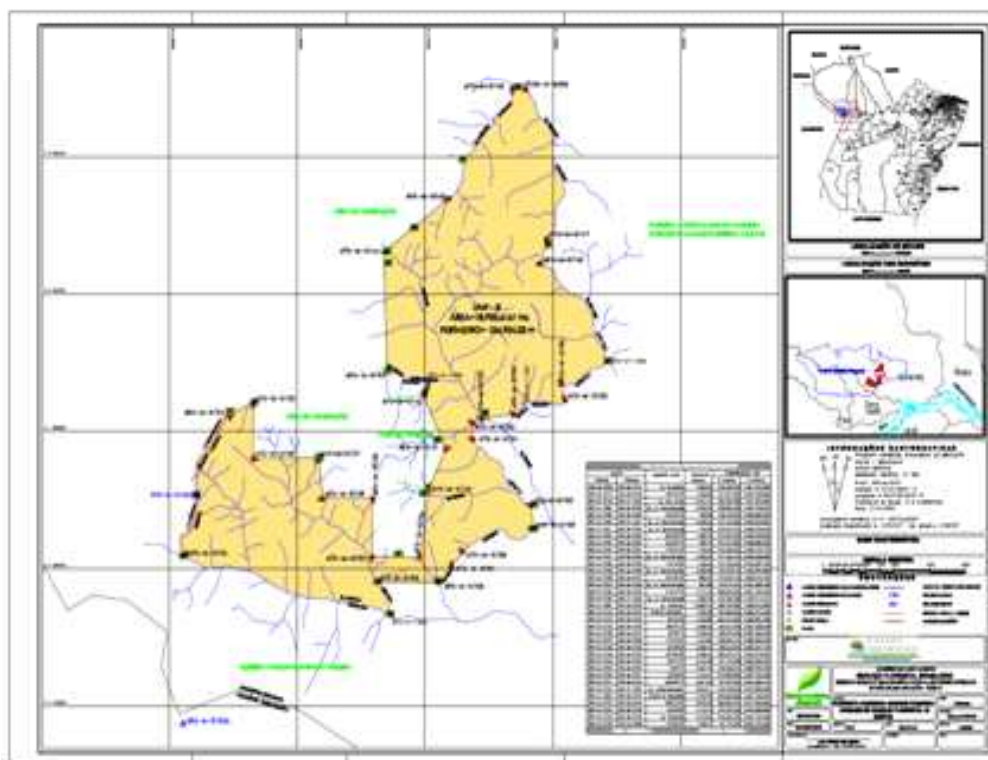
Área: 18.933,6161 ha

Perímetro: 104.924,23 m

DESCRIÇÃO PERIMÉTRICA

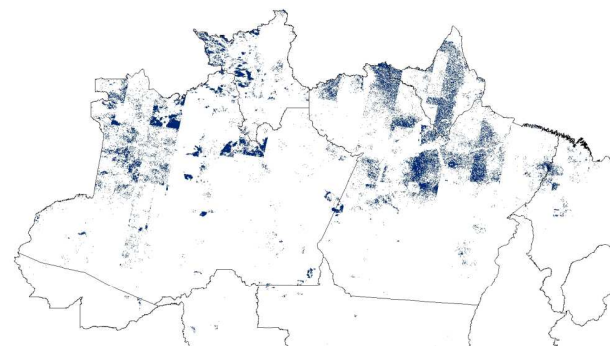
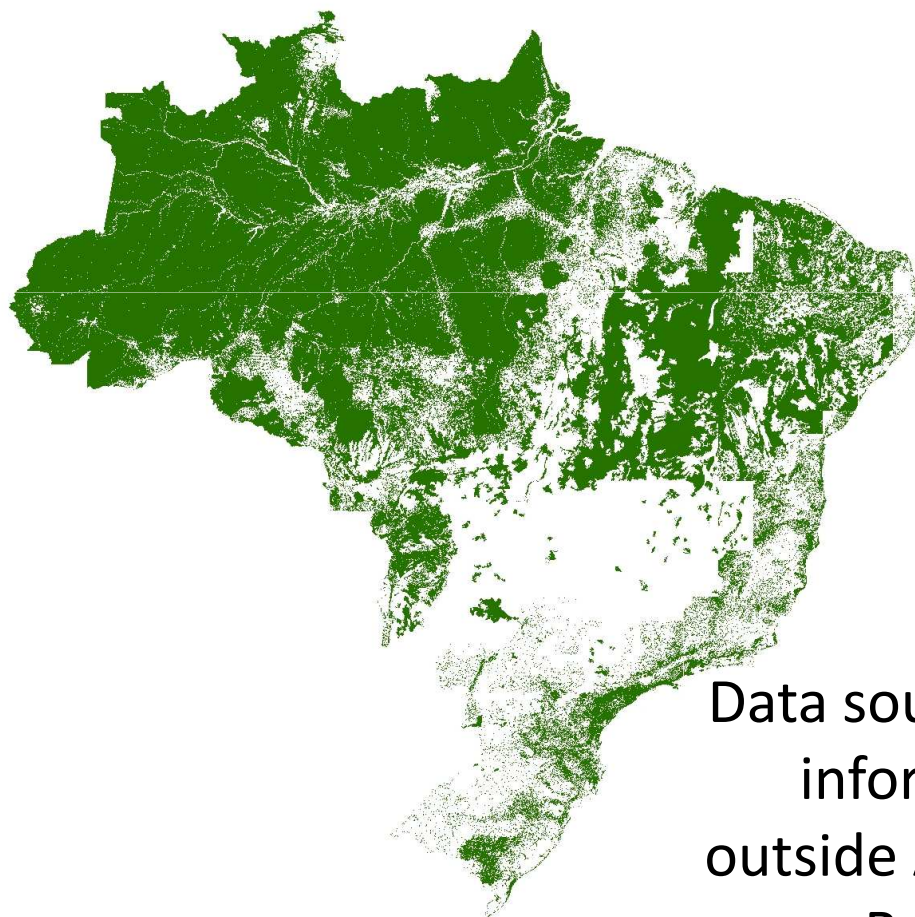
Inicia-se a descrição deste perímetro no marco CO6-M-5556, de coordenadas planas UTM: N 9.824.744,220 m e E 577.112,010 m, referenciado no Meridiano Central 57W, situado em um tributário do Igarapé Inajatuba; deste segue a montante do referido igarapé pela margem esquerda confrontando com Unidade de Manejo Florestal II da Floresta Nacional de Saracá-Taquera por uma distância de 7.955,63 m, até o marco AF0-M-5747, de coordenadas planas UTM: N 9.817.641,680 m e E 578.258,780 m; deste segue por uma linha reta com azimute de 195°42'23" e distância de 1.259,00 m, confrontando neste trecho com Unidade de Manejo Florestal II da Floresta Nacional de Saracá-Taquera, até o marco AF0-M-5748, de coordenadas planas UTM: N 9.816.429,690 m e E 577.917,960 m; situado em umas das cabeceiras do Igarapé dos Anjos; deste segue a jusante pela margem direita do referido igarapé confrontando com Unidade de Manejo Florestal II da Floresta Nacional de Saracá-Taquera com uma distância de 6.101,72 m, até o marco AF0-V-1396, de coordenadas planas UTM: N 9.811.812,583 m e E 581.297,092 m, situado no encontro do mesmo igarapé com um tributário sem denominação; deste segue a montante do referido tributário pela margem esquerda por uma distância de 2.700,72 m até o marco AF0-M-5766, de coordenadas planas UTM: N 9.810.746,610 m e E 578.954,490 m; deste segue por uma linha reta, com azimute de 165°56'34" e distância de 788,08 m, até o marco AF0-M-5765, de coordenadas planas UTM: N 9.809.982,290 m e E 579.150,600 m; localizado na cabeceira de um dos tributários sem denominação; deste segue a jusante do referido tributário pela margem direita com a distância de 2.266,00 m até o vértice, AF0-V-1397, de coordenadas planas UTM: N 9.809.815,694 m e E 577.014,590 m; desde segue a jusante do tributário sem denominação, pela margem direita com a distância de 702,69 m, até o marco AF0-M-5764, de coordenadas planas

Página 1 de 3



3. Forest Map (base 2006)

Clouds Persistence in North of Amazonian Region



Area: 8,5 milhões de km²

Forests: 56% (477.698.070 ha) – FRA 2005

Population: ~200 milhões

Cultivated Forests <1 % (~5.400.00 ha)

Data source lack of
information
outside Amazonian
Region

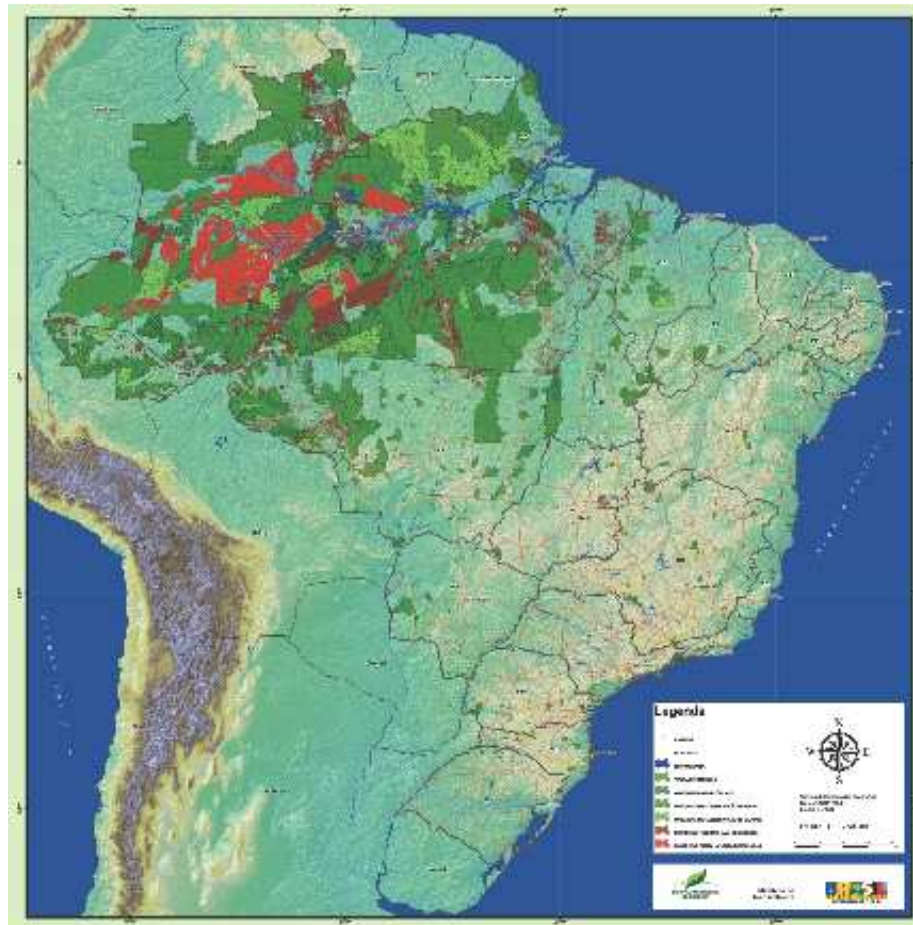
IBAMA's Monitoring:

- 2008 (five biomes)
- 2009 (five biomes)
- 2010 (two biomes)

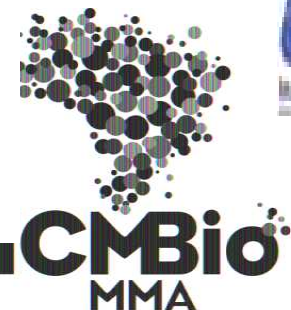
ALOS

K&C Initiative
An international science collaboration led by JAXA

3. Public Forest Map



Sources of information:

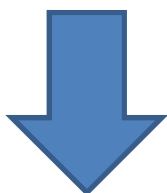


State Environmental Secretaries
State Forests Agencies
State Land Tenure Institutions

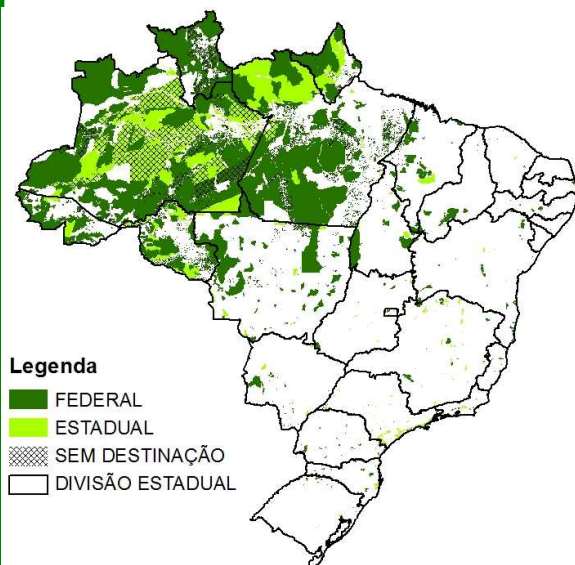


National Register Map for Decision Making

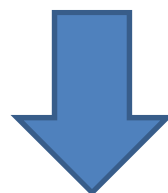
Decision Making



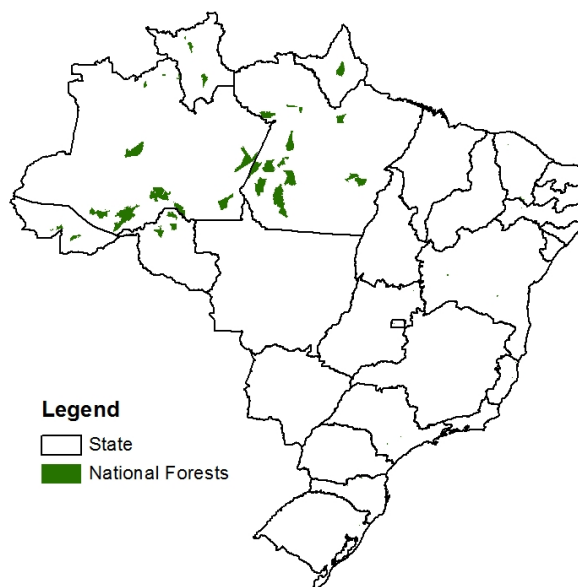
Governance



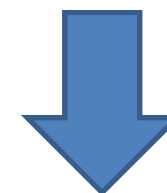
Concessions



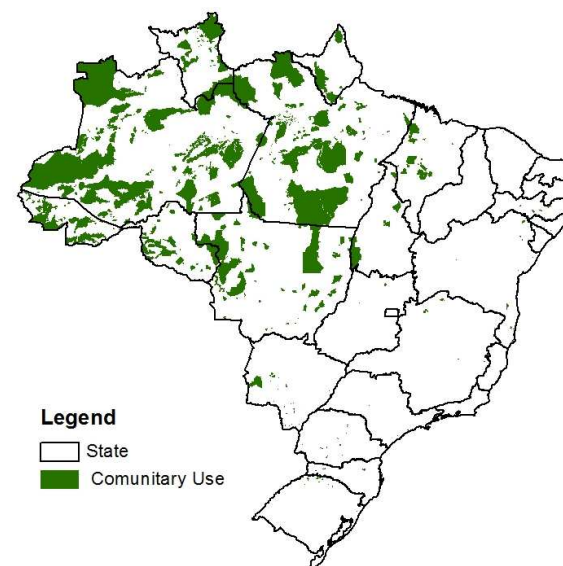
National Forests



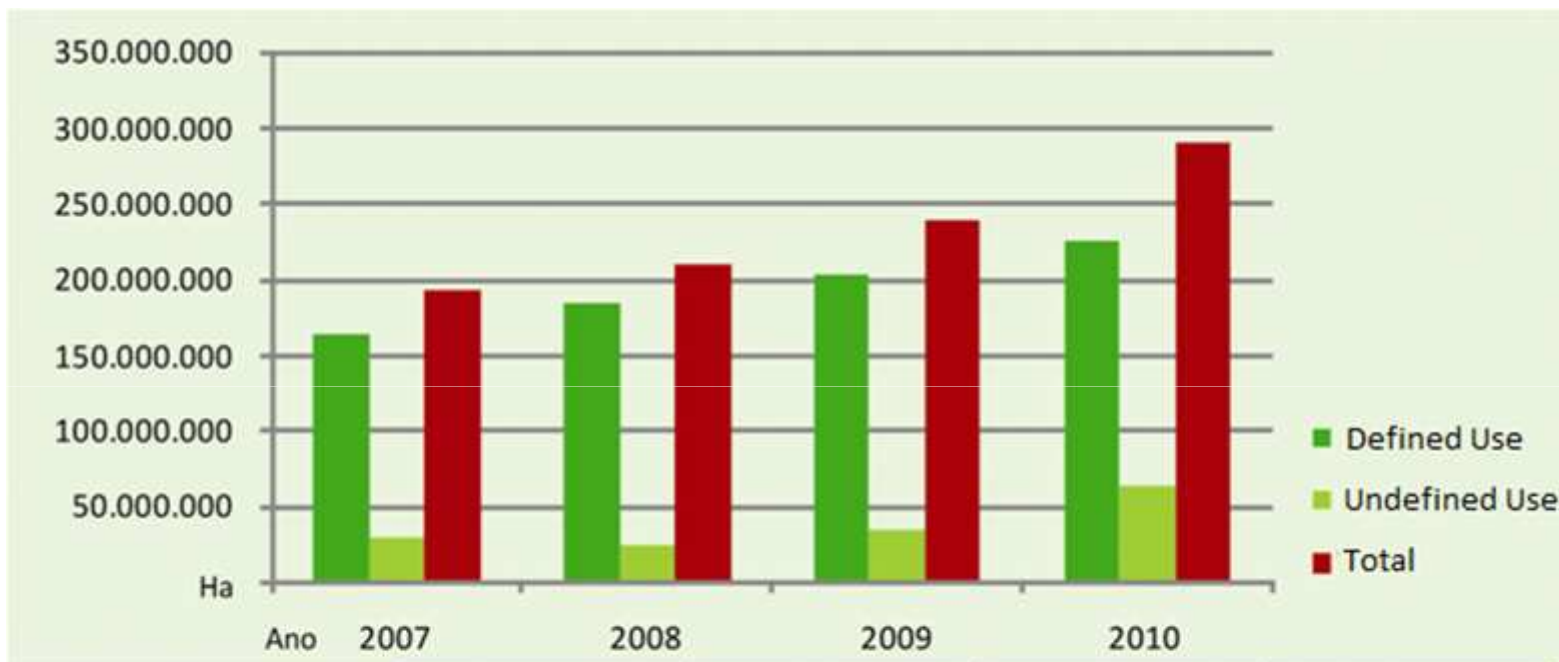
Promoting
sustainable use
comunitary basis



Comunitary Use



Evolution of Public Land Registered



	2007	2008	2009	2010
Defined Use (ha)	164.539.061	185.407.502	203.975.296	225.886.547
Undefined Use (ha)	29.296.649	25.360.698	35.212.758	64.601.944
Total (ha)	193.835.710	210.768.200	239.188.054	290.488.491

4 Forest Information



Forest Inventory

- Need the yearly based information about Brazilian forest
- Can provide information to validate to forest map.
- Minimum “Grid” of 20 x 20 km (N=21.125 sample points in Brazil)
- Forest/Non-forest for each sample point.

4. Forest Information

K&C Initiative
An international science collaboration led by JAXA

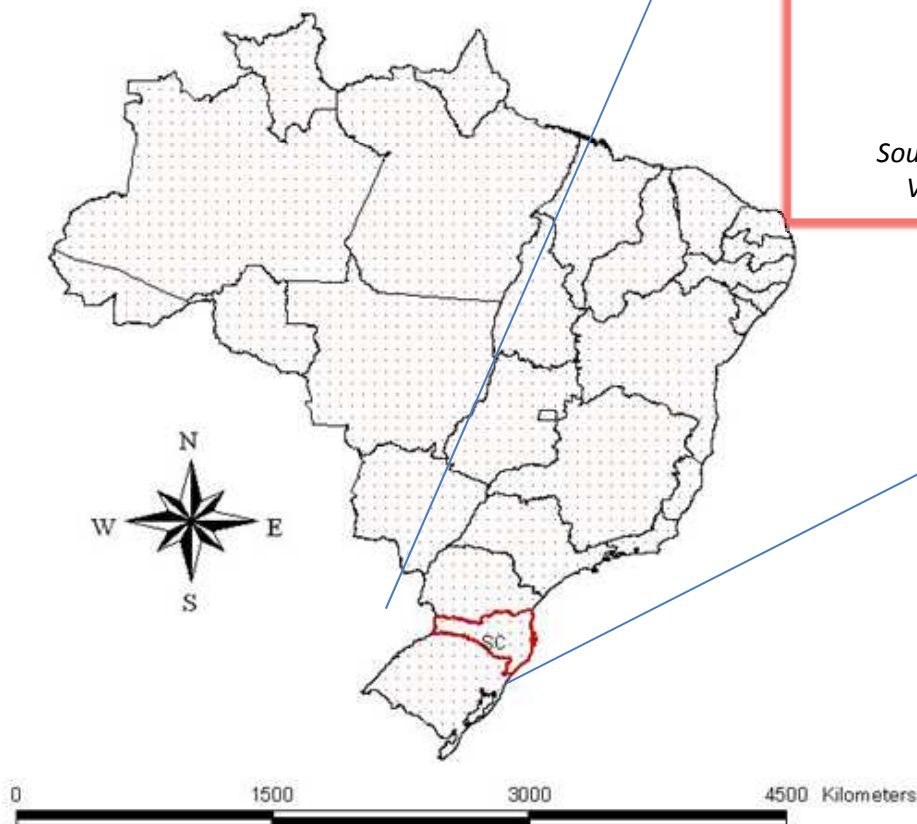
Forest Inventory

1 – Minimum of national grid of 20 x 20 km ($N=21.125$ sample points in Brazil (aprox. 6'48"x6'48" degrees))

2 – Grid over several types of vegetation

Source: Forest Types of IBGE Vegetation Map (2003)

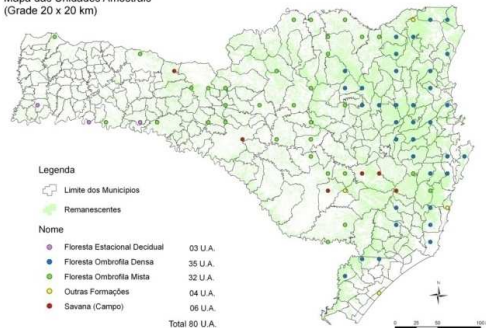
3 – Stratification of the sample units on Forest Non-Forest



ALOS

K&C Initiative
An international science collaboration led by JAXA

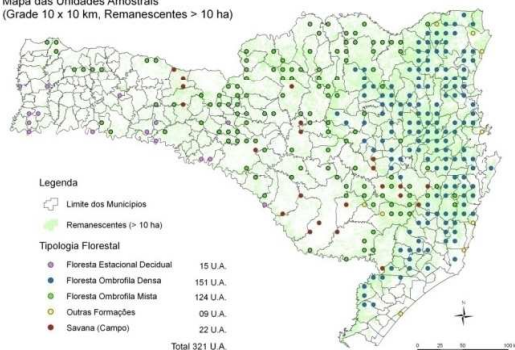
Mapa das Unidades Amostras
(Grade 20 x 20 km)



20x20

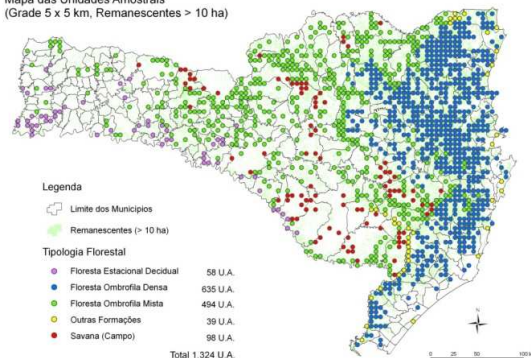
Density of points can change to balance or intensify the forest types.

Mapa das Unidades Amostras
(Grade 10 x 10 km, Remanescentes > 10 ha)

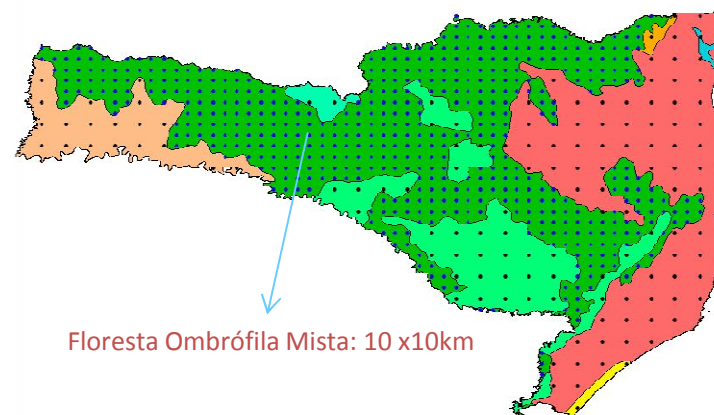


10x10

Mapa das Unidades Amostras
(Grade 5 x 5 km, Remanescentes > 10 ha)

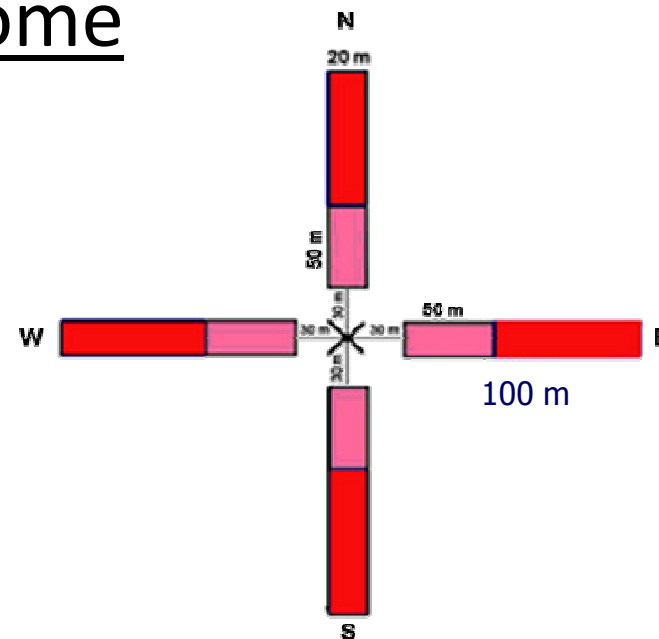


5x5



Floresta Ombrófila Mista: 10 x10km

Quadrant Parcels in Amazonia Biome



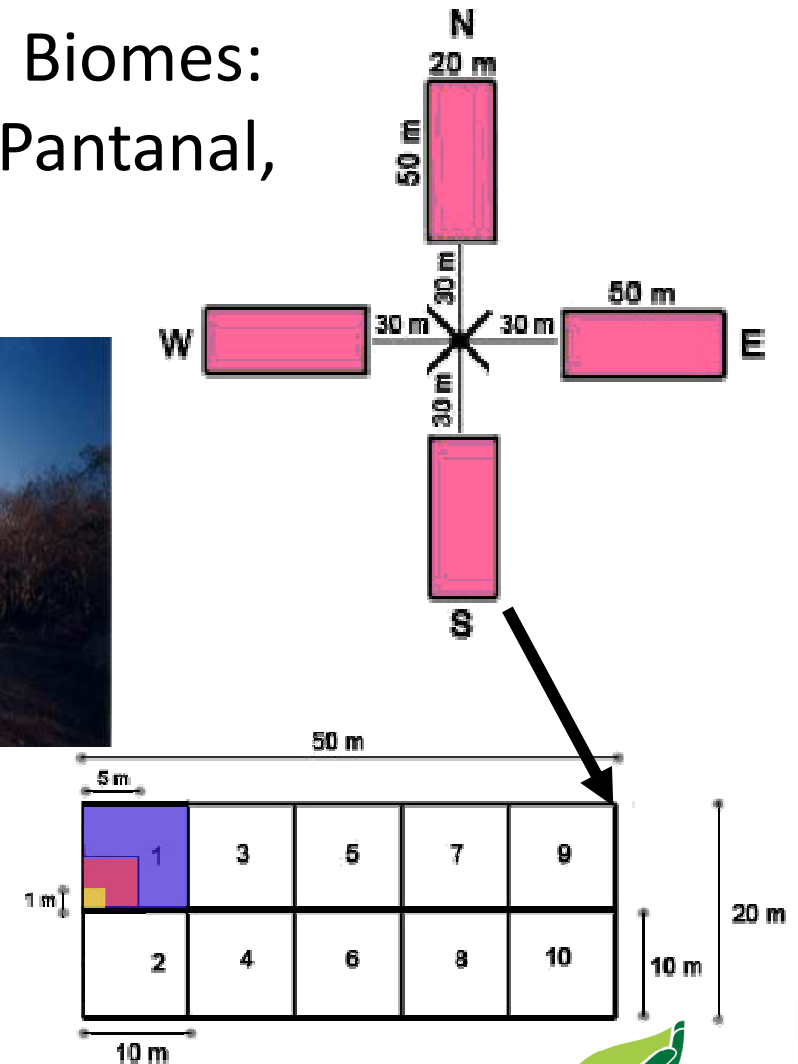
Parcels/Sub-parcels – Dimensions and tree inclusion thresholds

LEVEL	DIMENSIONS (m)	AREA (m ²)	Inclusion thresholds
I	1 x 1	1	$h \geq 1,5 \text{ m}$ e $\text{DAP} < 5 \text{ cm}$
II	5 x 5	25	$5 \text{ cm} \leq \text{DAP} < 10 \text{ cm}^{**}$
III	10 x 10	100	$10 \text{ cm} \leq \text{DAP} < 20 \text{ cm}$
IV	20 x 50	1,000	$20 \text{ cm} \leq \text{DAP} < 40 \text{ cm}$
V (AMAZONIA)	20 x 100	2,000	$\text{DAP} \geq 40 \text{ cm}$

ALOS

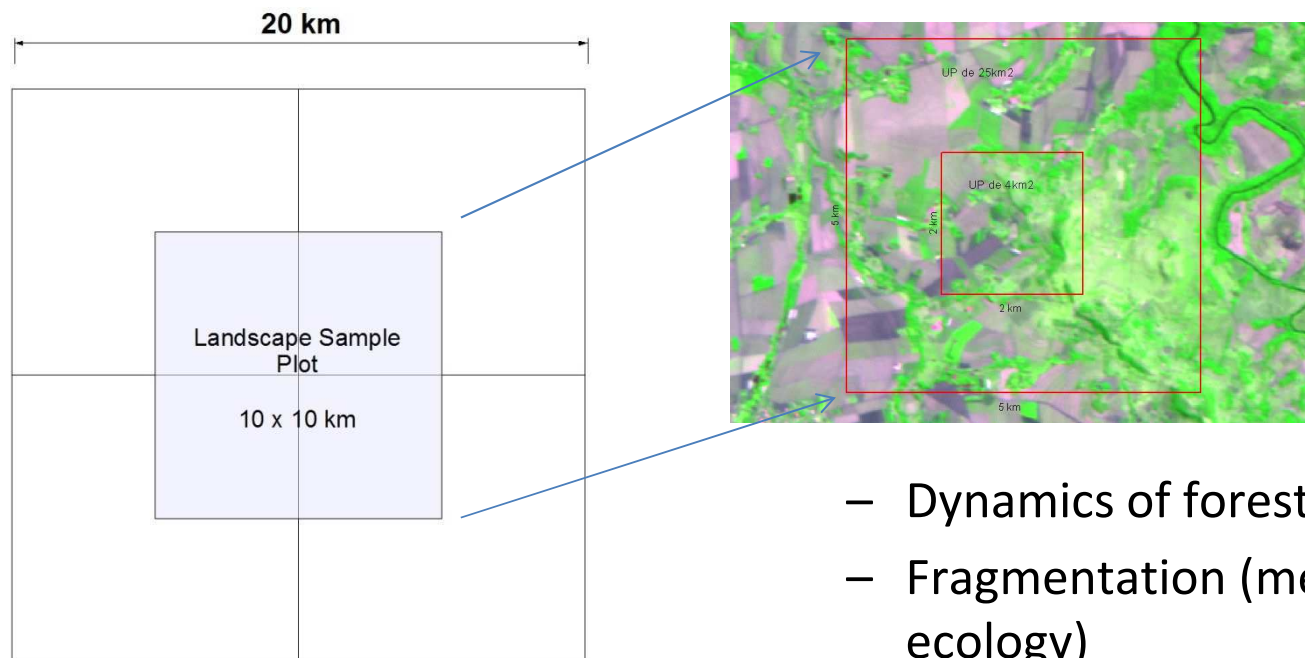
K&C Initiative
An international science collaboration led by JAXA

Quadrant Parcels in Other Brazilian Biomes: Mata Atlantica, Cerrado, Caatinga, Pantanal, Pampa




SERVIÇO FLORESTAL
BRASILEIRO

Landscape Analysis: Metrics



- Dynamics of forest use change
- Fragmentation (metrics from landscape ecology)
- Evaluation of presence of Riparian Forest
- Trees Outside the Forest (TOF)

For Santa Catarina was used
SOPT, for Federal District
ALOS, Atlantic Forest ALOS.
Can be CBERS or Landsat.

Expected Forest Parameters:

- Floristic Composition
- Forest Coverage Area
- Forest Stocks
- Forest Dynamics
- Forest Structure
- Biomass and Carbon
- Forest Management
- Forest Production
- Forest Healthy
- Biodiversity (vegetation)
- Forest Use (traditional)
- Forest Property
- Accessibility to Forest Resources
- Forest Fragmentation (landscape) Interview with local people

Besides the biophysical parameters:

Approximately 2 interviews for each sample point with local people (forest related social, cultural, economical, and about perception of governance).

ALOS

K&C Initiative
An international science collaboration led by JAXA

Thanks to the team

