Mahogany Project

The Problem

Forest Degradation and exhaustion of stocks of the Mahogany (*Swietenia macrophylla*)

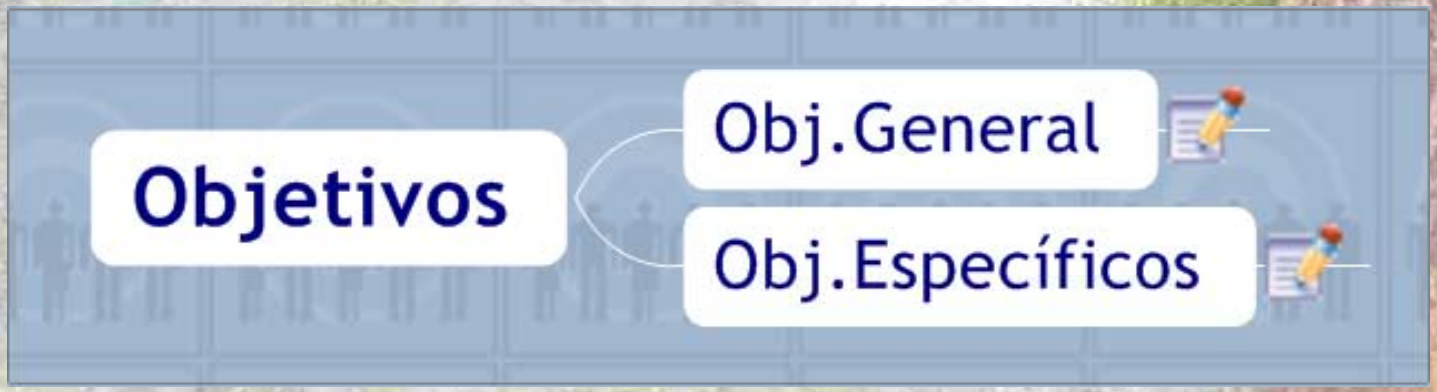
The causes

- 85 years of disordered extractive activity
- Lack of a strategy of sustainability for the species
- Destruction of the habitat caused by land use conversion to agricultural and cattle uses

Project Antecedents

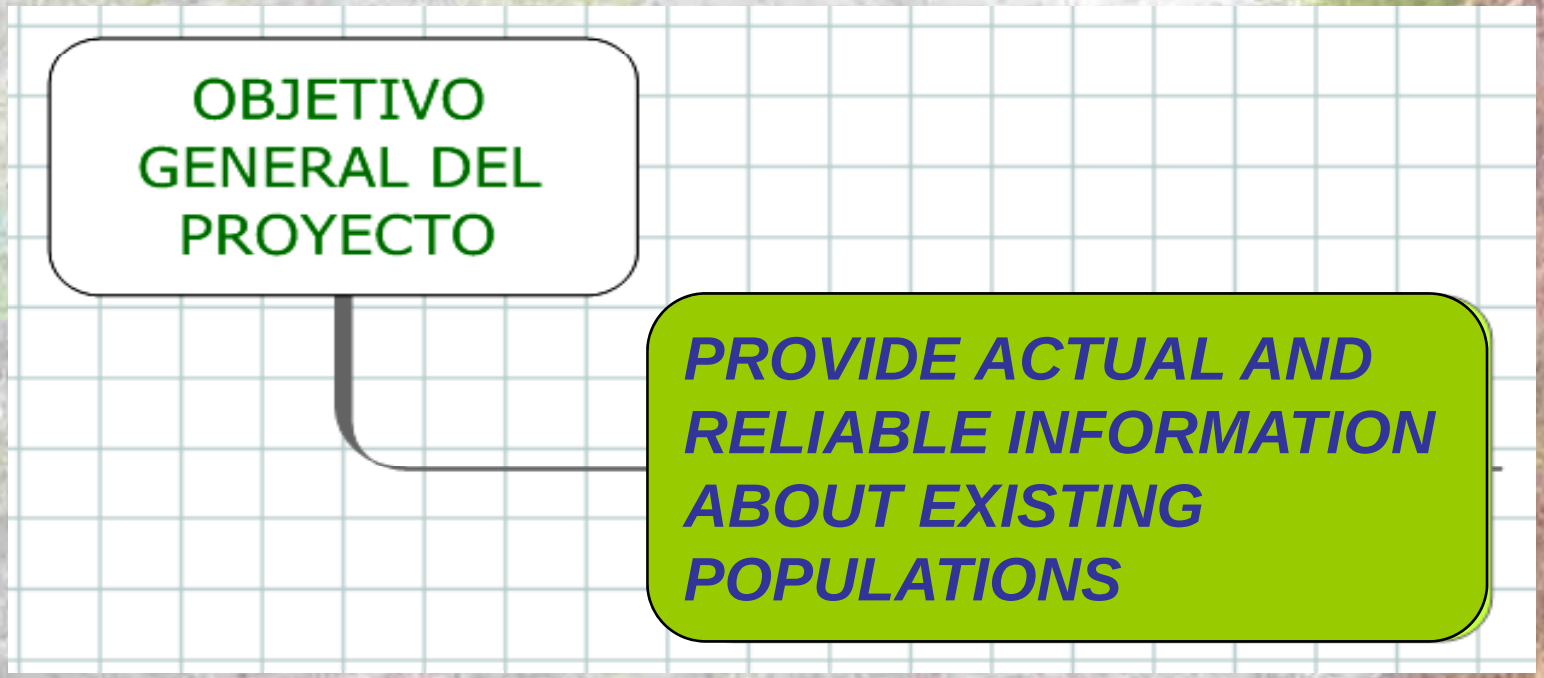
- Twelfth meeting of the Conference of the Parties (Santiago, 2002): Mahogany on Appendix II
- November 15th, 2003
- Pucallpa´s meeting on June 2004
- Fortification of Administrative and Scientific Authorities Project (2005)

Objectives



(Proy Caoba) _01_Objetivos.ppt

In order to contribute to the design and instrumentation of national policies effective in reverting the tendencies that affect to Swietenia macrophylla...



General Objective

Provide
actual and reliable information about existing populations

... appropriate for achievement of...

- ✓ **Possibilities of annual quota**
- ✓ **Strategy for the recovery and sustainable utilization of the species**

Specific Objectives

PROJECT'S SPECIFIC OBJECTIVES

- Obj.1 Mahogany Natural distribution Map
- Obj.2 Forest Survey
- Obj.3 National strategy of conservation proposal

Specific Objective 1

Mahogany Natural distribution Map

… with information about …

- **Density of trees**
- **Capacity of production**
- **Zones with greater impact**
- **Risks of loss of populations**

Specific Objective 2

Forest survey

… With work about …

- **Characterization plots**
- **Revision of evaluation reports**
- **Qualitative and quantitative information**

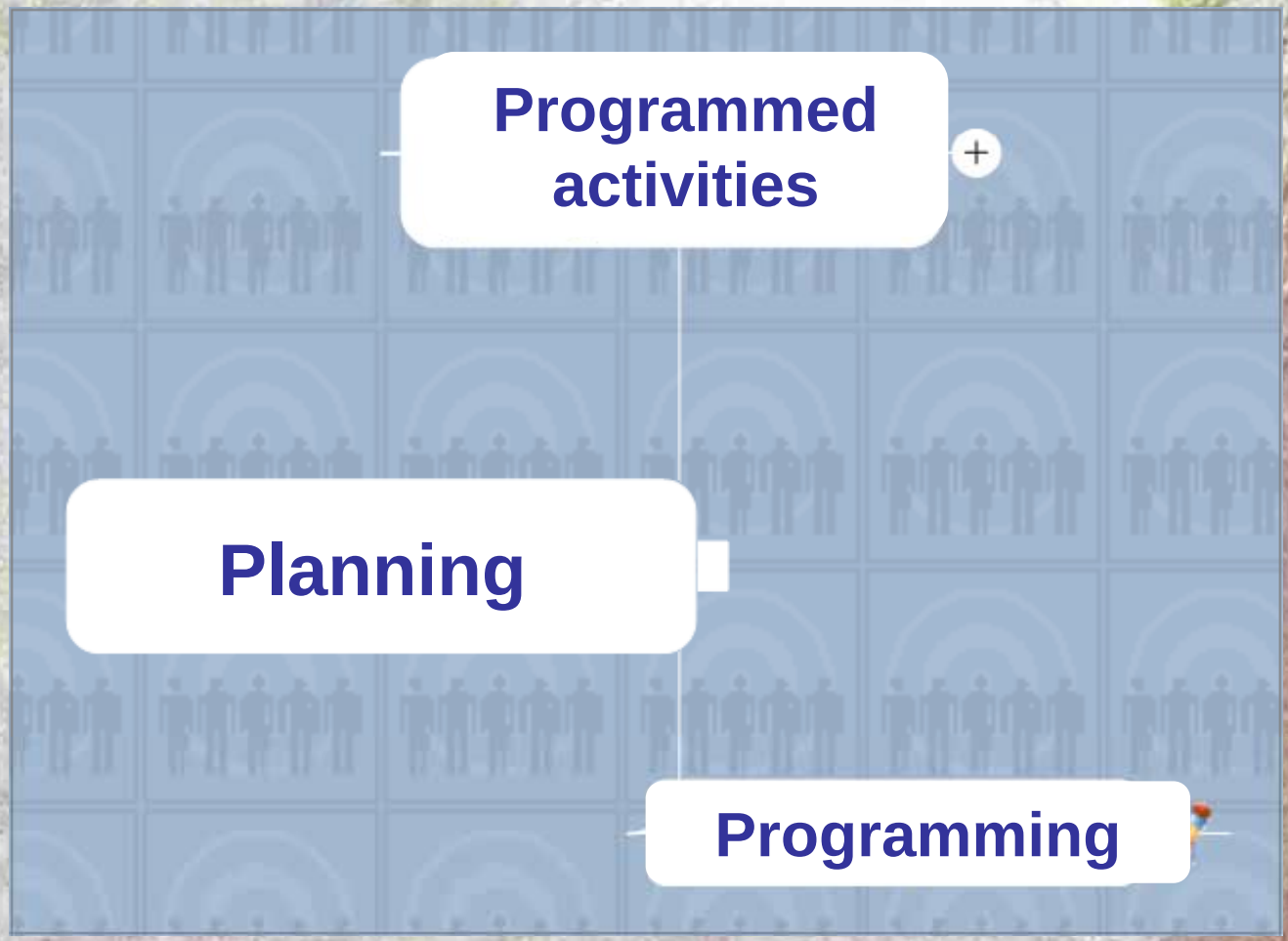
Specific Objective 3

National strategy of conservation proposal

… based on …

- **Sustainable forest management**
- **Low impact logging**
- **Silvicultural systems**

Planning



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Planning

Specific objectives of the Project

- Obj.1 Mapa de distribución natural
- Obj.2 Levantamiento forestal
- Obj.3 Estrategia de conservación

Programmed activities - 0

Obj.1 Mapa de distribución natural

Obj.2 Levantamiento forestal

Obj.3 Estrategia de conservación

Programmed activities - 1

Obj.2 Levanta-miento forestal

Obj.3 Estrategia de conservación

Obj.1 Mapa de dis-tribución natural

1.1. Revision and compilation of information
1.2. Distribution map
1.3. Development of a dynamic GIS

Programmed activities - 2

Obj.1 Mapa de distribución natural

Obj.3 Estrategia de conservación

Obj.2 Levantamiento forestal

2.1. Design, execution and processing

2.2. Characterization of populations

Programmed activities - 3

Obj.1 Mapa de distribución natural

Obj.2 Levantamiento forestal

Obj.3 Estrategia de conservación

3.1. Results diffusion Meetings

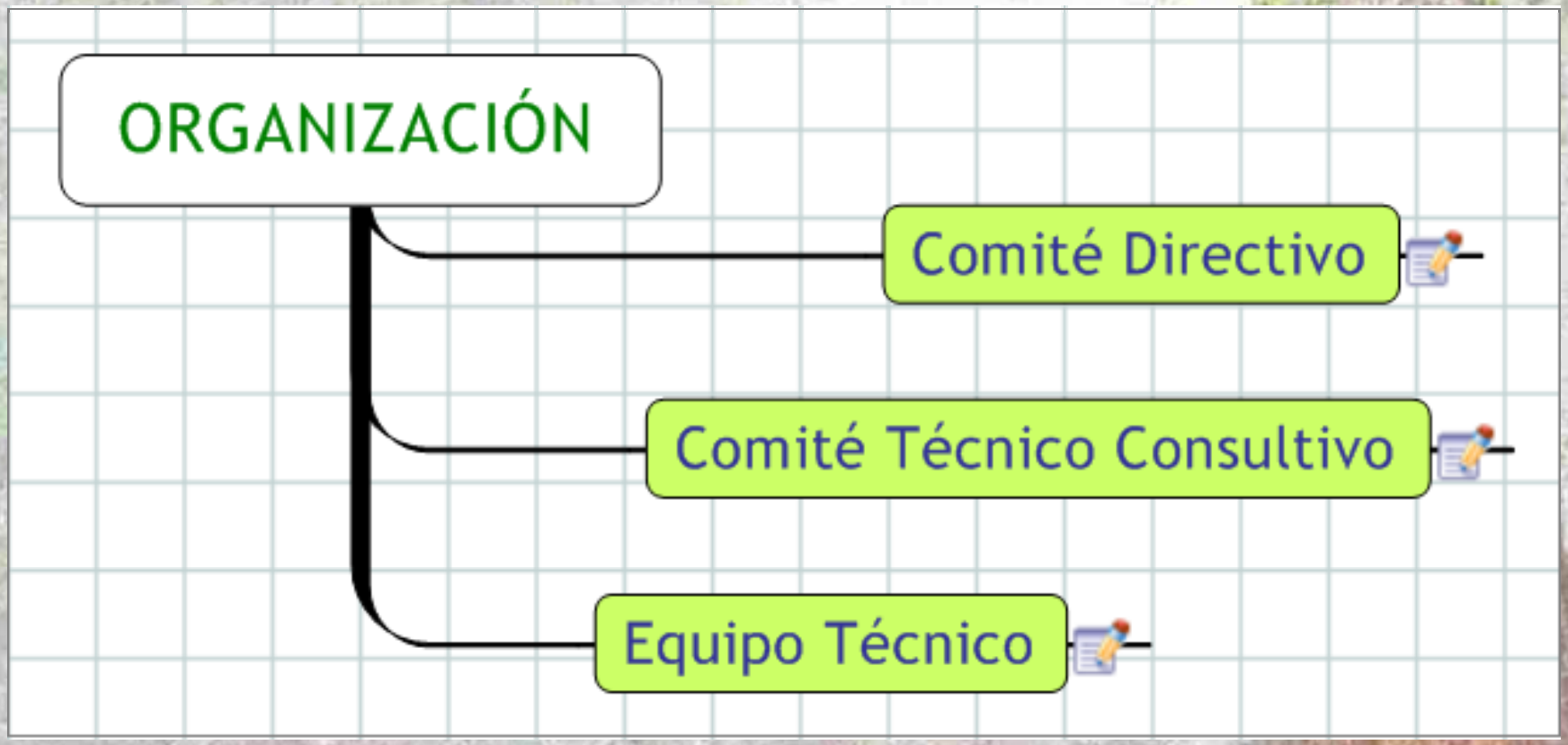
3.2. Proposal of action and strategy plan

Programming

Organization

(Proy Caoba)_03_Organizacion.ppt

Organization



Directive Committee

Formed by

- ITTO
- UNALM /FCF
- WWF
- INRENA
- CNF

Functions

- ✓ It orients the Project
- ✓ It receives periodic report of advance
- ✓ It approves readjustments of the programming

Consultative Technical Committee -1

Consultative Technical Committee -2

Functions

- ✓ It offers technical direction
- ✓ It receives periodic report of the advance
- ✓ Sociabiliza los resultados
- ✓ It offers feedback

Formed by

- ADEX (Exporter association)
- AIDESEP (Interetnica Association de Peruvian Forest Development)
- Proterra Association
- Cancillería - General Directory of Environment

Consultative Technical Committee -3

Formed by (cont.)

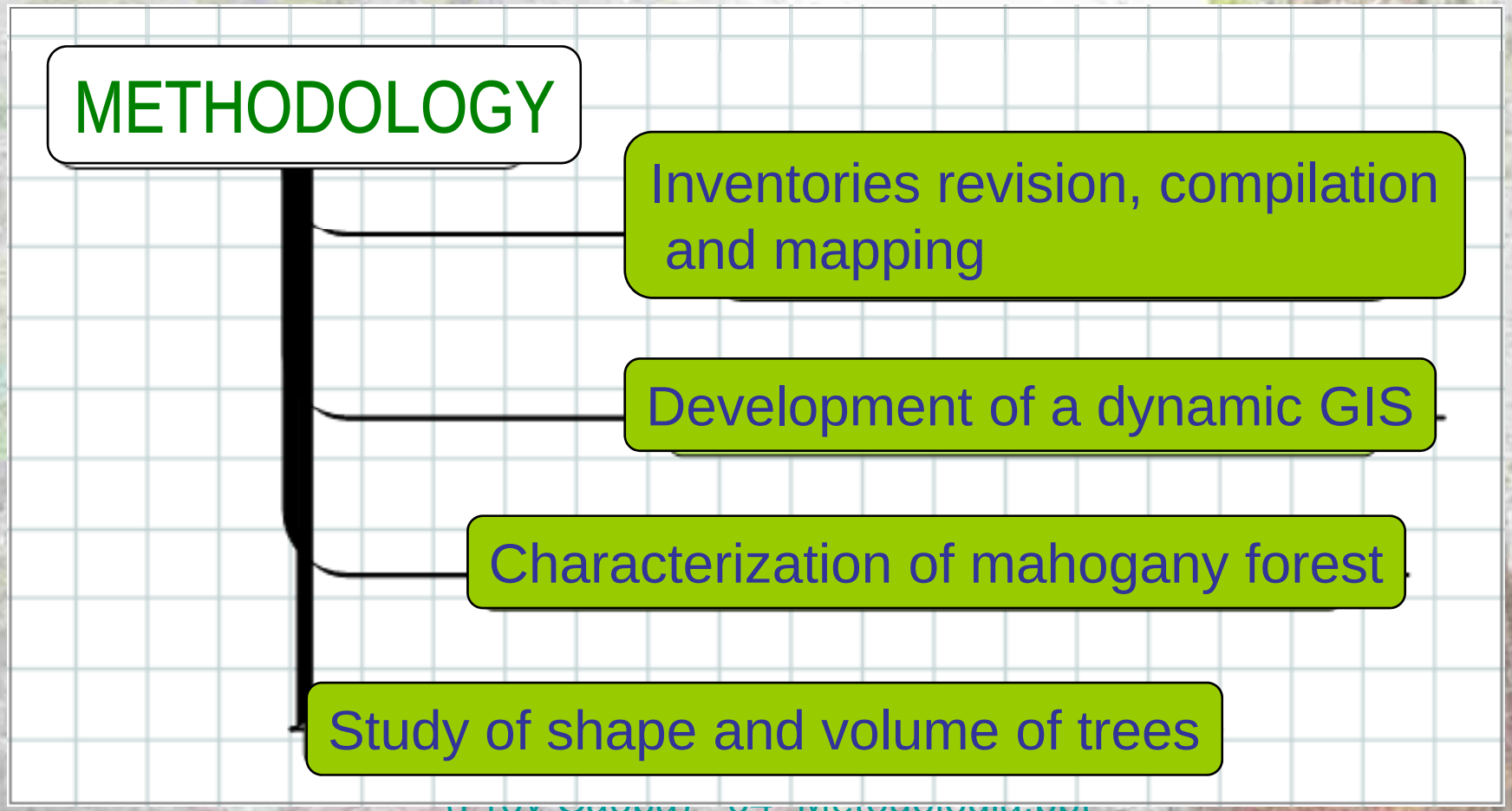
- CI (Conservación Internacional)
- CIP - Capítulos de Ing. Forestales de Lima y Ucayali
- CONAM (Comisión Nacional del Medio Ambiente)
- CONCYTEC (Comisión Nac. de Ciencia y Tecnología)
- IIAP (Instituto de Investigación de la Amazonia Peruana)
- INIAE (Instituto Nac.de Investigac.Agraria y Extensión)
- OSINFOR (Org.Superv.de Rec. Forestales Maderables)
- SPDA (Sociedad Peruana de Derecho Ambiental)
- UNAP (Universidad Nacional de la Amazonia Peruana)
- UNU (Universidad Nacional de Ucayali)

- Directive and Consultative Comities celebrated date:
- CD: 29/12/05, 17/08/06 y 14/12/06
- CC: 11/08/06 y 28/02/07

Technical Staff

Ignacio Lombardi	*Coordinator*
Victor Barrena	*Evaluation, inventories and imagery*
Carlos Vargas	*Information* systems
Patricia Huerta	*Evaluation of forestry resources*
Carlos Garnica	*Cartography and imagery*
Juan Carlos Ocaña	*Inventories*
Américo Gamarra	*Data base*

Methodology



(Proy Caoba) - 04 Metodología.ppt

Inventories revision, compilation and mapping

1. Forestry inventories identification and capture

	A	B	C	D	E	F	G	H	I	J
1	FORMA01									
2		Clave:	1985MA+++_IFDFATT_							
3		Título:	Inventario forestal en el distrito forestal de Atalaya departamento de Ucayali.							
4		CeldasEstudio:	1156;1157;1158;1159;1160;1186;1187;1188;1189;1190;1210;1211;1212;1213;1214;1235							
5		Año:	1985							
6		TipoEstudio:	IF	IF=Inventario Forestal, EX=Estudio Exploratorio, SD=Estudio						
7		Extensión (ha):	664960							
8		ZonaDeVida:	bh-T;bmh-PT	Clave BANDIF. Usar ';' (punto y coma) para separar claves						
9		Altitud (msnm):								
10		Fisiografía:		Clave IEC						
11		TipoDeBosque:	111000;1120	Clave BANDIF						
12		Accesibilidad:	F#0	T#/F# (T=terrestre, F=fluvial; #: 1=fácil, 2=medio, 3=dificil, 0=desconocido)						
13		RefBibliografica:	Inventario forestal en el distrito forestal de Atalaya Departamento de Ucayali.							
14		DapMinimo (cm):								
15		HayCaoba?:	S	S/N						
16		VolumenHaCaoba:		Como figura en el estudio						
17		UnidadVolumen:								
18		ArbolesHaCaoba:								
19		AreaBasalHaCaoba:								
20		VolumenHaSpp:								
21		ArbolesHaSpp:								
22		Observaciones:	No hay datos numéricos							

Inventories revision, compilation and mapping

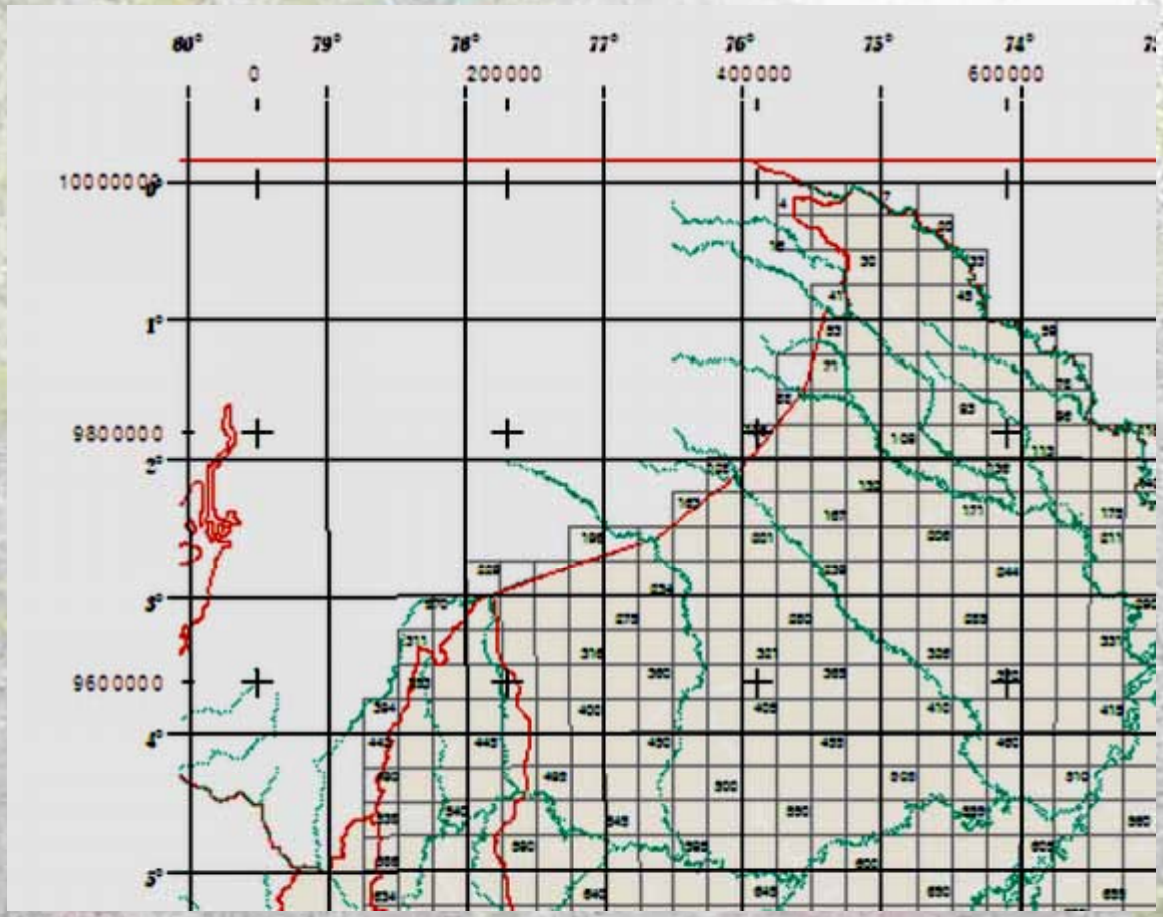
2. Inventory studies enumeration

Relación de Estudios de Recursos Naturales Revisados

1	1968	NAT BN	RE	295000	0	S	0 000	0 000	0 000	0 000	I st Pol Bosque Nac Ipana	1968
2	1965	ONE RKAMM	E X	2200000	0	S	0 000	0 000	40 297	0 000	II PE S / Kosñipata AltoM Dios M	1965
3	1966	I AOII PI	RI	3360000	0	S	0 000	0 000	0 000	0 000	II Proyecto Huallaga (F AO 66)	1966
4	1966	ONE R/RIP	E X	962000	0	S	0 000	0 000	51 920	0 000	II I RN Zona Rio Pachitea	1966
5	1968	ONE RRTGP	E X	892000	40	S	3 770	0 640	87 568	29 147	II I RN Rio Tumbo Gran Pajonal	1968
6	1970	ONE RRSM	E X	737060	37 5	S	0 000	0 000	80 917	0 000	II I RN / Rios Santiago y Morona	1970
7	1970	ONE RVRIPP	E X	826350	40	S	0 296	0 031	90 390	40 405	II I RN / Villa Rica Pto Pachitea	1970
8	1970	UNAII BJ I	IF	100000	25	S	0 000	0 000	95 850	99 190	II Bosques de Jenaro Herrera	1970
9	1971	MAIIBNVII	E X	845000	30	S	0 734	0 127	59 400	49 300	II Exp BN A Von Humboldt	1971
10	1971	UNAI BNI	SD	6000	25	S	0 589	0 062	77 100	67 450	II Zona Nueva Italia	1971
11	1974	UNASAISPA	IF	20507	0	S	0 000	0 000			I vl RF SAIS PAMPA (Pucallpa)	1974
12	1975	I AOII BNAVH	IF CT	200000	30	S	0 597	0 045	126 640	85 490	II del BNAVH (I II Va Canada)	1975
13	1975	ONE RIQNAIR	RL	5600000	75	S	0 012	0 000			II I RN / Iquitos Nauta y Colonia /	1975
14	1976	ONE RCI AM	SD	180000	25	S	0 000	0 000	0 000	0 000	II R Syl ZonaCenepa Alto Marañ	1976
15	1976	SYPI INAM	E I	20000	27	N	0 000	0 000	60 600	50 800	I I II Planta extracc y aserr Inan	1976
16	1976	UNAI XRI MI P	IF I X	1000000	25	S	0 000	0 000	130 950	107 900	Proy Complejo Maderero Pucallpa	1976
17	1977	ONE RX/ EI	E X	950000	25	S	0 000	0 000	0 000	0 000	II I RN / Iberia Iñapari	1977
18	1978	ONE RPAEIIJ	IF	900000	0	S	0 000	0 000	0 000	0 000	II I Z Pucallpa Abujao	1978
19	1980	I II IIICA	E I	1598600	40	S	2 002	0 221	34 906	9 084	Aprv For Iiq Nac Imabo Cordillera	1980
20	1980	ONE RAYIBRI	RI	730000	25	S	0 226	0 060	91 242	64 170	II I RN / R Alto Yuruc y Breu	1980
21	1980	ONE RE SCHY	RE	970000	25	S	0 279	0 107	114 470	85 210	II I RN / I speranza Chandles Yi	1980
22	1981	ONE RSPICH	SD	128600	25	S	0 004	0 005	74 269	71 810	II SD RN / Rio Pichis (Proy Pich	1981
23	1982	ONE RSATAL	SD	88400	25	S	0 000	0 000	85 089	54 759	II SD RSyl / Atalaya	1982
24	1982	ONE RSPAI C	SD	95000	25	S	0 000	0 000	67 248	56 390	II SD RN / Rio Palcazu	1982
25	1982	UNAI II NAC	IF SD	3459/69	30	S	0 000	0 000	110 834	69 868	II Nac Selva Central (Proy Oxap	1982
26	1982	UNAI I MSTP	IF	0000	0	S	0 000	0 000	0 000	0 000	I oll RRI I La Merced Satipo	1982

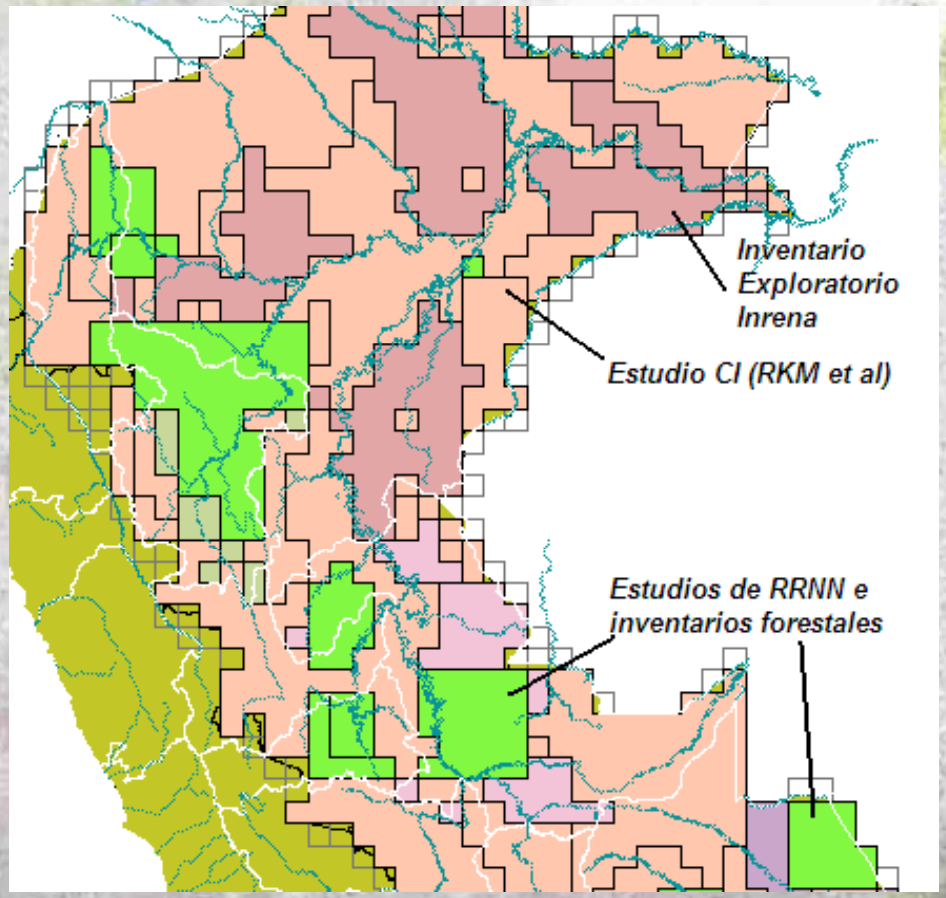
Inventories revision, compilation and mapping

3. Inventory studies georeferencing



Inventories revision, compilation and mapping

4. Inventory studies mapping

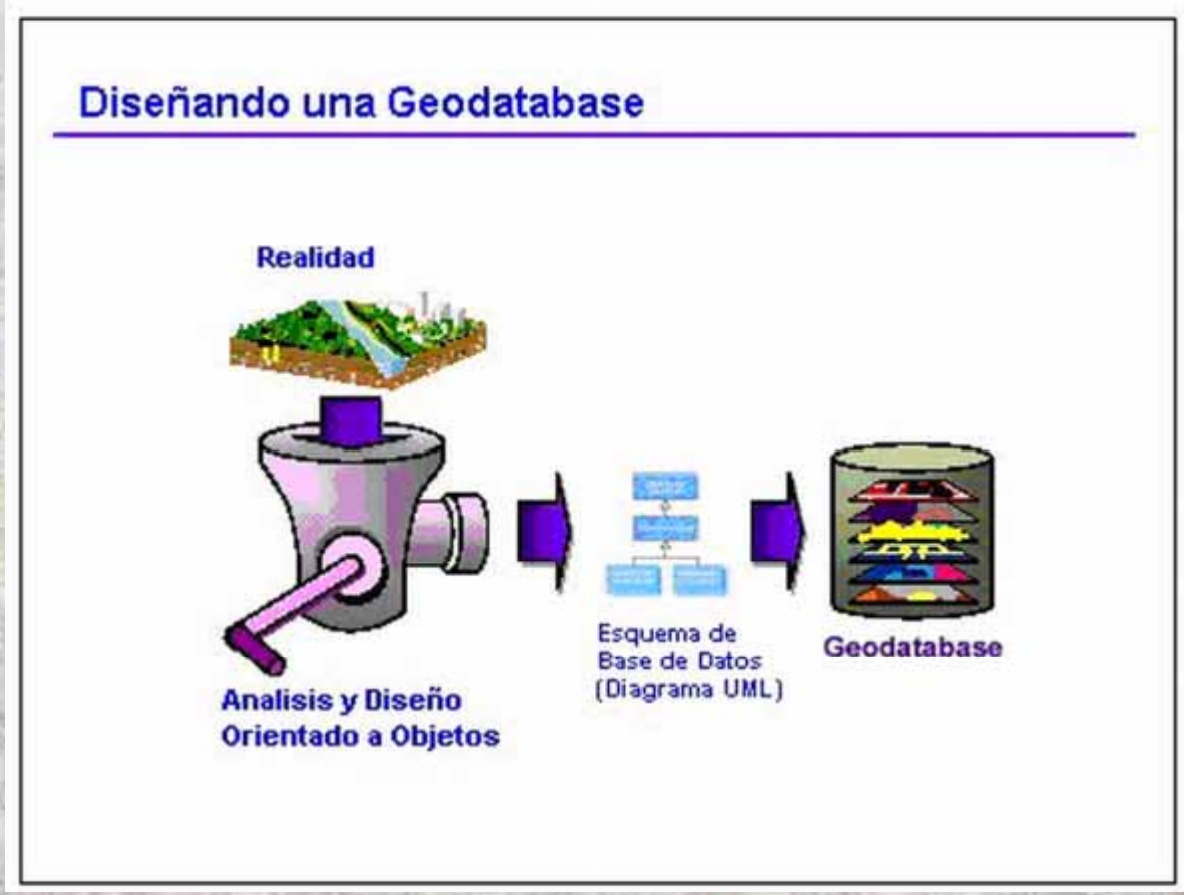


Inventories revision, compilation and mapping

5. Tree location georeferencing

- **Revision of census of POAs provided by INRENA**
- **Search of available herbariums' data bases**
- **Consultations to trustworthy people**
- **Previous forest inventories (ONERN, DMF, MINAG, INRENA, etc.)**
- **Specific documents of mahogany evaluation**

Development of a dynamic GIS



Development of a dynamic GIS

1. Study area

	Superficie en km² (excluyendo ANPs)		
Departamento	***Total***	***Bosques productivos***	***% Bosques productivos***
LORETO	368,851.95	328,921.83	89.2%
MADRE de DIOS	85,300.54	46,947.51	55.0%
SAN MARTIN	51,253.31	28,294.75	55.2%
UCAYALI	102,410.55	85,751.96	83.7%
	607,816.35	***489,916.05***	***80.6%***

Development of a dynamic GIS

2. Digital spatial data

Base Cartography:

IGN: National chart, 2000 (1/100000)

- **Hydrography**
- **Contours**
- **Roads**
- **Towns**

INEI: Administrative boundaries, 2003

MinEdu: Village and Towns, 2006

MinTC: Roads, 2005

Thematic Cartography:

UNALM/CDC:

- **Biogeographics Provinces**
- **Peru Ecoregions**

INRENA/Cifor:

- **BPP**
- **Forest concessions**
- **Forest Types of BPP**
- **ATFFS**
- **Main concessions Forest**
- **Peruvian Forest Map 1995**

INRENA/Intdc.ANPs: SINANPE

Inst. del Bien Común: Natives communities

INRENA/Intdc.Rec.Hídr.: Basin.

UNALM/FCF: Preliminary Mahogany density Map

INRENA-CONAM: Peruvian Amazon deforestation Map 2000

Development of a dynamic GIS

3. Digital attribute data

POA : 2002 – 2006

Departa-mento	*Núm. total de Conce-siones (1)*	*Núm. de Conce-siones con caduci-dad (1)*	*Número de Conce-siones recopila-das con Caoba*	*Número de POAs recopila-dos con Caoba (2002 – 2006)*	*% Avance en ingreso de datos (a feb. 2007)*	*% Avance en ingreso estandari-zación de datos*
Madre de Dios	*85*	*5*	*56 (2)*	*111 (2)*	*100*	*100*
Ucayali	*177*	*24*	*77*	*95*	*100*	*100*
San Martín	*34*	*2*	*12*	*26*	*38*	*0*
Loreto	*248*	*0*	*32*	*32*	*100*	*100*

Development of a dynamic GIS

4. Standardization of census data: tables

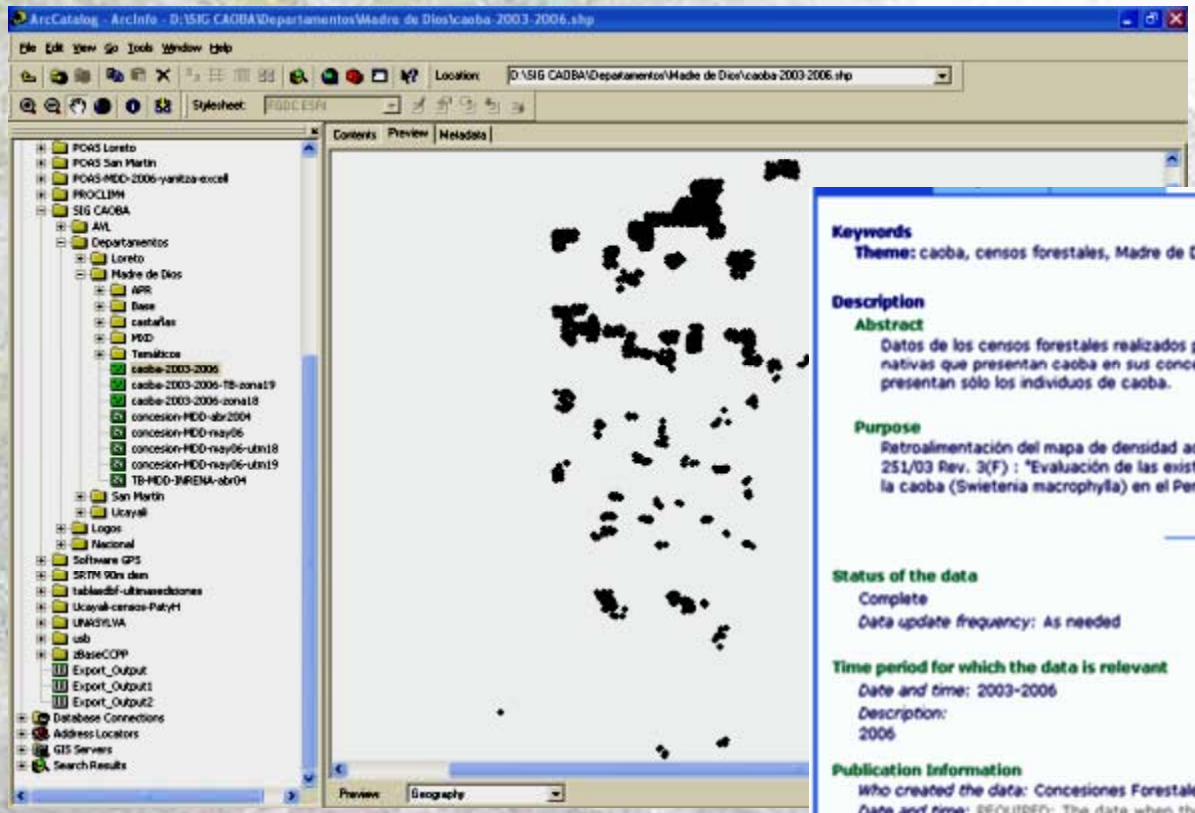
FAJA	ARBOL	ESPECIE	DAP__M_	H_C__M_	FUSTE	VOL__M3_	X	Y	SEMILLERO
5	S-2	Caoba	0,85	12	B		385893	8683413	semillero
11	A-2	Caoba	0,90	12	B	4,96	387186	8683548	
5	A-7	Caoba	1,10	15	B	9,27	386035	8684115	
6	A-9	Caoba	1,10	14	B	8,65	386088	8684123	
12	A-10	Caoba	1,30	12	B	10,35	387407	8684144	

N°_ORDEN	LINEA_T	ESTACION	X_ESTACION	Y_ESTACION	CODO_SP	DISTANCIA_	AZIMUT_°_	CAP__M_	DAP__CM_	DAP2__CM_	HC__M_	CAL_FUSTE_	SEMILLE
1	1	1	387573	8784037	7	20	117		90	90	2	E	
2	1	1	387573	8784037	10	22	64	35	0	0	2	E	
3	1	4	387648	8784077	10	21	156	50	0	0	2	A	
4	1	5	387573	8784077	10	20	48	30	0	0	4	E	
5	1	3	387373	8784037	6	14	60	180	0	0	4	E	
7	1	14	387393	8784037	2	10	106	260	0	0	0	A	
8	1	22	388093	8784037	10	18	156	210	0	0	2	E	
9	1	23	388113	8784037	10	26	103	360	0	0	6	A	
10	1	31	388313	8784037	3	16	151		90	70	0	E	
11	1	36	388448	8784077	15	10	51	44	0	0	2	E	
12	1	39	388440	8784037									
13	1	42	388569	8784037									
14	1	43	388613	8784037									
15	1	44	388648	8784037									
16	1	45	388673	8784077									
17	1	50	388793	8784037									
18	1	55	388913	8784037									
19	1	53	388893	8784037									

FAJA	CODIGO	ESPECIE	DAP	HC	FUSTE	VOL	X	Y	CONDICION
5	S-2	Caoba	85	12	B		385893	8683413	Semillero
11	A-2	Caoba	90	12	B	4.960	387186	8683548	Aprovechable
5	A-7	Caoba	110	15	B	9.270	386035	8684115	Aprovechable
6	A-9	Caoba	110	14	B	8.650	386088	8684123	Aprovechable
12	A-10	Caoba	130	12	B	10.350	387407	8684144	Aprovechable
13	A-10	Caoba	150	15	B	17.230	387532	8684129	Aprovechable
13	A-7	Caoba	160	14	B	18.300	387480	8683715	Aprovechable
10	A-7	Caoba	170	16	B	23.610	386969	8683983	Aprovechable
13	A-6	Catahua	95	15	B	6.910	387532	8683709	Aprovechable
2	A-5	Catahua	110	18	B	11.120	385310	8684115	Aprovechable
1	S-5	Catahua	110	18	B		385153	8683481	Semillero
13	A-1	Catahua	200	15	B	30.630	387522	8683197	Aprovechable

Development of a dynamic GIS

5. Standardization of census data: metadata



Keywords
Theme: caoba, censos forestales, Madre de Dios

Description
Abstract
Datos de los censos forestales realizados para los POA's 2003-2006 de las conseciones y comunidades nativas que presentan caoba en sus concesiones forestales o permisos, respectivamente. Se presentan sólo los individuos de caoba.

Purpose
Retroalimentación del mapa de densidad actual de caoba para el Perú, Proyecto UNALM-ITTO PD 251/03 Rev. 3(F) : "Evaluación de las existencias comerciales y estrategia para el manejo sostenible de la caoba (Swieteria macrophylla) en el Perú"

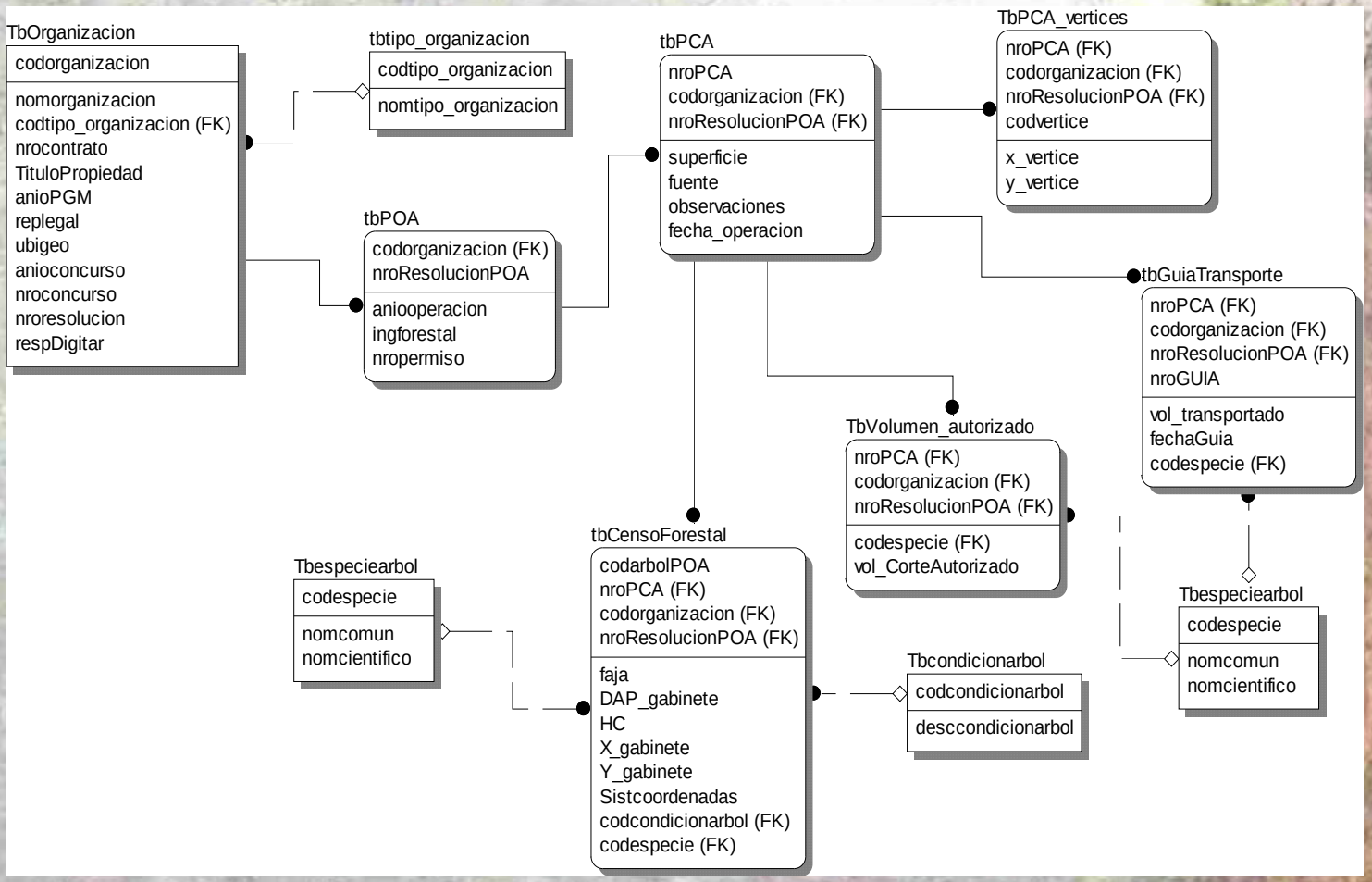
Status of the data
Complete
Data update frequency: As needed

Time period for which the data is relevant
Date and time: 2003-2006
Description:
2006

Publication Information
Who created the data: Concesiones Forestales, Comunidades Nativas
Date and time: REQUIRED: The date when the data set is published or otherwise made available for release. at time 2003-2006

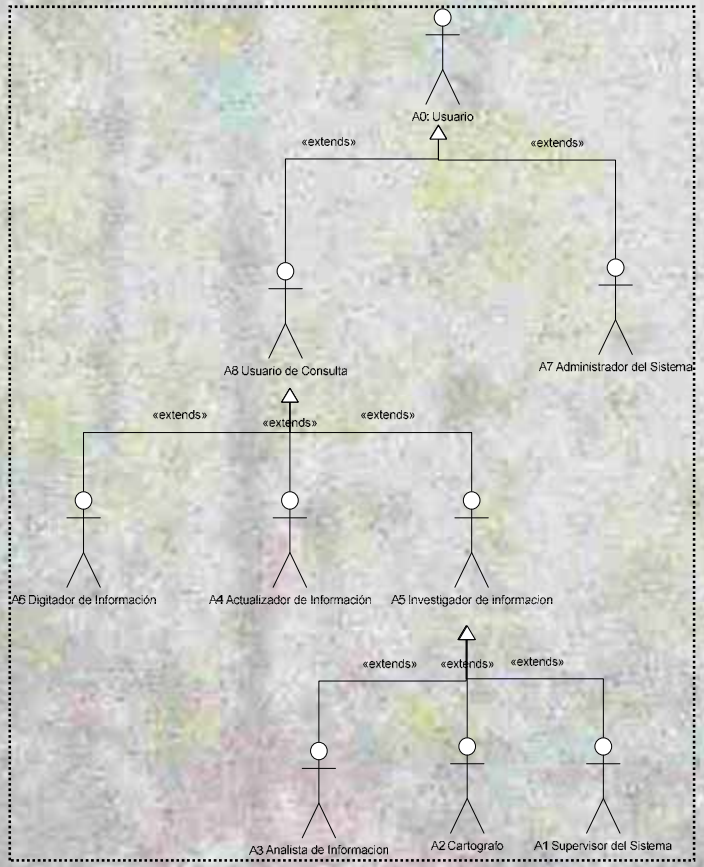
Development of a dynamic GIS

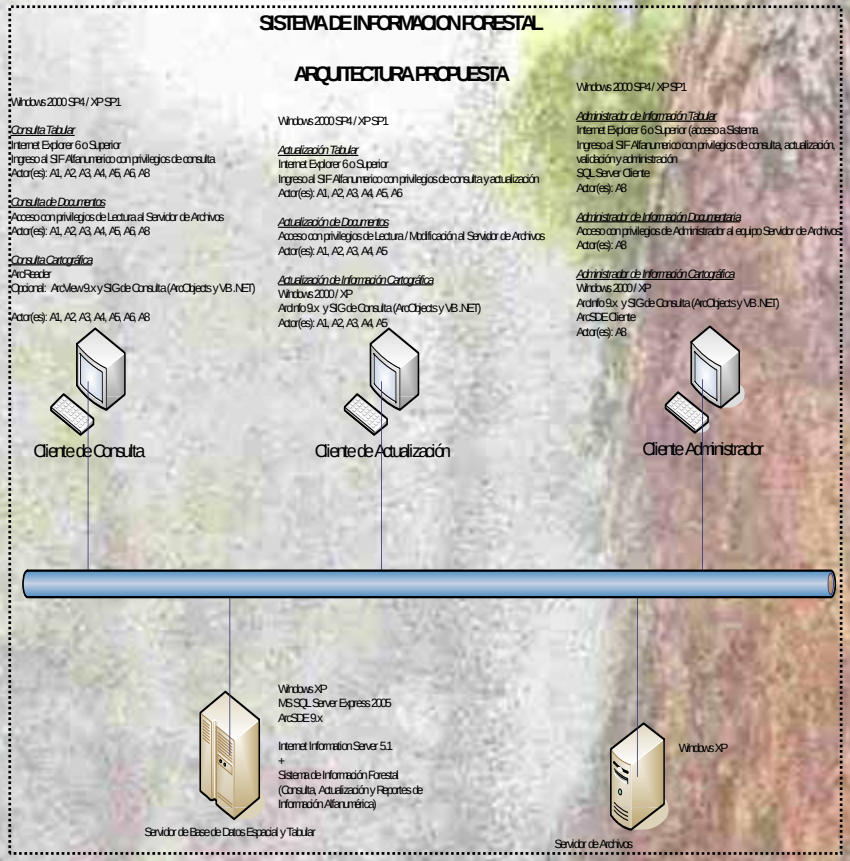
6. Analysis and organization of data



Development of a dynamic GIS

7. Role analysis and architectural design





Characterization of mahogany forest

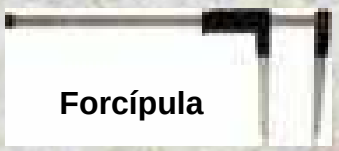
Characterization of mahogany forest

1. Characterization brigade – Crew and equipment

Brigada de caracterización de población de caoba (7):

- 1 Jefe de Brigada
- 1 Asistente
- 1 Matero-trochero

GPS y Antena GPS



Forcípula

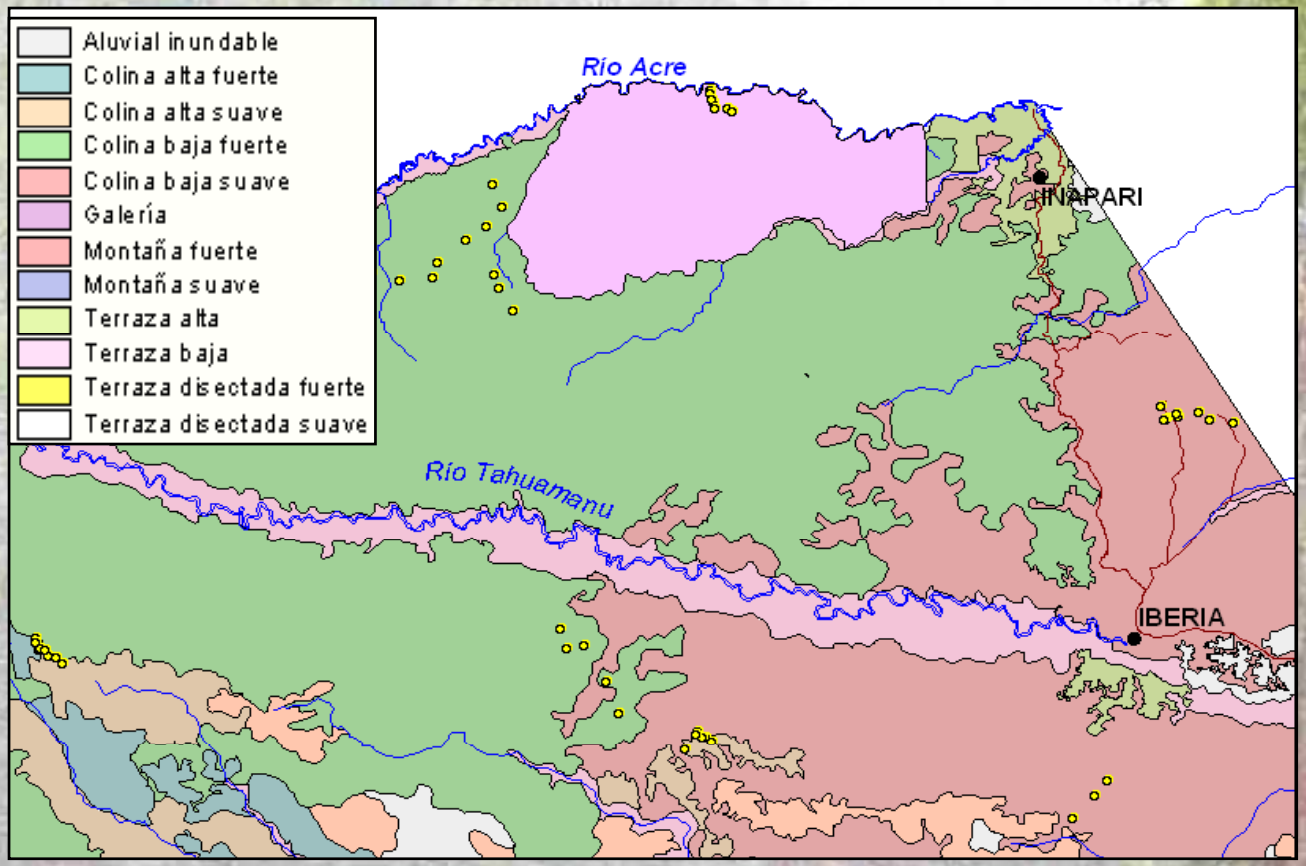
Medidor de espesor de corteza

Brújula

Wincha

Characterization of mahogany forest

2. Characterization-plots by forest types (TB)



Characterization of mahogany forest

3. Characterization-plots (PCs): criteria

- ✓ Forest types (FT) containing mahogany's trees
- ✓ Number of registered mahogany's trees
- ✓ Differentiated density areas (according to POA´s data and the Proj. "Fortalecimiento de las Autoridades Administrativa y Científica de CITES Perú" report
- ✓ CP by pairs in every selected location (1 standing tree and 1 stump)
- ✓ Accessibility
- ✓ Permission to enter to the characterization area granted by the concession holder or the native community.

Characterization of mahogany forest

4. Number of Characterization-plots (CP) needed

$$n = \frac{pqZ^2}{E^2} = \frac{0.5 \times 0.5 \times 1.96^2}{0.15^2} = 42.68 \rightarrow 43$$

Where:

n minimal number of CP

p probability of regeneration occurrence in the CP

q probability of regeneration non-occurrence in the CP

E sampling error (maximum allowed percentage to move away of the real percentage)

Z tabular value of Z for a confidence level 1-α = 0.95

An additional 10% security margin is considered. Then, in a practical approach, as we must keep CP by pairs, n = 50

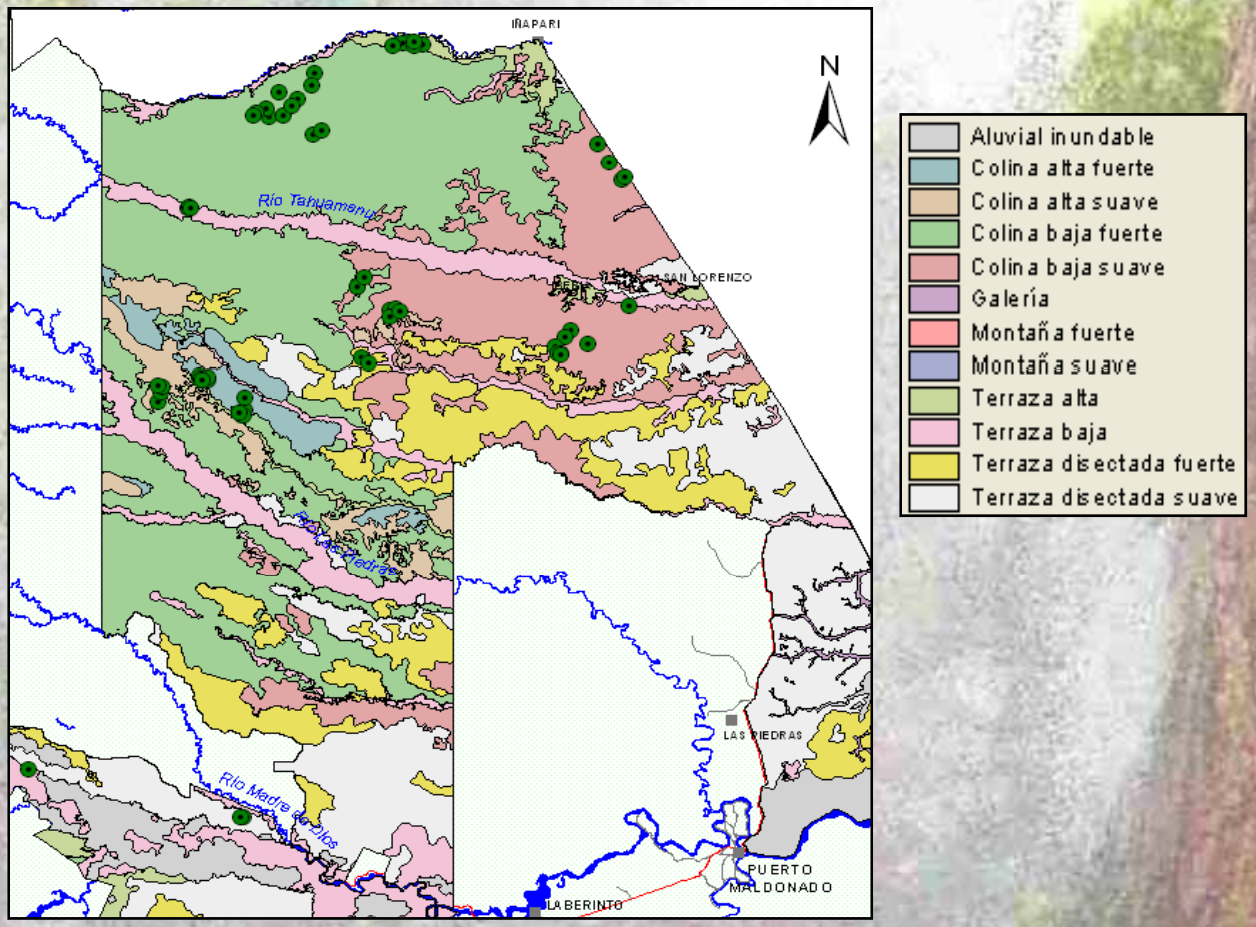
Characterization of mahogany forest

5. Distribution of CPs by forest types in MDD

Tipos de Bosque - Madre de Dios	Número de caobas	Superficie (ha)	Densidad (arb/ha)	%	Número de Muestras	Redondeo	Número de Muestras Definitivo
Bosque de Colina alta fuerte	25	1175.50	0.0213	17.39	8.70	9	10
Bosque de Colina alta suave	30	1908.54	0.0157	12.86	6.43	6	6
Bosque de Colina baja fuerte	2168	76495.76	0.0283	23.18	11.59	12	12
Bosque de Colina baja suave	253	19077.70	0.0133	10.85	5.42	5	6
Bosque de Terraza alta	10	511.11	0.0196	16.00	8.00	8	8
Bosque de Terraza baja	25	2901.97	0.0086	7.05	3.52	3	4
Bosque de Terraza disectada fuerte	78	8936.83	0.0087	7.14	3.57	4	4
Bosque de Terraza disectada suave	15	2212.42	0.0068	5.54	2.77	3	4
TOTAL	**2604**	**113219.83**	**0.1223**	**100.00**	**50**	**50**	**54**

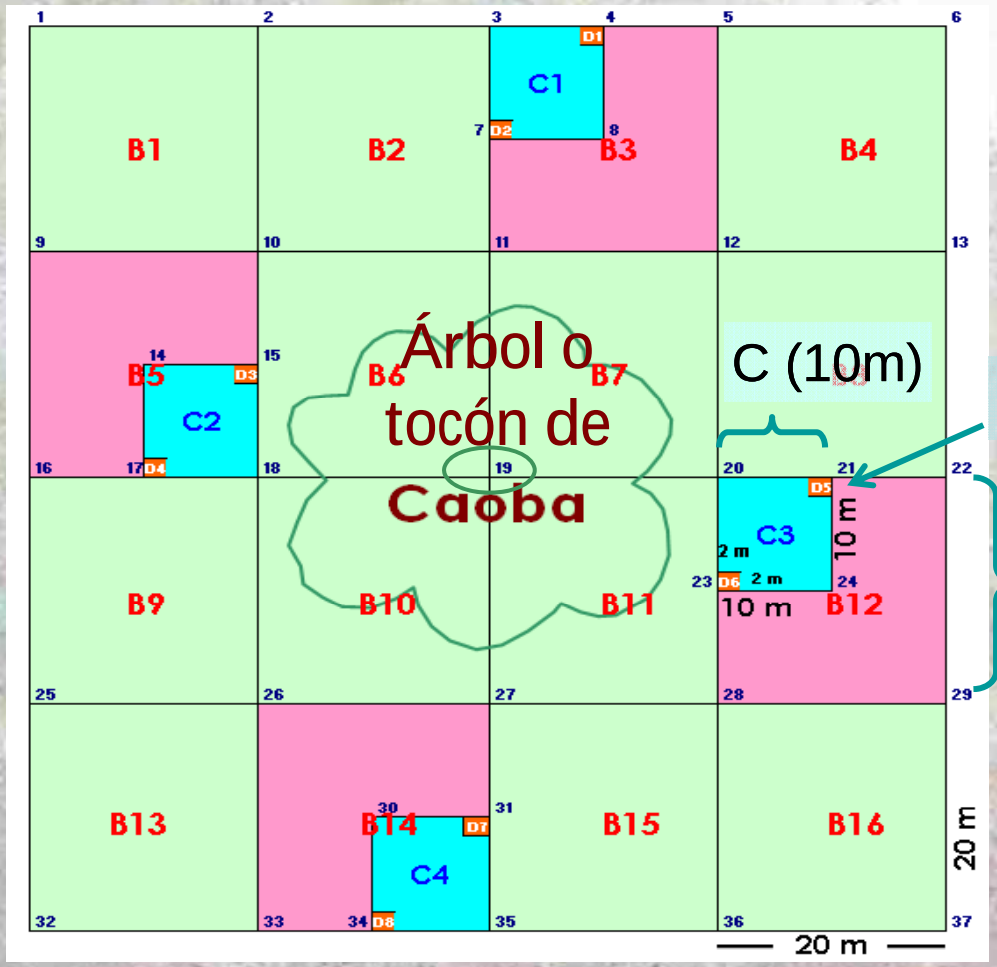
Characterization of mahogany forest

6. Location of distributed CPs in MDD - planned



Characterization of mahogany forest

8. Shape and dimensions of the CP elements



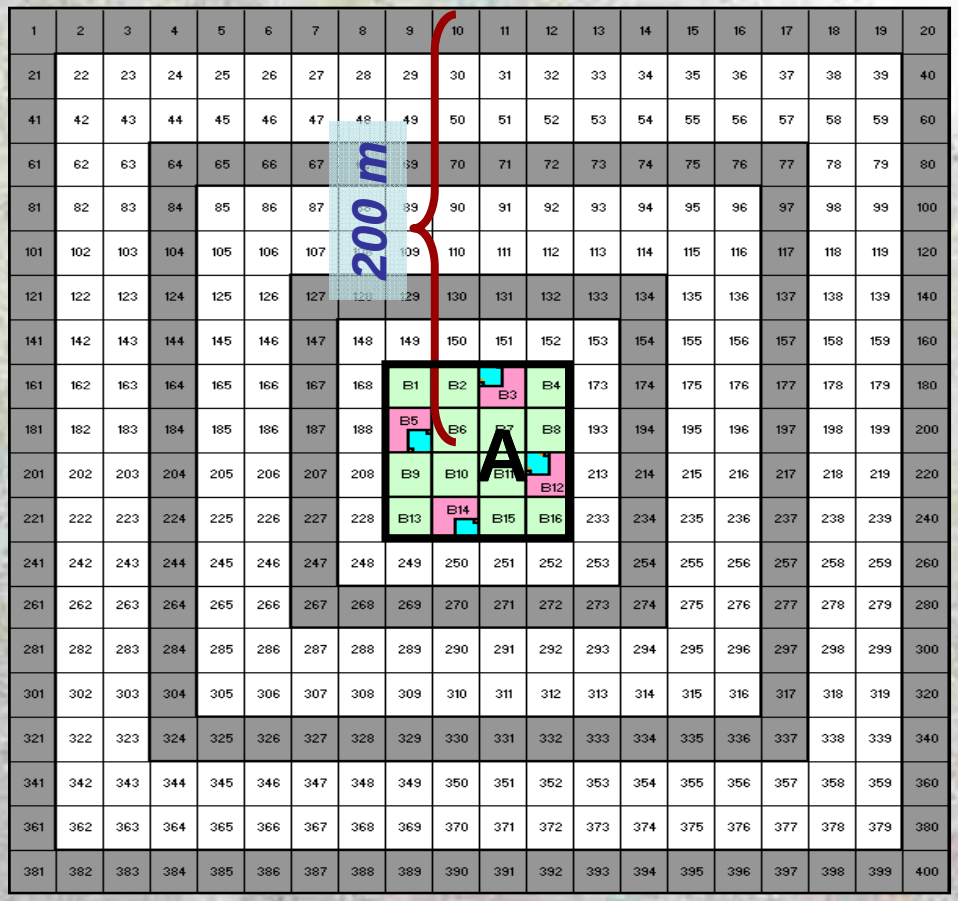
Characterization of mahogany forest

9. Functional parts of the CP

Nombre de la Parcela	Parcela "A" (Parcela "Madre")		Parcela "B"	Parcela "C"	Parcela "D"
Tamaño de la parcela	80 x 80 m		20 x 20 m	10 x 10 m	2 x 2m
Superficie	6400 m²		400 m²	100 m²	4 m²
Superficie en la Parcela A	6400 m²		1600 m²	400 m²	32 m²
Número de Parcelas por Caoba seleccionada	1		4	4	8
Especies a evaluar	*Caoba y otras especies*			Caoba	
Tamaño de los individuos a inventariar	DAP > 30 cm.		DAP: 10 a 30 cm.	HT = 1,3 m hasta DAP ≤ 10 cm.	HT : 0,30-1,30 m
Categoría de vegetación	Árboles			Fustales	Latizales / Brinzales
	Caoba		*Otros*	*Caoba y otras*	Caoba
	Arboles en Pie	Tocones			
	▪ X, Y ▪ DAP ▪ Altura total ▪ Altura fuste ▪ Posición sociológica ▪ Espesor de corteza ▪ Estratos ▪ Iluminación de la copa ▪ Vigor del árbol ▪ Calidad de fuste	▪ X, Y ▪ Diámetro ▪ Circunferencia (aletas)	▪ X, Y ▪ DAP ▪ Altura total ▪ Posición sociológica	▪ DAP ▪ Altura total	▪ Conteo de individuos de caoba

Characterization of mahogany forest

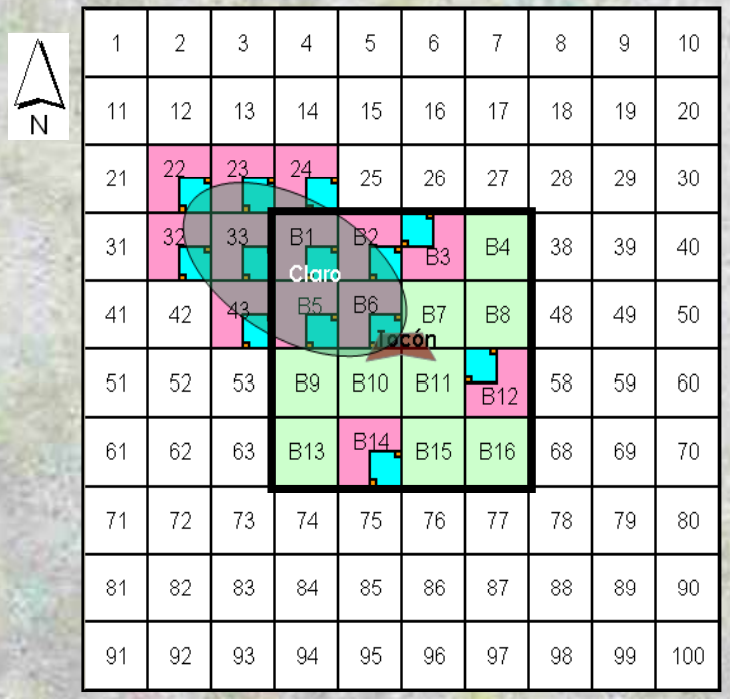
10. Auxiliary Plots "X"



- Inspection in a 200 m radius from the center of the plot "A" to check possible mahogany's natural regeneration.
- The directions towards which natural regeneration occurs demands plots "X", distanced 40 m to each other, as far as 200 m.

Characterization of mahogany forest

11. Auxiliary Plots "Y"

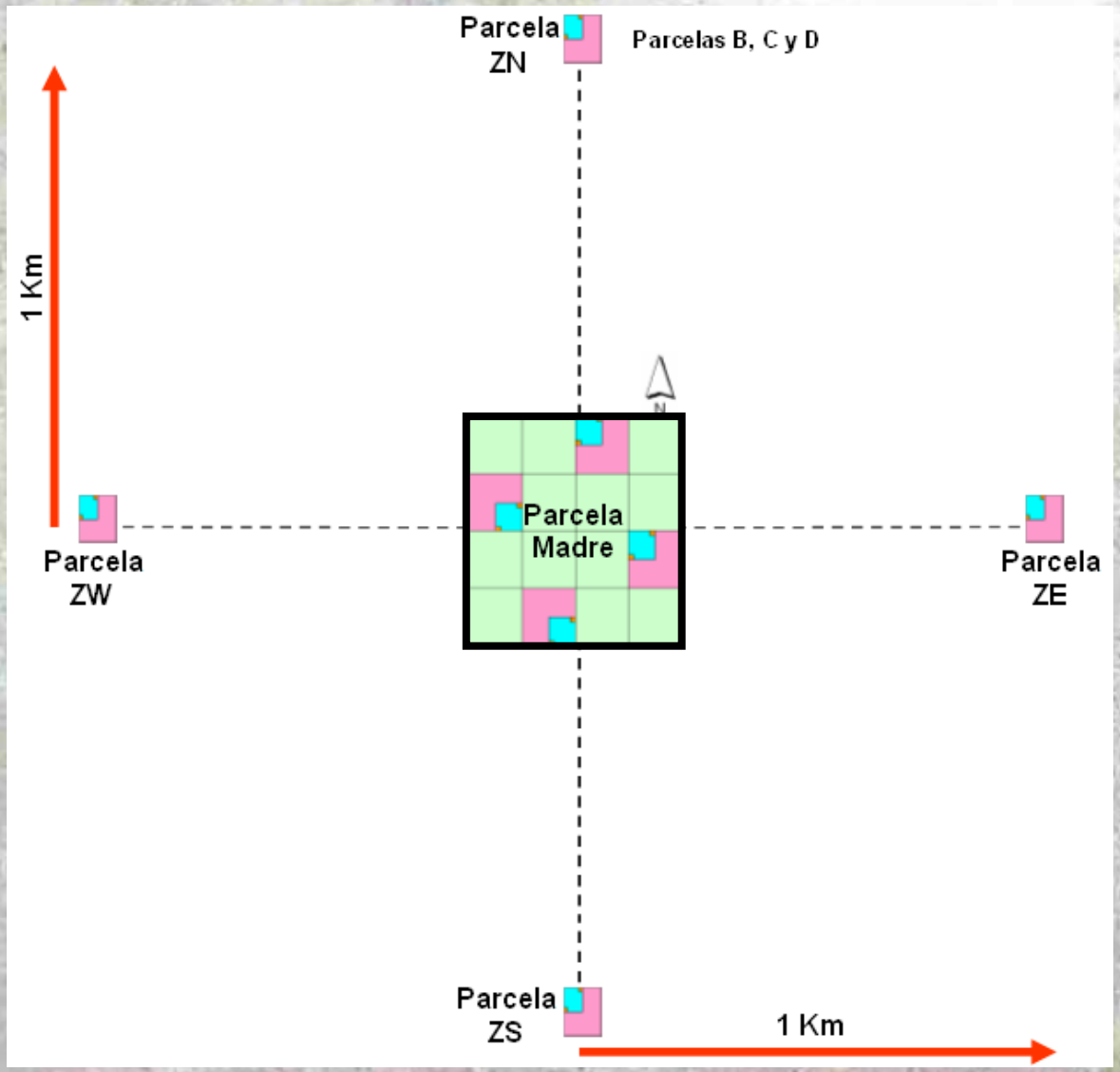


- If a forest opening exists inside Plot "A", caused by the fall of the central mahogany tree, then it is measured the diameter of the stump, the perimetric circumference which surrounds the buttress, the direction of the clear inside and outside the plot.
- Also, it is identified the affected Y- Plots (equivalent to B plots) inside and outside plot A.

- The damage produced on the surrounding vegetation is evaluated and how well is the recovering process.

Characterization of mahogany forest

12. Parcelas auxiliares "Z"



Characterization of mahogany forest

13. Vegetation analysis

a. Complexity Index

$$IC = 10^{-3}\ hbds$$

h : medium height of the forest in meters
b : basal area in m^2 / (plot)
d : number of trees /(plot)
s : number of species (plot)

b. Sorensen's index of Community

$$CC = \frac{2a}{2a + b + c}.$$

a : # common species to samples 1 and 2
b : # species only of the sample 1
c : # species only of the sample 1

c. Simplified Importance of Value Index (IVI s)

$$IVIs = Abun\ rel + Dom\ rel$$

Abun rel : Relative abundance
Dom rel : Relative dominance

Study of shape and volume of trees

Study of shape and volume of trees

1. Volume & Shape Brigade – Crew and equipment

Brigada de caracterización de forma y volumen (1):

- 1 Jefe de Brigada
- 2 Asistentes
- 1 Matero-trochero

GPS and Antenna

Compass

Medidor de espesor de corteza

Bitterlich Relascope

Forcípula

Wincha

Barreno de Pressler

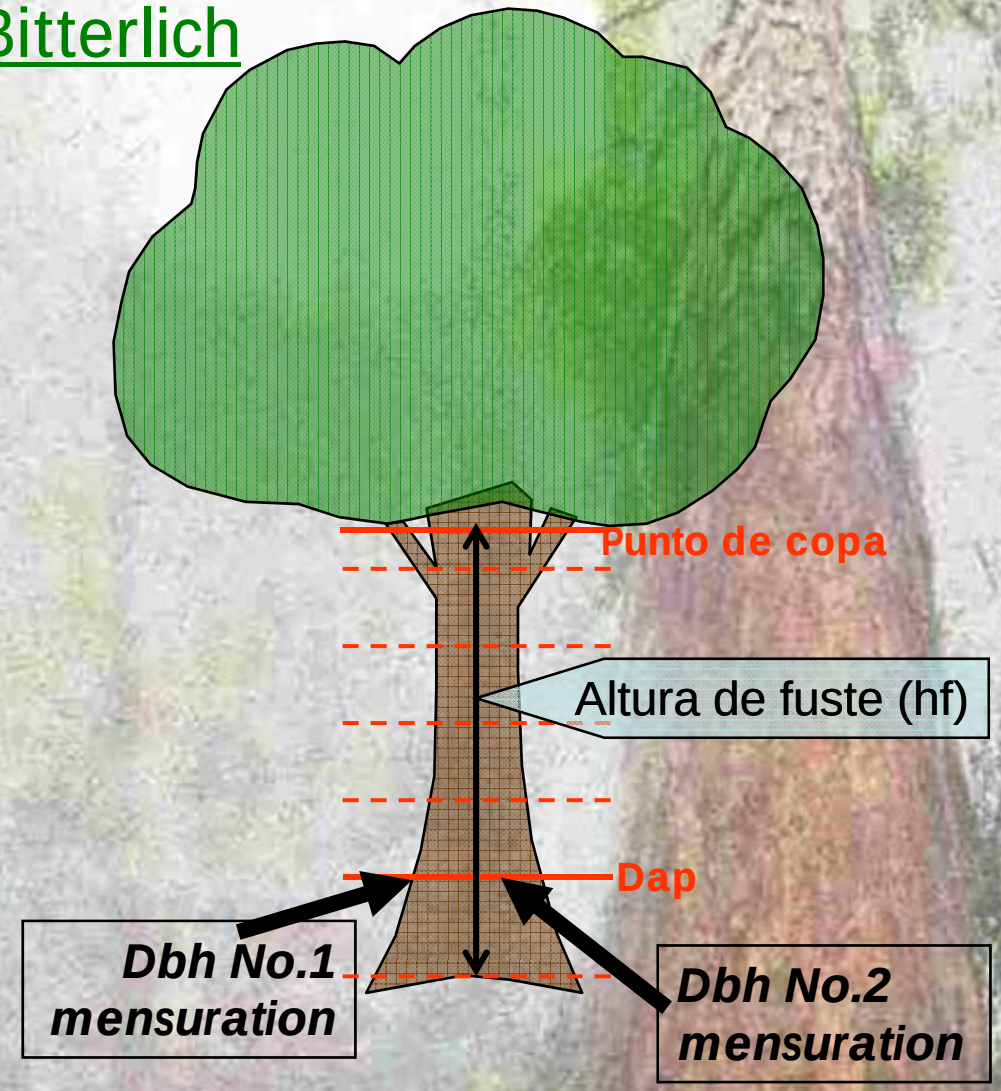
Study of shape and volume of trees

1. Tree measurement with Bitterlich Relascope

According to the height of Fuste of the tree :

hf ≤ 12 m:
Diameters are measured every 1 meter using relascope.

hf >12 m:
Diameters are measured every 2 meter using relascope.



Study of shape and volume of trees

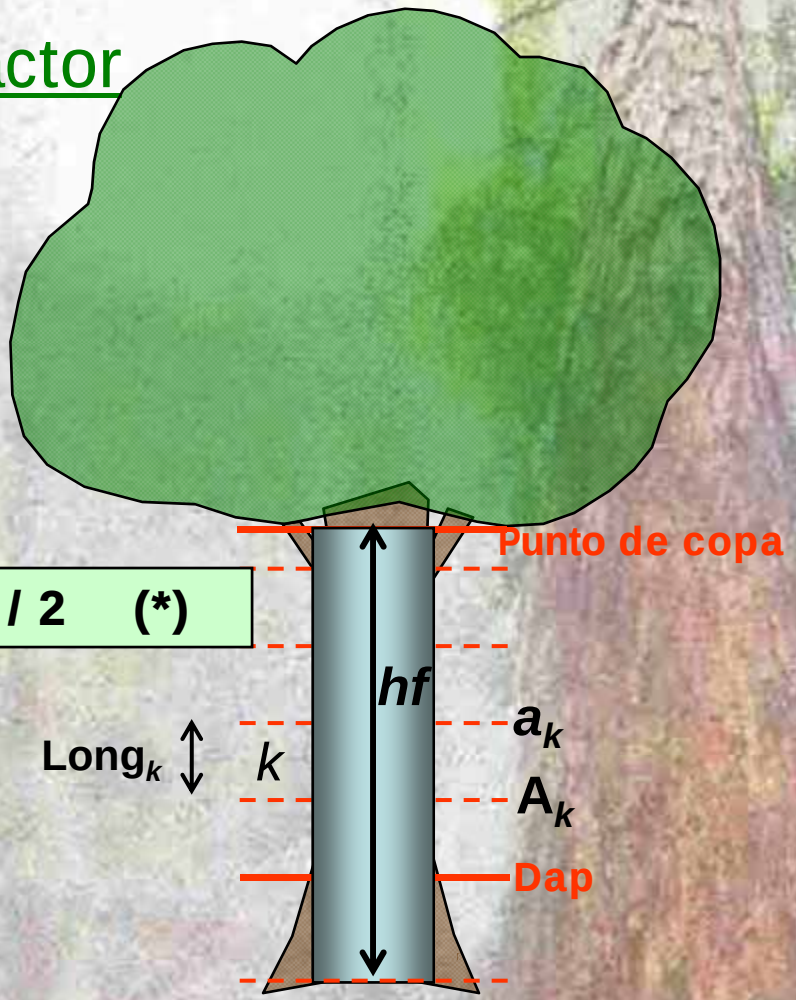
2. Determination of the form factor *(FF)*

FF=Actual Vol / Vol of cylinder

Vol of cylinder = pi x Dap²/4 x *hf*

Actual Vol = ∑ Vol of sections

Vol of section *k* = Long$_k$ *x* (A$_k$ + *a*$_k$) / 2 (*)



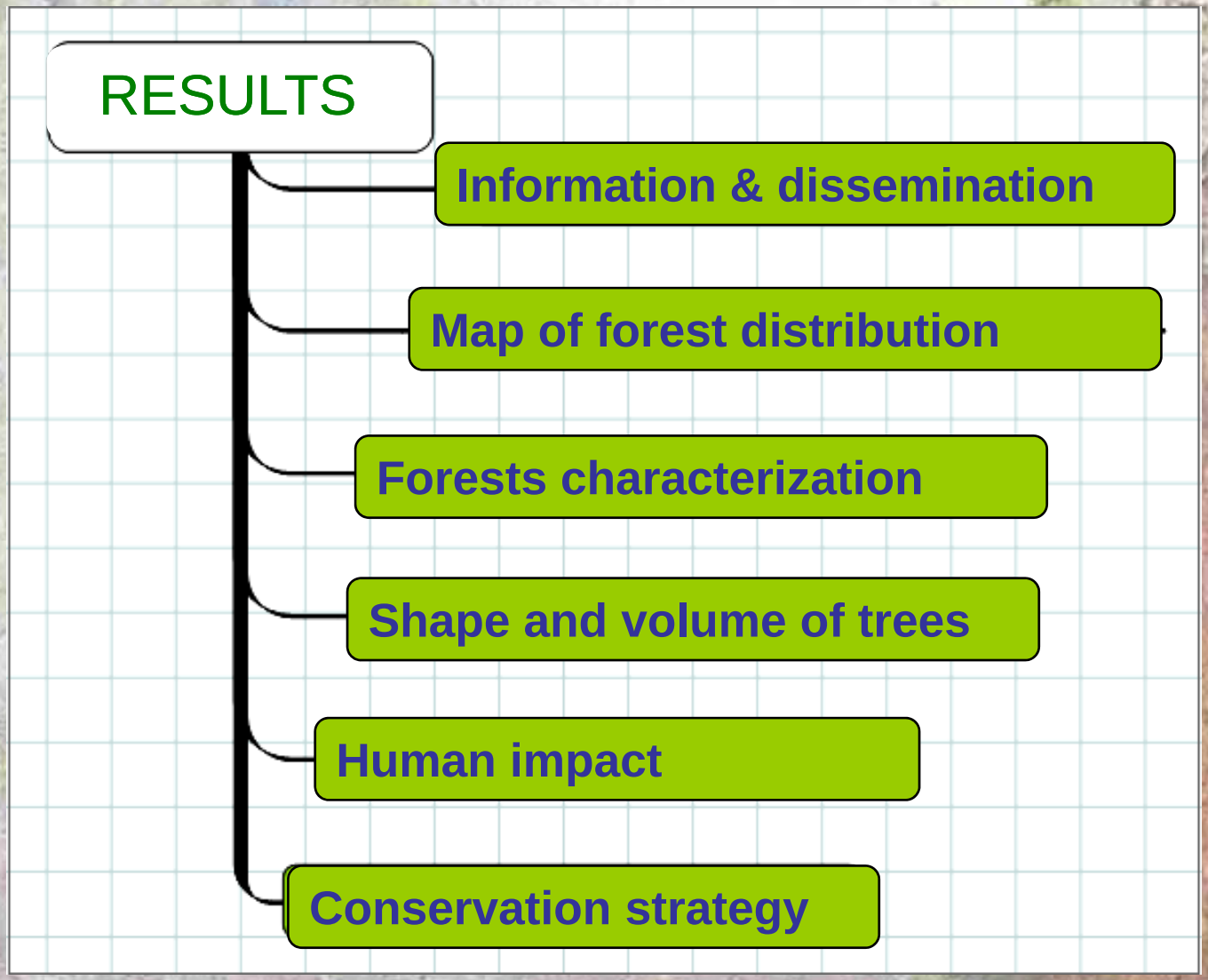
(*) Smallian formula, where:

Long$_k$: trunk length

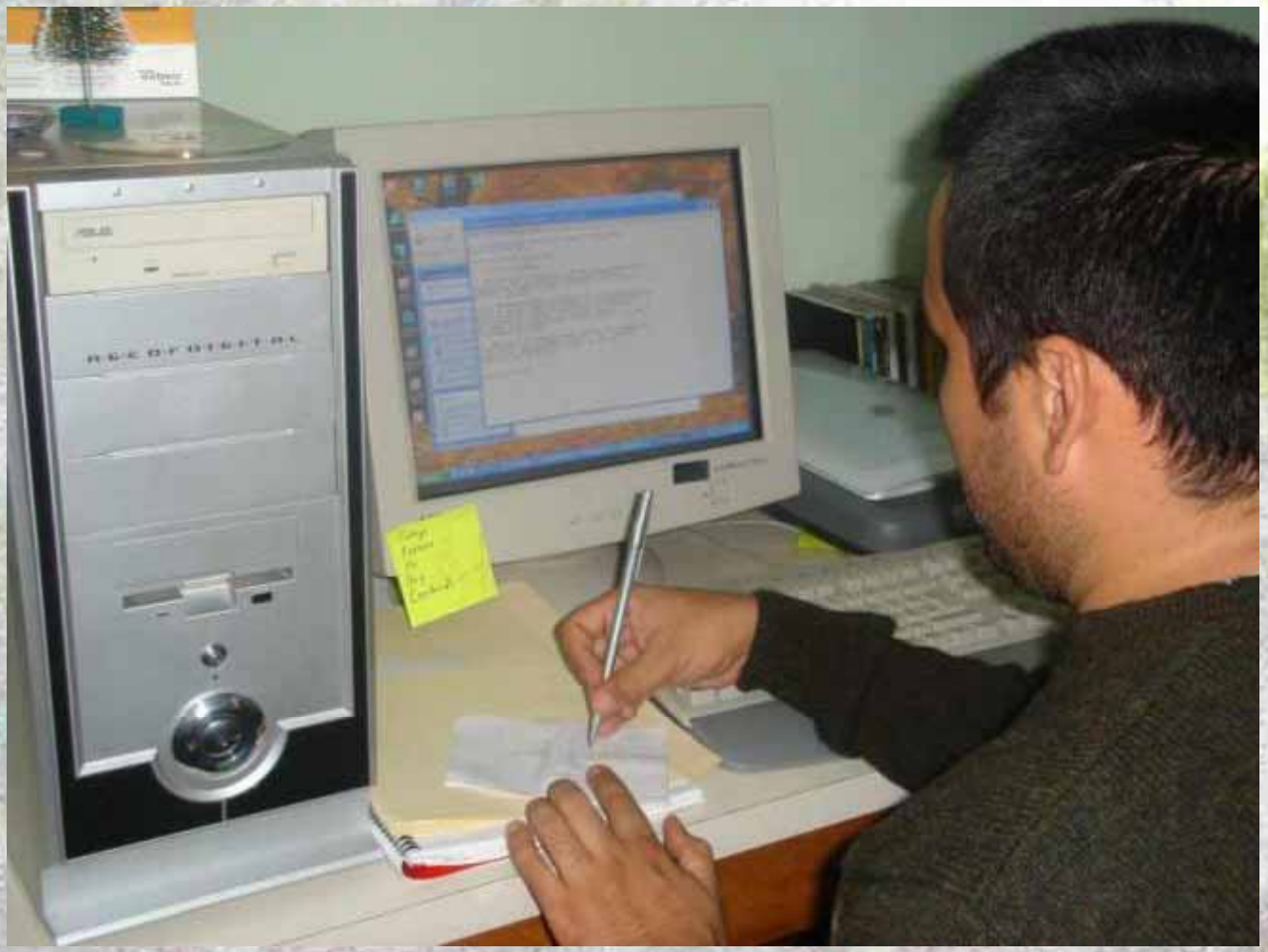
A$_k$: area of the major section

a$_k$: area of the minor section of the ***k* log**

Results


RESULTS
Information & dissemination
Map of forest distribution
Forests characterization
Shape and volume of trees
Human impact
Conservation strategy

Information & dissemination



Information & dissemination

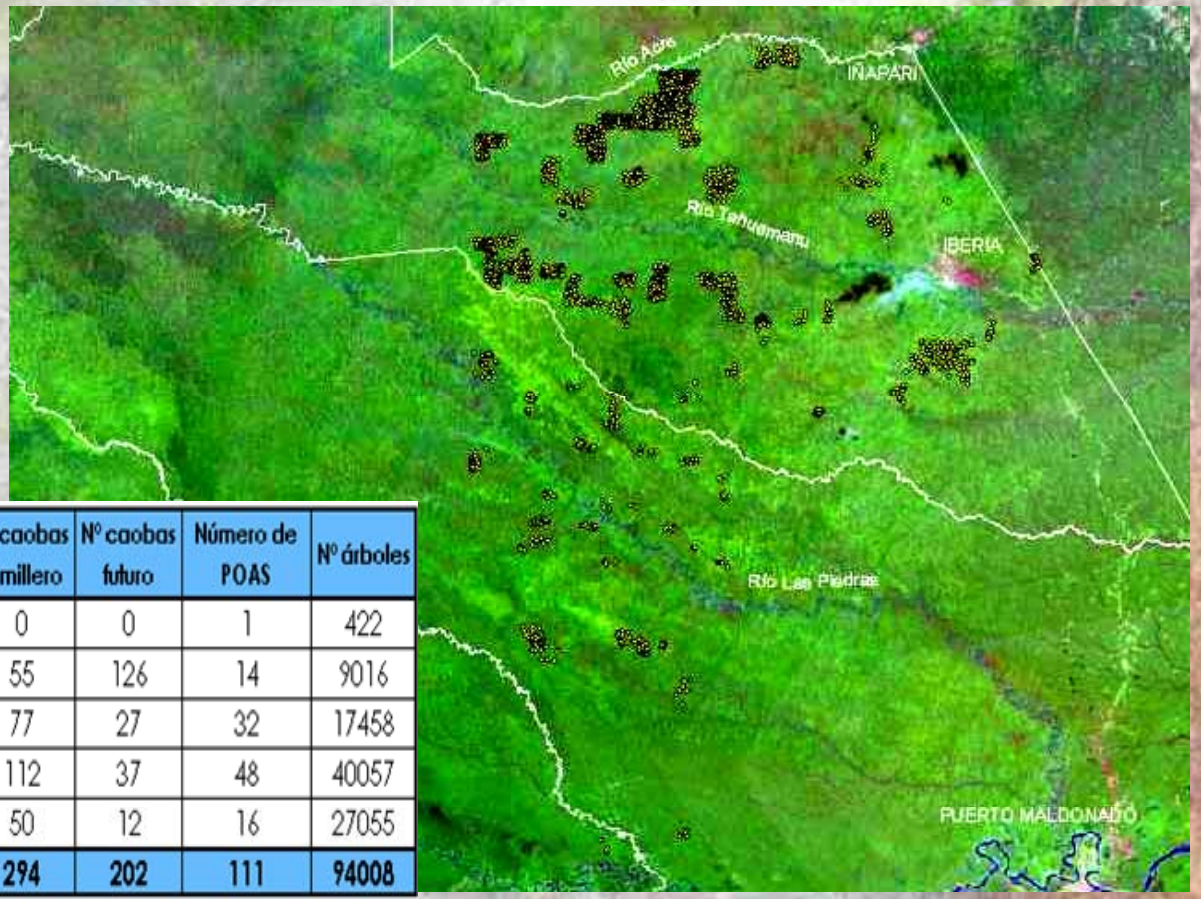
1. Forest concessions data entry

Departa-mento	Núm. total de Conce-siones (1)	Núm. de Conce-siones con caduci-dad (1)	Número de Conce-siones recopila-das con Caoba	Número de POAs recopila-dos con Caoba (2002 – 2006)	% Avance en ingreso de datos (a feb. 2007)	% Avance en ingreso estandari-zación de datos
Madre de Dios	85	5	56 (2)	111 (2)	100	100
Ucayali	177	24	77	95	100	100
San Martín	34	2	12	26	38	0
Loreto	248	0	32	32	100	100

Information & dissemination

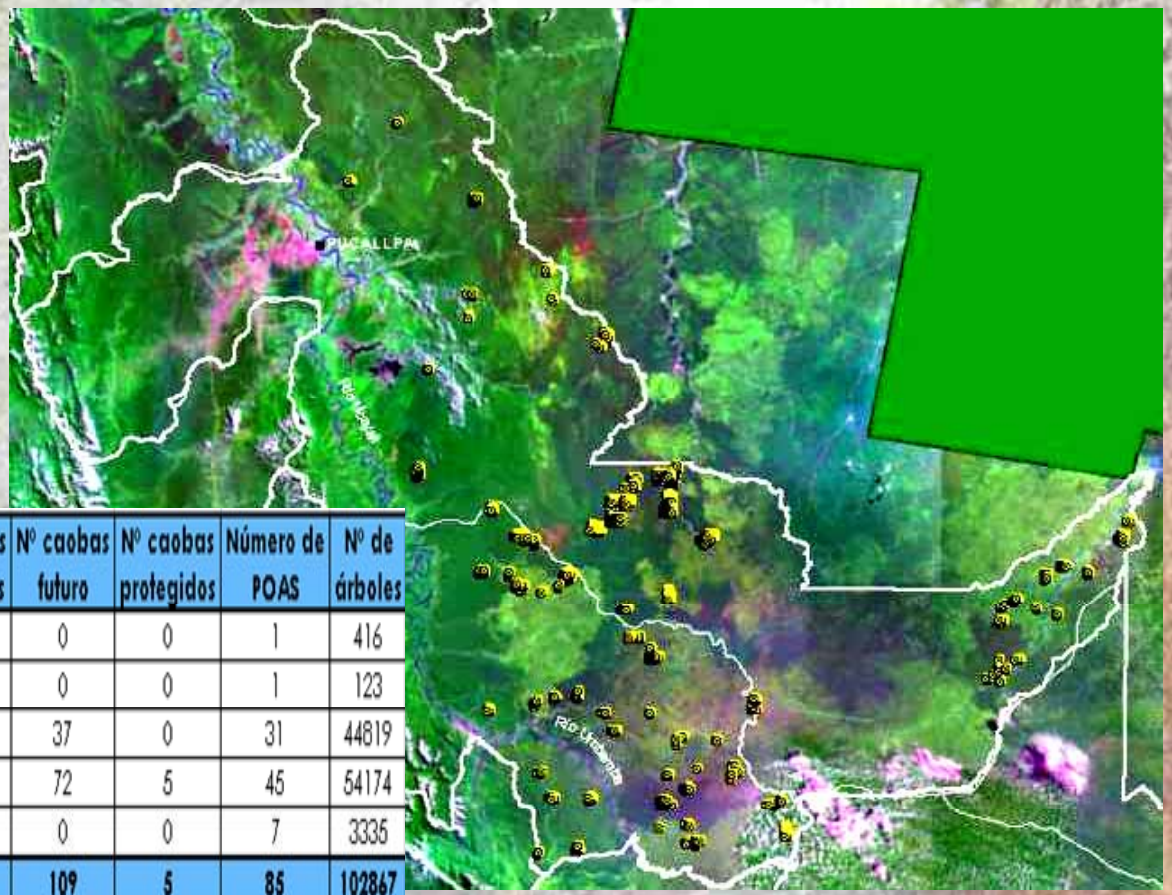
2. Mahogany trees in forest concessions - MDD

Año	Nº total caoba	Nº caobas aprovechables	Nº caobas semillero	Nº caobas futuro	Número de POAS	Nº árboles
2002	1	1	0	0	1	422
2003	612	431	55	126	14	9016
2004	815	711	77	27	32	17458
2005	863	714	112	37	48	40057
2006	319	257	50	12	16	27055
TOTAL	**2610**	**2114**	**294**	**202**	**111**	**94008**



Information & dissemination

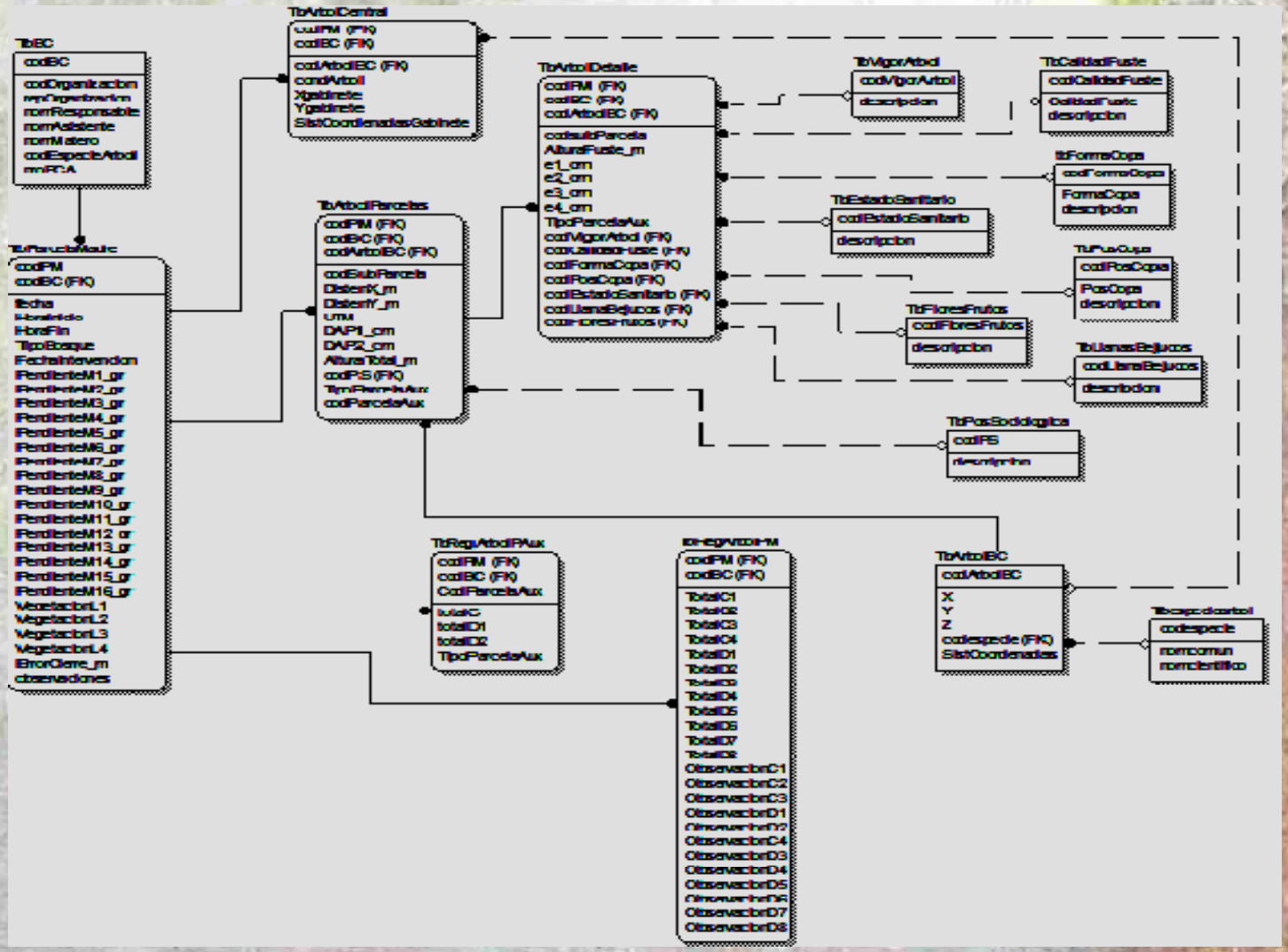
3. Mahogany trees in forest concessions - UCA



Año	Nº total de caoba	Nº caobas aprovechables	Nº caobas semilleros	Nº caobas futuro	Nº caobas protegidos	Número de POAS	Nº de árboles
2002	12	10	2	0	0	1	416
2003	6	5	1	0	0	1	123
2004	966	818	111	37	0	31	44819
2005	1729	1420	232	72	5	45	54174
2006	66	55	11	0	0	7	3335
TOTAL	**2779**	**2308**	**357**	**109**	**5**	**85**	**102867**

Information & dissemination

4. Diagram entity-relationship

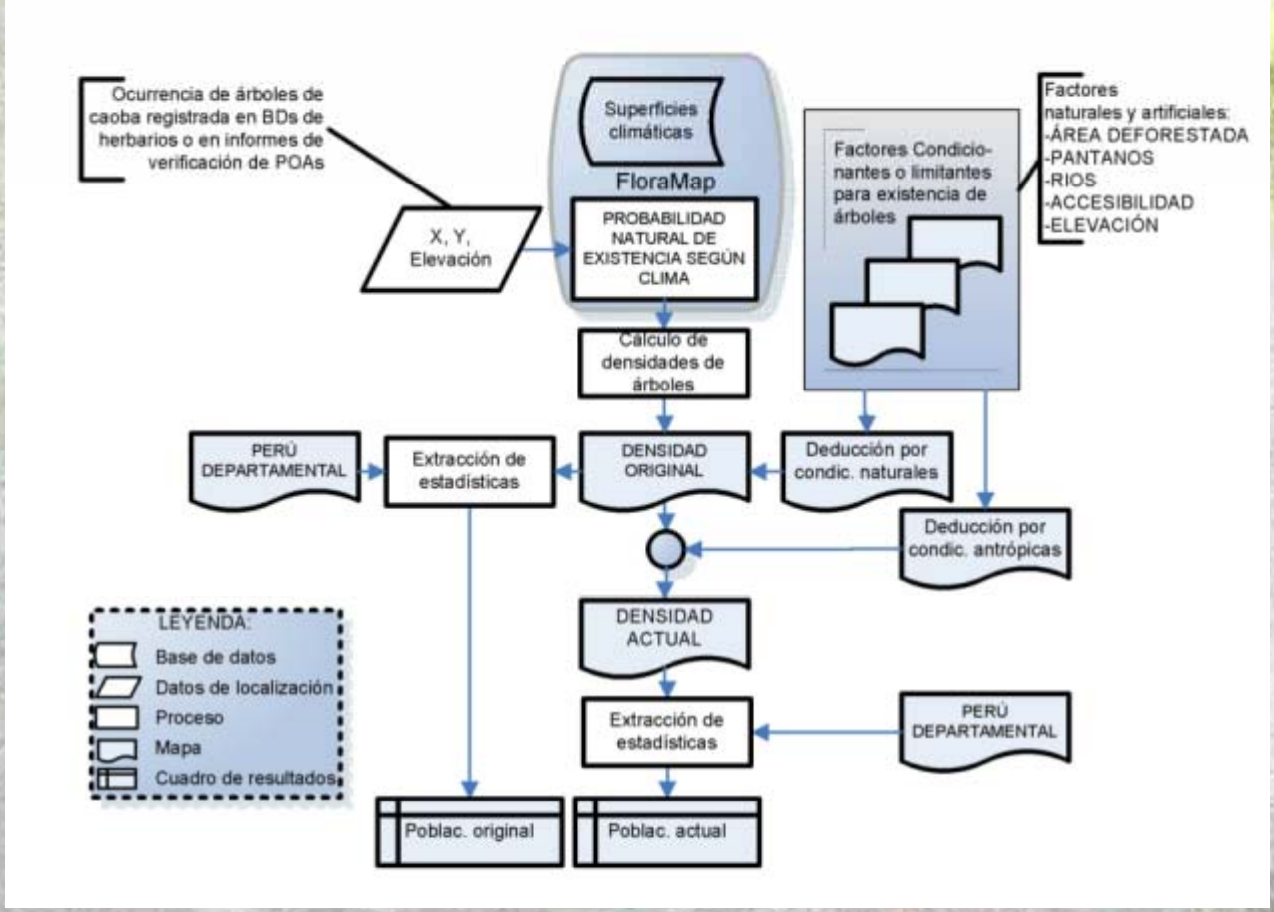


Information & dissemination

5. Communicating and spreading knowledge

Forest distribution map

1. Information processing



Forest distribution map

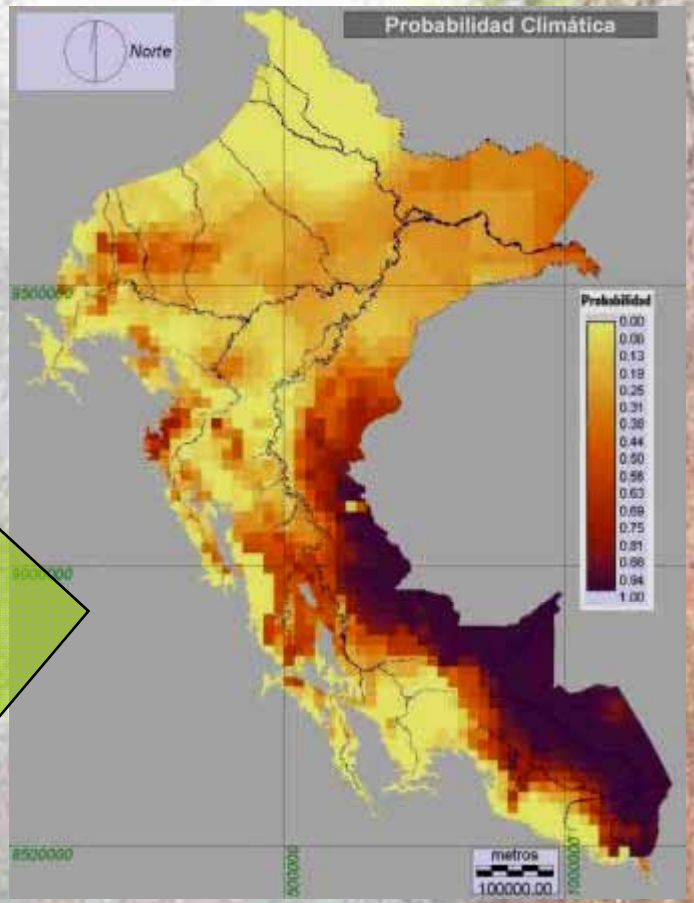
2. Preliminary base - climatic Probabilities

Origin	Cant.puntos X Y
- POAs checking	228
- DBs of herbariums	151
- Personal Communication	9
- Forest inventories	9
- WWF documents	92
(*total* = 489)	

Floramap

Idrisi

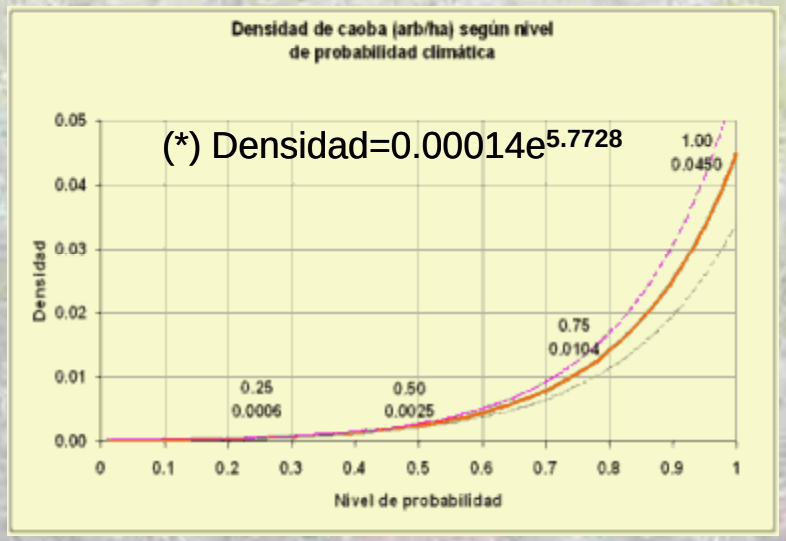
- *Grid climática x 36 datos: 18 km²*
- *Normalización de histogramas + Componentes principales + Ponderación de variables*
- *Cluster dendrograma-Ward*
- *Transformación vector → raster*

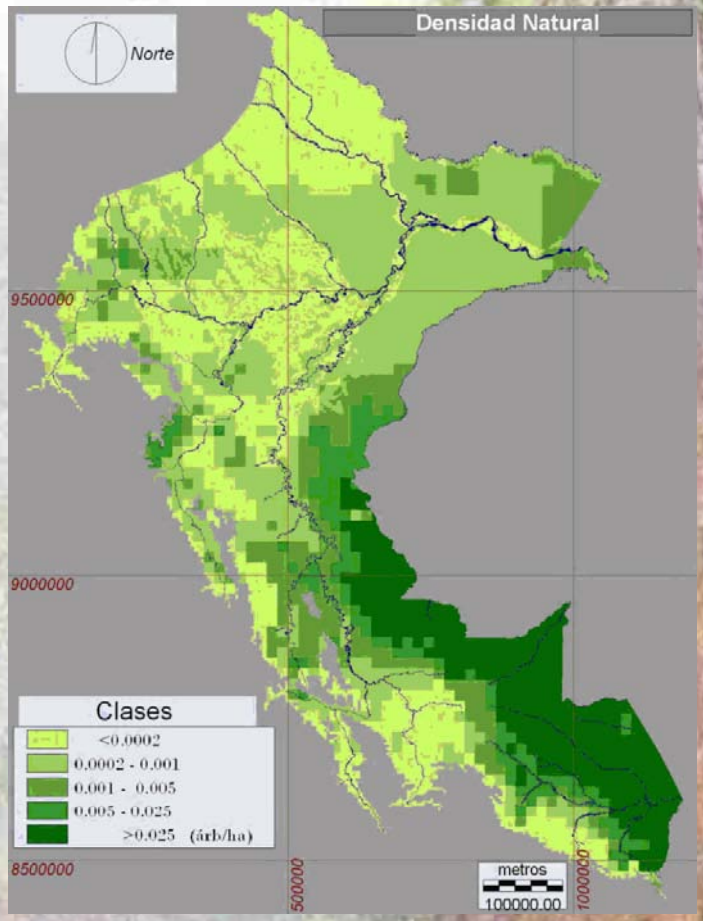


Forest distribution map

3. Estimate of natural density

- Study area: Amazonia <1200 msnm
- Cells ¼ min. (±465m or 21.53 ha)
- Adjustment of probability: pantano =0.2
  river/lake =0.0
- Probability → Density - Conversion (*)





Forest distribution map

4. Estimate of present density

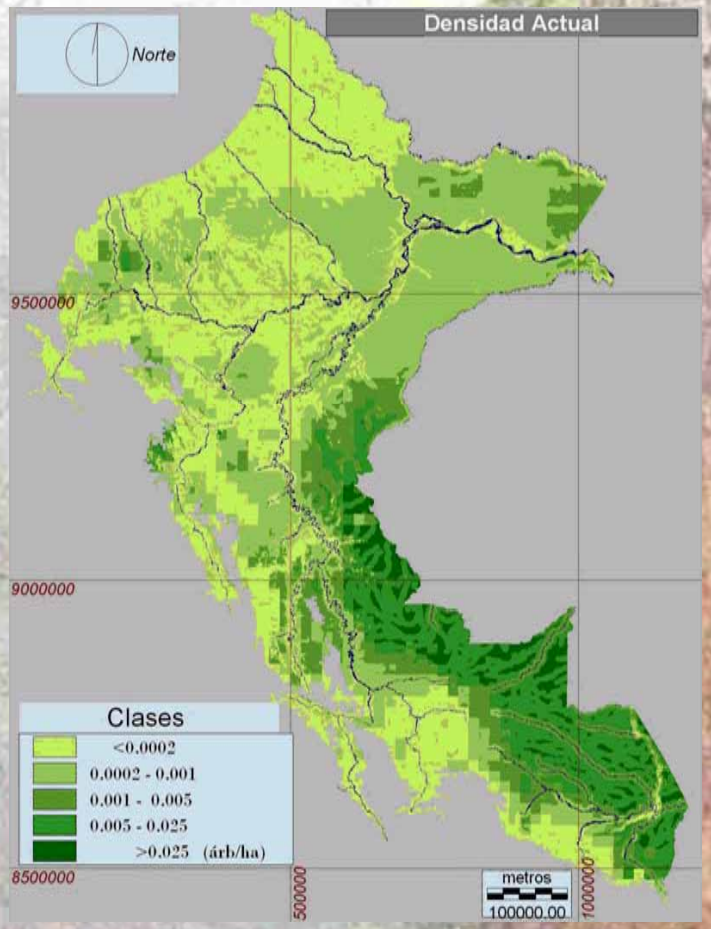
- Adjustment of probability by vegetal cover change and human risk

Zona	Descripción	Elemento base	Distancia (km)	Factor de ajuste
i1	Contigua a ríos mayores	Río principal	0 a menos de 5	0.5
i2	Subpróxima a ríos mayores	Río principal	5 a menos de 8	0.75
i3	Medio distante a ríos mayores	Río principal	8 a menos de 10	0.9
i4	Contigua a ríos secundarios	Río de 2do. y 3er. orden	0 a menos de 5	0.75
i5	Contigua a carreteras	Carretera principal	0 a menos de 5	0.5

(Áreas deforestadas: probabilidad = 0,0)

- Conversion Probability → Density
- Density range:

Clase de densidad (árb/ha)	Supficie por árbol (ha)
< 0.0002	< 5000
0.0002 – 0.001	5000 - 1000
0.001 – 0.005	1000 - 200
0.005 – 0.025	200 - 40
> 0.025	> 40



Forest distribution map

5. Estimated population by department

Ámbito territorial			Población Actual			
Cod.	Departamento	Area estudio (1000 ha)	Arboles Comerciales (Dap≥75cm)	Rango estimado	Arboles no comerciales (Dap<75cm)	TOTAL
1	AMAZONAS	1,094	274	(262 - 284)	183	457
5	AYACUCHO	80	10	(10 - 10)	7	17
6	CAJAMARCA	278	38	(38 - 38)	25	63
8	CUSCO	1,407	213	(211 - 214)	142	355
10	HUANUCO	1,182	679	(611 - 738)	453	1,132
12	JUNIN	1,119	215	(210 - 220)	143	358
16	LORETO	32,892	19,825	(17647 - 21802)	13,217	33,042
17	MADRE de DIOS	4,695	38,164	(30531 - 45509)	25,443	63,607
19	PASCO	718	655	(594 - 718)	437	1,092
21	PUNO	176	25	(25 - 25)	17	42
22	SAN MARTIN	2,829	1,787	(1561 - 1996)	1,191	2,978
25	UCAYALI	8,575	68,160	(53785 - 82175)	45,440	113,600
	Subtotal		*130,045*	*(105475 - 153729)*	*86,697*	*216,742*
100	SINANPE	12,542	*52,733*	*(42096 - 63058)*	*35,155*	*87,888*
	TOTAL:		182,778	*(147571 - 216787)*	121,852	304,630

Forest Characterization

Forest Characterization

1. Characterization-plots (CPs) survey

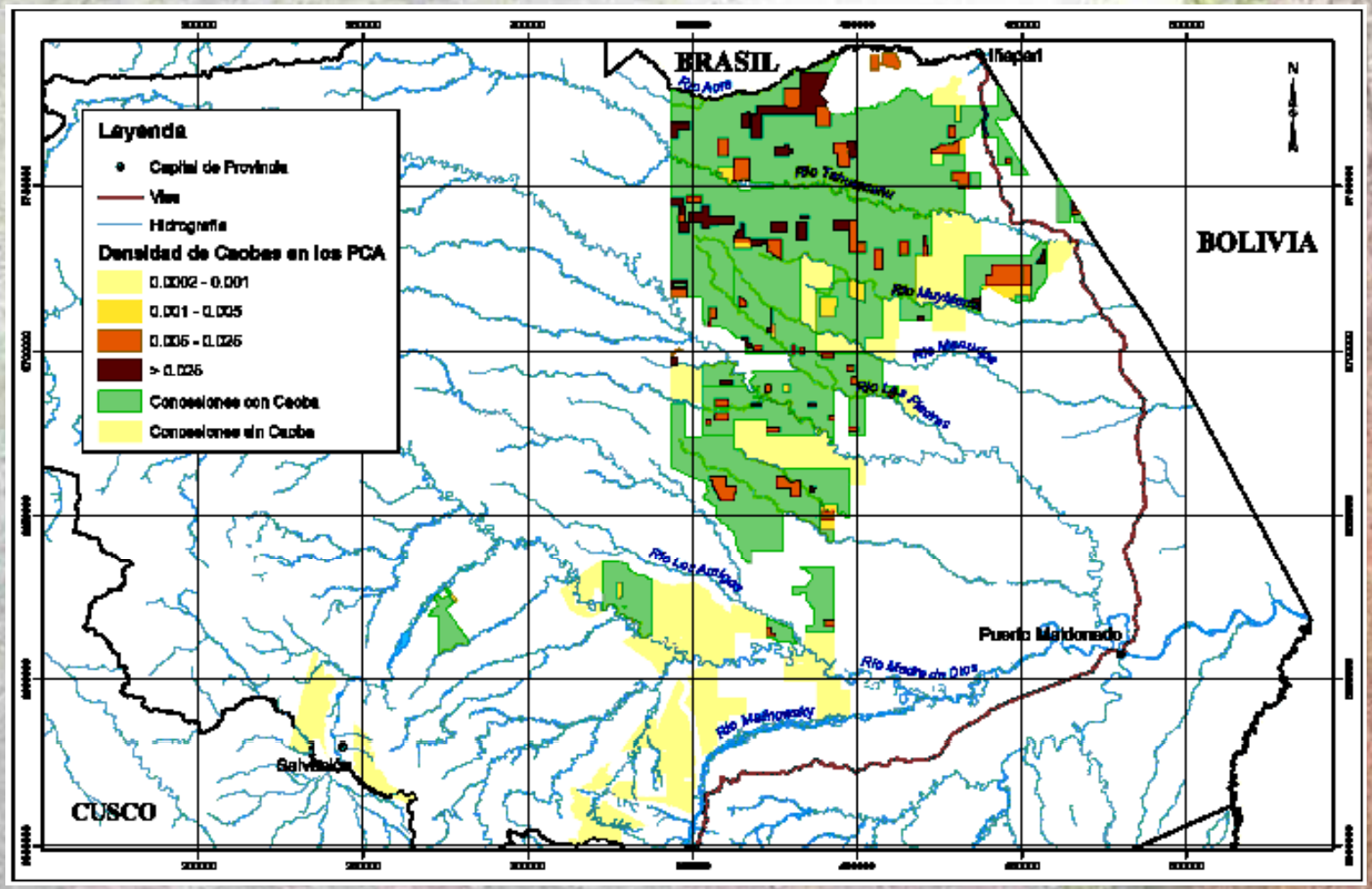
Planning and effective profit in Madre de Dios

Tipos de Bosque - Madre de Dios	Número de caobas	Superficie (ha)	Densidad (arb/ha)	%	Número de Muestras	Redondeo	PM levantadas en campo
Bosque de Colina alta fuerte	25	1175.50	0.0213	17.39	8.70	10	5
Bosque de Colina alta suave	30	1908.54	0.0157	12.86	6.43	6	8
Bosque de Colina baja fuerte	2168	76495.76	0.0283	23.18	11.59	12	28
Bosque de Colina baja suave	253	19077.70	0.0133	10.85	5.42	6	9
Bosque de Terraza alta	10	511.11	0.0196	16.00	8.00	8	7
Bosque de Terraza baja	25	2901.97	0.0086	7.05	3.52	4	0
Bosque de Terraza disectada fuerte	78	8936.83	0.0087	7.14	3.57	4	0
Bosque de Terraza disectada suave	15	2212.42	0.0068	5.54	2.77	4	0
TOTAL	**2604**	**113219.83**	**0.1223**	**100.00**	**50**	**54**	**57**

**** Area of POA's with mahogany***

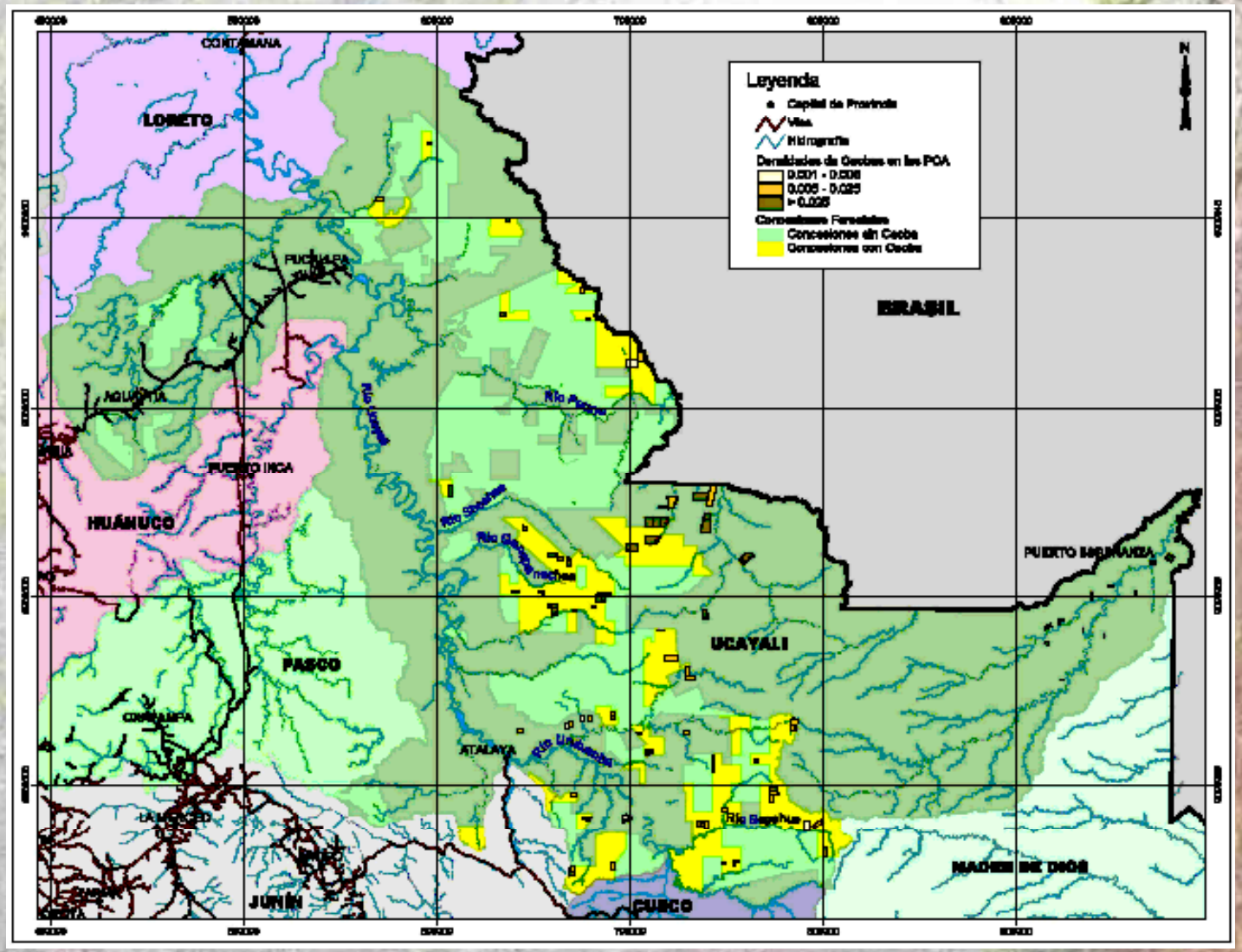
Forest Characterization

2. Mahogany density – MDD



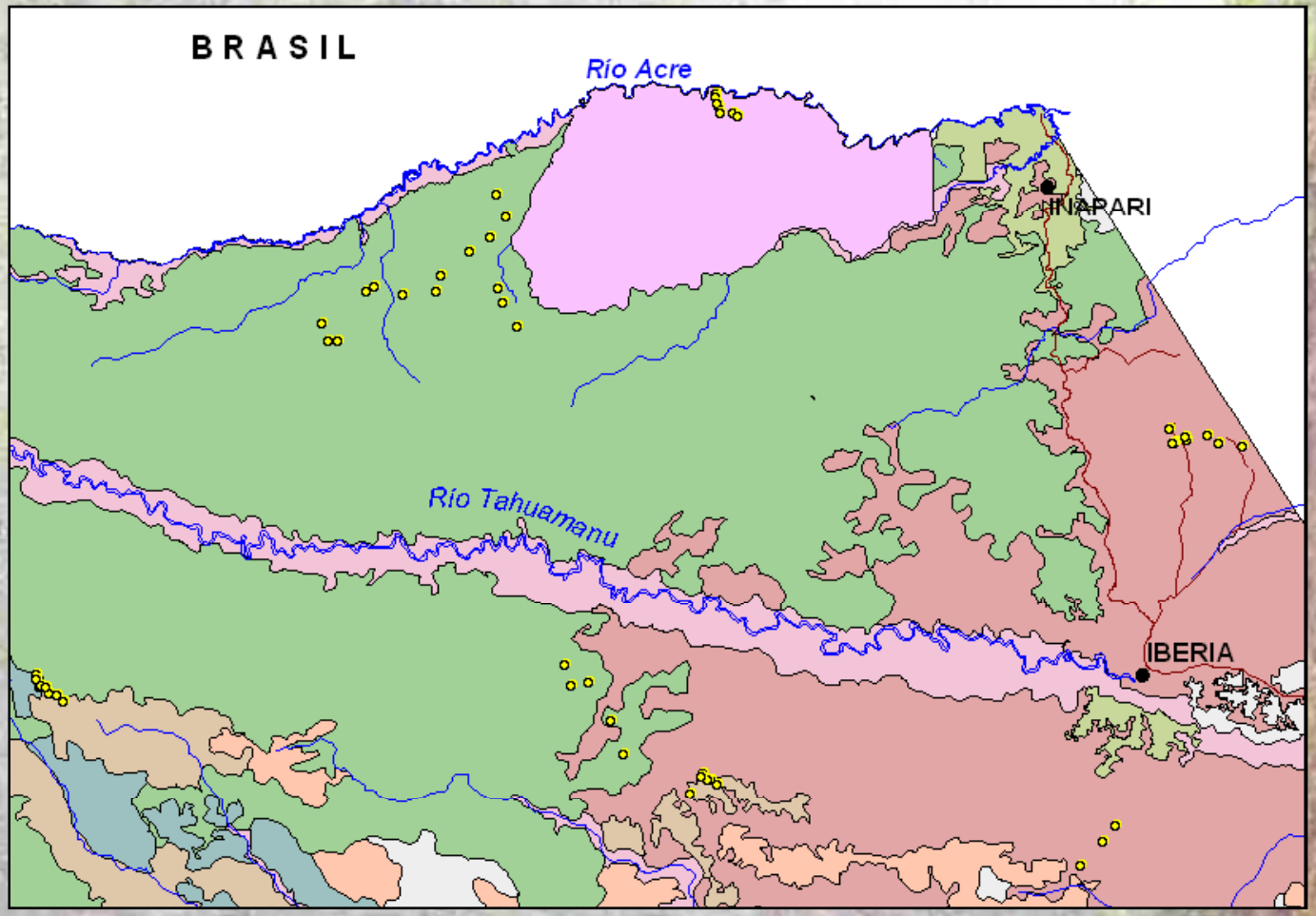
Forest Characterization

3. Mahogany density - UCA



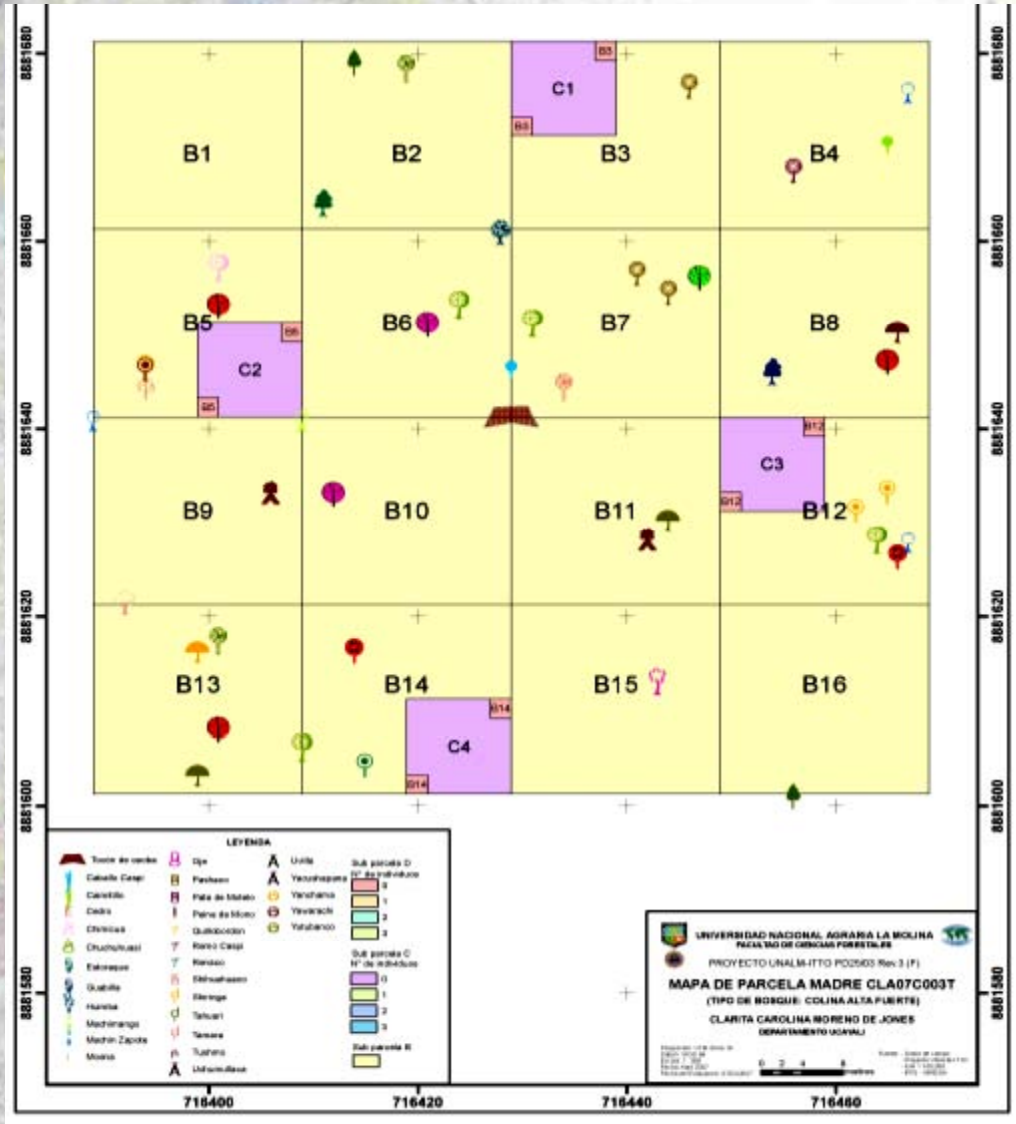
Forest Characterization

4. Location of plots actually surveyed- MDD



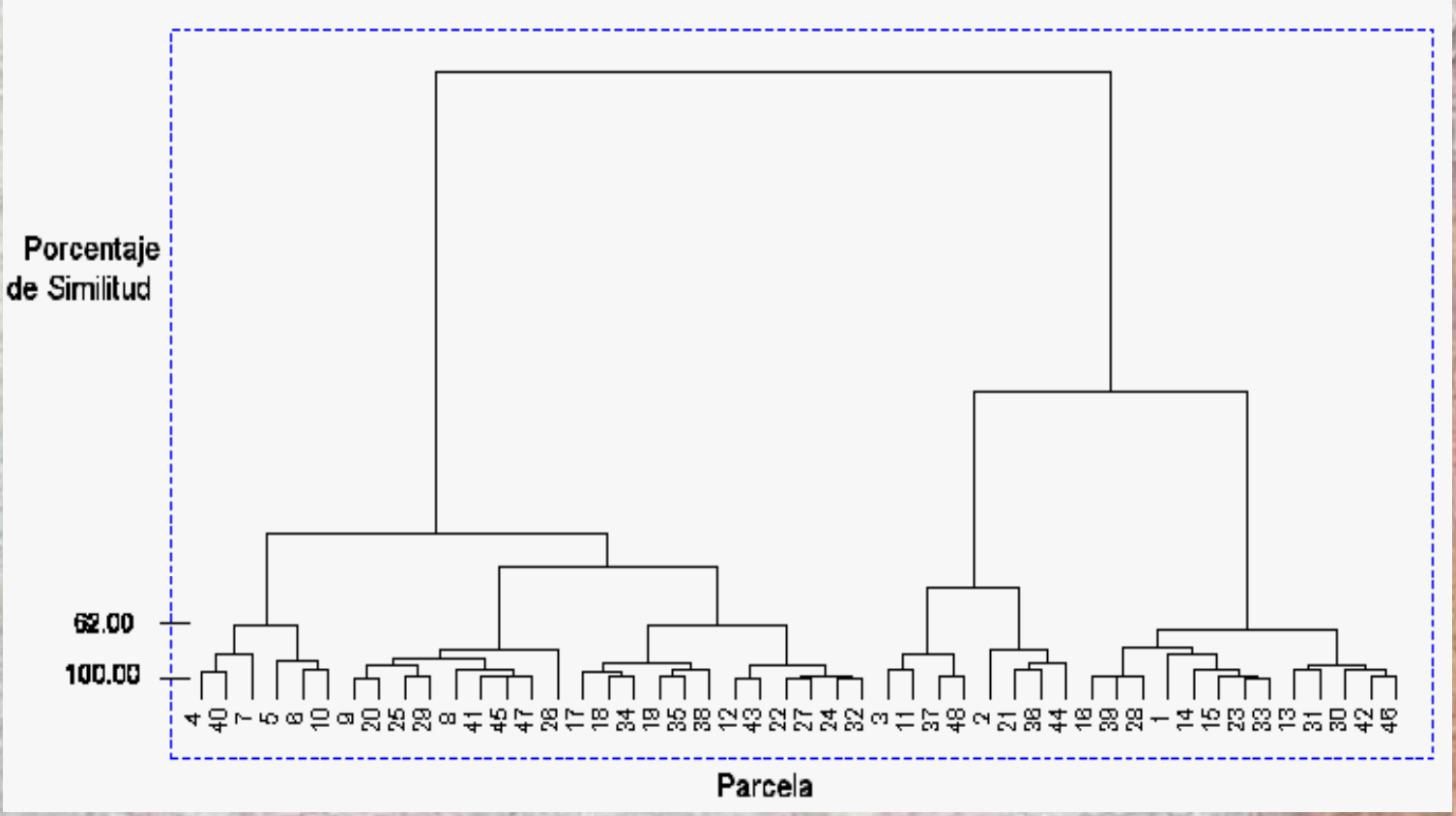
Forest Characterization

5. Mapping of trees inside a Characterization-plot



Forest Characterization

6. Association of CPs by similarity - MDD



Forest Characterization

7. Analysis of some CP's soil samples

ANALISIS DE SUELOS : CARACTERIZACION

Solicitante : PROYECTO UNAL-ITTO

Departamento : MADRE DE DIOS Provincia :
Distrito : Predio :
Referencia : H.R. 13453-003C-07 Fact. Pendiente Fecha : 18-01-07

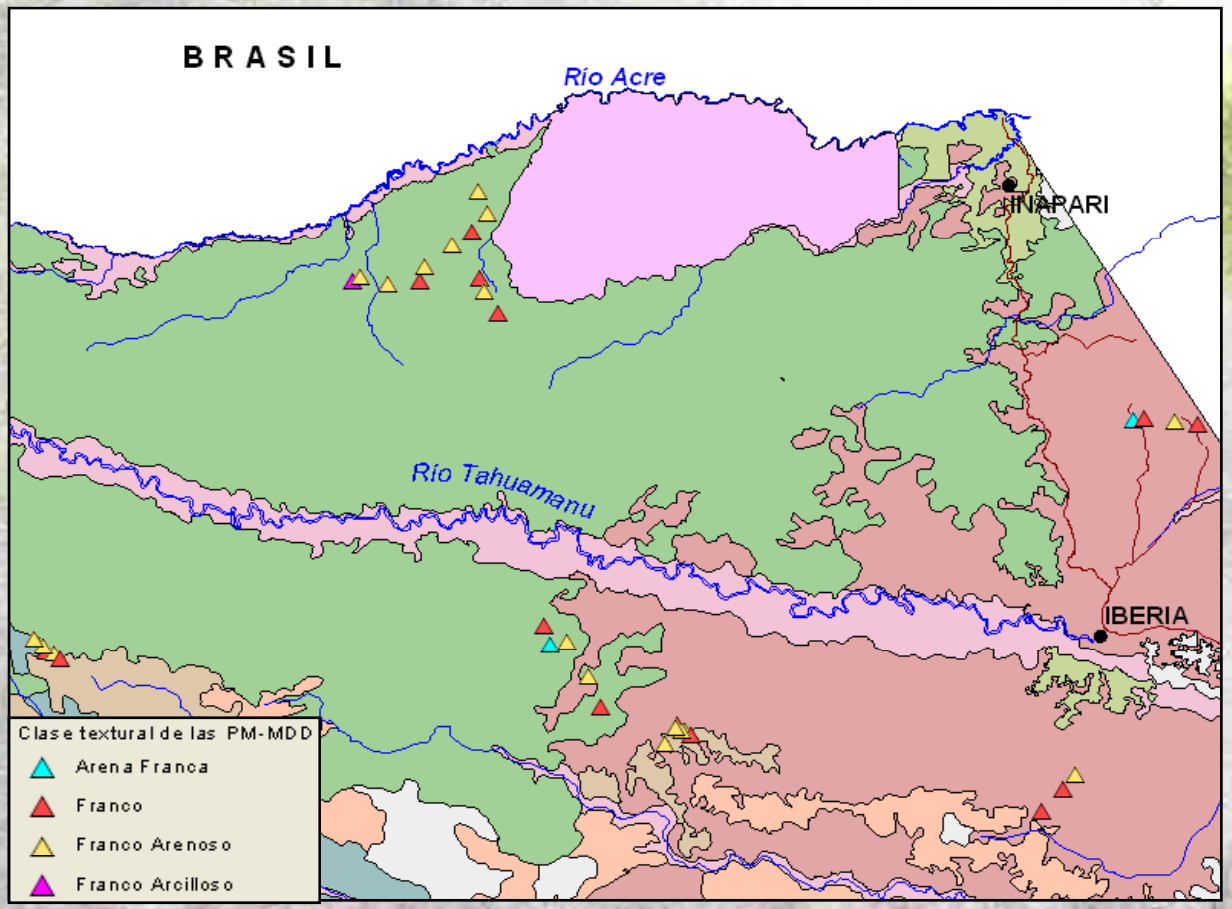
Número de Muestra			C.E.					.			Clase	CIC	Cambiables					Suma	Suma	%
Lab	Campo	pH	(1:1)	CaCO	M.O.	P	K	Arena	Limo	Arcilla	Textural		Ca ·	Mg ·	K	Na	Al + H	de Cationes	de Bases	Sat. De Bases
		(1:1)	dS/m	%	%	ppm	ppm	%	%	%		me/100g								
250	MO 37 ROT00C001S	5.06	0.55	0.00	1.9	5.0	140	74	24	2	A.Fr.	9.92	6.01	2.81	0.34	0.13	0.50	9.79	9.29	94
251	MO 38 ROT00C051N	5.61	1.19	0.00	6.2	14.7	256	50	38	4	Fr.A.	24.00	17.22	4.12	0.54	0.12	0.20	22.20	22.00	92
252	MO 39 NSH06G21T	5.90	1.05	0.00	6.4	16.6	249	26	58	16	Fr.L.	39.20	32.59	5.53	0.67	0.11	0.30	39.20	38.90	99
253	MO 40 NSH06G12T	5.63	0.59	0.00	3.8	11.8	236	68	28	4	Fr.A.	23.04	16.77	3.42	0.70	0.17	0.20	21.26	21.06	91
254	MO 41 NSH06G16T	6.48	1.50	0.00	9.1	17.6	398	56	36	8	Fr.A.	40.00	33.02	5.61	1.13	0.23	0.00	39.99	39.99	100
255	MO 42 SAW06G06T	5.22	1.13	0.00	3.5	9.9	233	34	50	16	Fr.	18.88	13.30	3.07	0.62	0.21	0.20	17.40	17.20	91
256	MO 43 SAW06G30T	5.79	1.00	0.00	3.4	9.9	189	60	38	2	Fr.A.	26.08	22.20	2.95	0.57	0.15	0.20	26.07	25.87	99
257	MO 01-U SAW06G002S	5.82	0.59	0.00	2.5	7.0	337	60	34	6	Fr.A.	28.80	22.42	5.10	0.96	0.12	0.20	28.80	28.60	99
258	MO 02-U SHA05G16S	6.76	0.59	0.00	4.7	16.6	245	40	40	20	Fr.	37.76	31.93	4.88	0.77	0.18	0.00	37.76	37.76	100
259	MO 03-U SHA05G017A	5.43	0.85	0.00	3.1	7.0	140	54	38	8	Fr.A.	24.64	19.40	4.50	0.43	0.11	0.20	24.64	24.44	99
260	MO 04-U SHA05G018A	5.33	0.61	0.00	1.5	5.0	174	66	26	8	Fr.A.	24.00	19.59	3.59	0.52	0.10	0.20	24.00	23.80	99
261	MO 05-U SAW06G005A	5.52	1.02	0.00	6.0	7.9	293	46	46	8	Fr.	36.32	29.62	5.63	0.77	0.10	0.20	36.32	36.12	99

A = arena ; A.Fr. = arena franca ; Fr.A. = franco arenoso ; Fr. = Franco ; Fr.L. = franco Limoso ; L= limoso ; Fr.Ar.A. = franco arcillo arenoso ; Fr.Ar. = franco arcilloso; Fr.Ar.L. = Franco arcillo limoso ; Ar.A. = Arcillo Arenoso ; Ar.L. = arcillo limoso ; Ar. = Arcilloso

Ing. Rubén Bazán Tapia
Jefe del Laboratorio

Forest Characterization

8. Soil texture classes in CPs - MDD



Forest Characterization

9. Natural regeneration in CPs - MDD

	En sub parcelas C y D (obligatorias)		*Observaciones (parcelas no obligatorias)*	
	Latizales h < 1,3 m Dap < 10 cm	*Brinzales h > 0, 3 m h < 1,3 m*	*Latizales h < 1,3 m Dap < 10 cm*	*Brinzales h > 0, 3 m h < 1,3 m*
Número de subparcelas con reg. natural	***3 (1,5 %)***	***6 (1,5 %)***	***1 (0,12 %)***	***21 (2,62 %)***
Número total de plántulas de reg. natural	***5***	***10***	***1***	***26***
Numero de plántulas de reg. nat por Ha	***3***	***63***		

Shape and volume of the trees

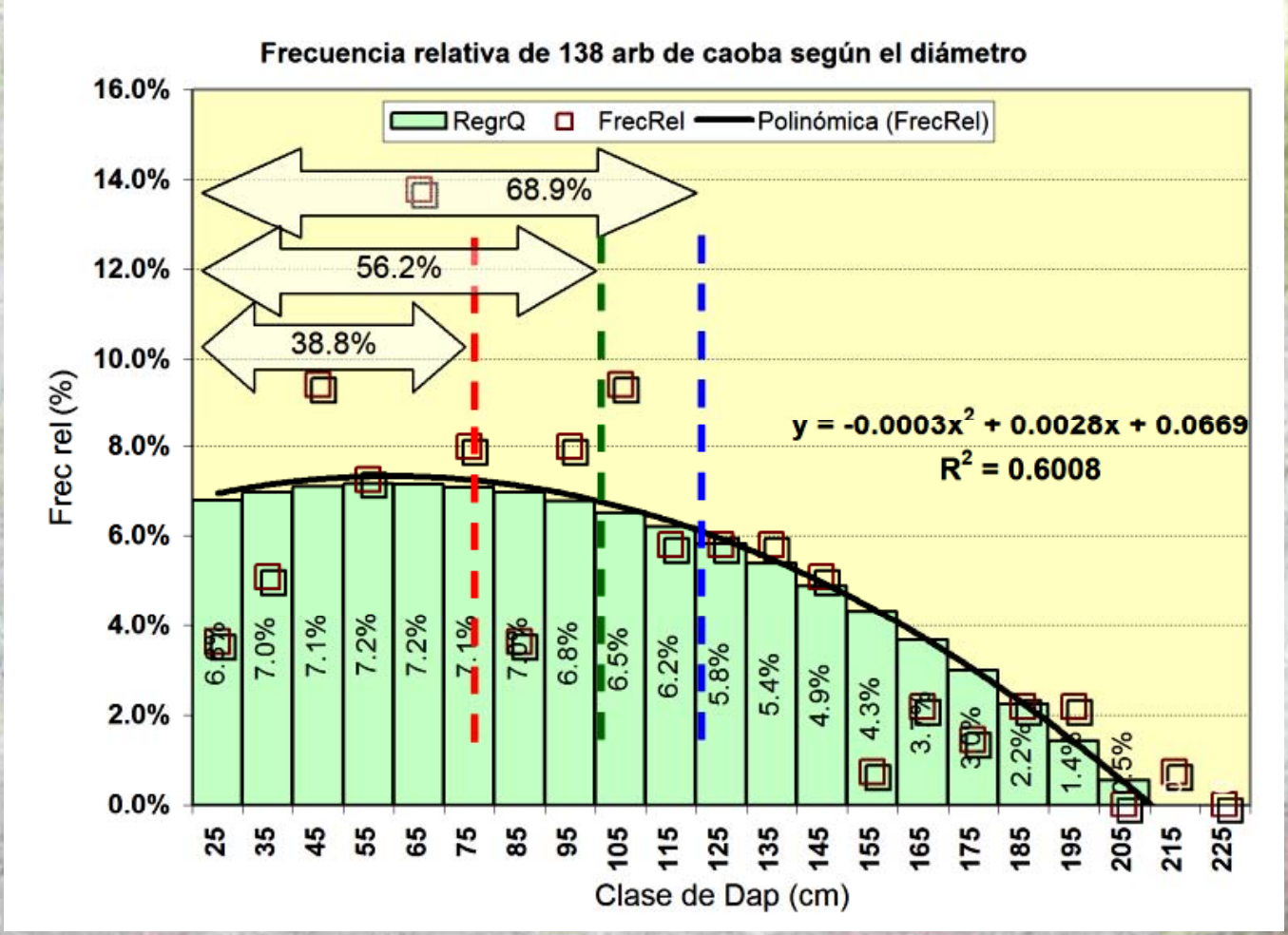
Shape and volume of the trees

1. Characterization of 169 trees - MDD

Clase Diamétrica	No. Arb		Factor de Forma (tentativo)	Altura del Fuste (m)			Volumen	
	Arboles	%		Mínimo	Máximo	Promedio	Vol C/C (m3)	Vol S/C (m3)
10 - 19.9	2	1.18	0.89	7.75	8	7.88		
20 - 29.9	5	2.96	0.83	4.5	8.5	6.30	0.26	0.24
30 - 39.9	7	4.14	0.80	6	17	9.29	0.70	0.66
40 - 49.9	13	7.69	0.77	4.5	18	10.69	1.27	1.20
50 - 59.9	11	6.51	0.66	6.25	19	12.25	1.90	1.76
60 - 69.9	22	13.02	0.73	7	25	13.25	3.13	2.93
70 - 74.9	8	4.73	0.77	6.5	16	10.71	3.25	3.09
75 - 79.9	5	2.96	0.83	8	14	11.88	4.80	4.39
80 - 89.9	7	4.14	0.72	8	21.25	15.05	6.02	5.70
90 - 99.9	17	10.06	0.66	10	19	14.29	8.80	8.19
100 - 109.9	19	11.24	0.77	8	18	13.87	9.07	8.57
110 - 119.9	10	5.92	0.80	10.25	20	14.53	11.53	10.89
120 - 129.9	9	5.33	0.72	12	22	18.56	14.28	13.73
130 - 139.9	11	6.51	0.70	9	22.5	15.28	14.32	13.69
140 - 149.9	8	4.73	0.72	9	18.5	13.75	16.62	15.82
150 - 159.9	1	0.59	0.65	13.75	13.75	13.75	16.53	15.65
160 - 169.9	3	1.78	0.78	12	17	14.83	23.60	22.89
170 - 179.9	2	1.18	0.72	14	18	16.83	26.32	25.06
180 - 189.9	5	2.96	0.74	13	14	13.50	26.71	25.22
190 - 199.9	3	1.78	0.74	12	14	12.67	27.72	26.51
200 - 209.9	0	0.00					0.00	0.00
210 - 219.9	1	0.59	0.67	12	12	12.00	29.68	27.71
Total	169	100.00	0.75	9.21	16.93	12.77	11.57	11.04

Shape and volume of the trees

2. Diametrical distribution of trees - MDD



Shape and volume of the trees

3. Characterization of 102 trees - UCA

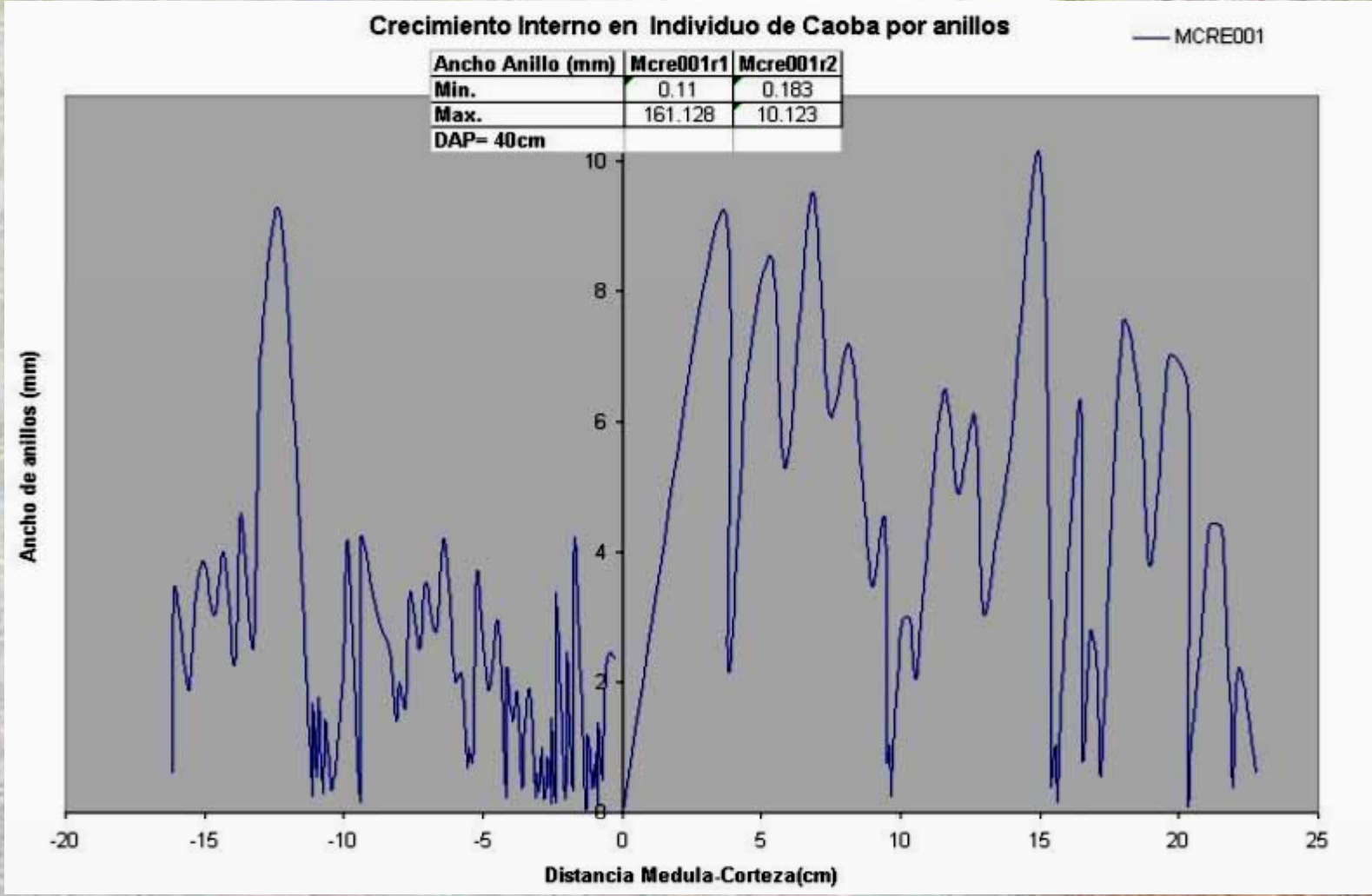
CLASE DIAMETRICA	Número de árboles		Factor de Forma	Fuste (m)	Fuste (m)	Fuste (m)	Volumen C/C (m3)	Volumen S/C (m3)	Diferencia
	Arboles	%		Máximo	Mínimo	Promedio			
10.00-19.99									
20.00-29.99	0	0.00							
30.00-39.99	1	0.98	0.8606	5.00	5.00	5.00	0.488	0.380	0.108
40-49.99	1	0.98	0.7983	8.00	8.00	8.00	1.085	0.872	0.212
50-59.99	4	3.92	0.7499	10.50	5.25	8.94	1.473	1.339	0.134
60-69.99	9	8.82	0.7224	14.00	9.00	11.22	2.777	2.493	0.284
70-74.99	3	2.94	0.8634	13.00	10.00	11.00	4.029	3.671	0.357
75-79.99	4	3.92	0.8820	15.00	11.00	12.94	5.437	5.049	0.387
80-89.99	10	9.80	0.8379	19.50	8.00	11.95	5.655	5.266	0.389
90-99.99	12	11.76	0.8076	16.50	5.00	11.10	6.162	5.760	0.402
100-109.99	11	10.78	0.8142	15.50	9.50	13.02	9.036	8.293	0.742
110-119.99	7	6.86	0.8739	19.00	8.00	12.43	11.526	10.869	0.657
120-129.99	7	6.86	0.7609	16.00	8.00	12.79	11.796	11.106	0.690
130-139.99	10	9.80	0.8127	17.00	7.00	12.10	14.006	13.112	0.894
140-149.99	4	3.92	0.6601	19.00	12.50	16.25	16.659	15.795	0.864
150-159.99	7	6.86	0.7706	20.00	10.00	14.21	20.344	19.272	1.072
160-169.99	4	3.92	0.7825	14.00	9.00	11.75	19.401	18.471	0.930
170-179.99	1	0.98	0.7431	12.00	12.00	12.00	20.840	20.324	0.516
180-189.99	3	2.94	0.7312	16.00	14.00	14.67	28.804	28.176	0.628
190-199.99	2	1.96	0.8152	14.00	10.00	12.00	28.997	27.365	1.632
200-209.99	0	0.00							
210-219.99	1	0.98	0.7647	12.00	12.00	12.00	33.316	32.730	0.586
220-229.99	0	0.00							
230-239.99	0	0.00							
240-249.99	1	0.98	0.7067	14.00	14.00	14.00	46.6418	46.2049	0.437
Total	**102**	**100.00**							

Shape and volume of the trees

4. Ring study

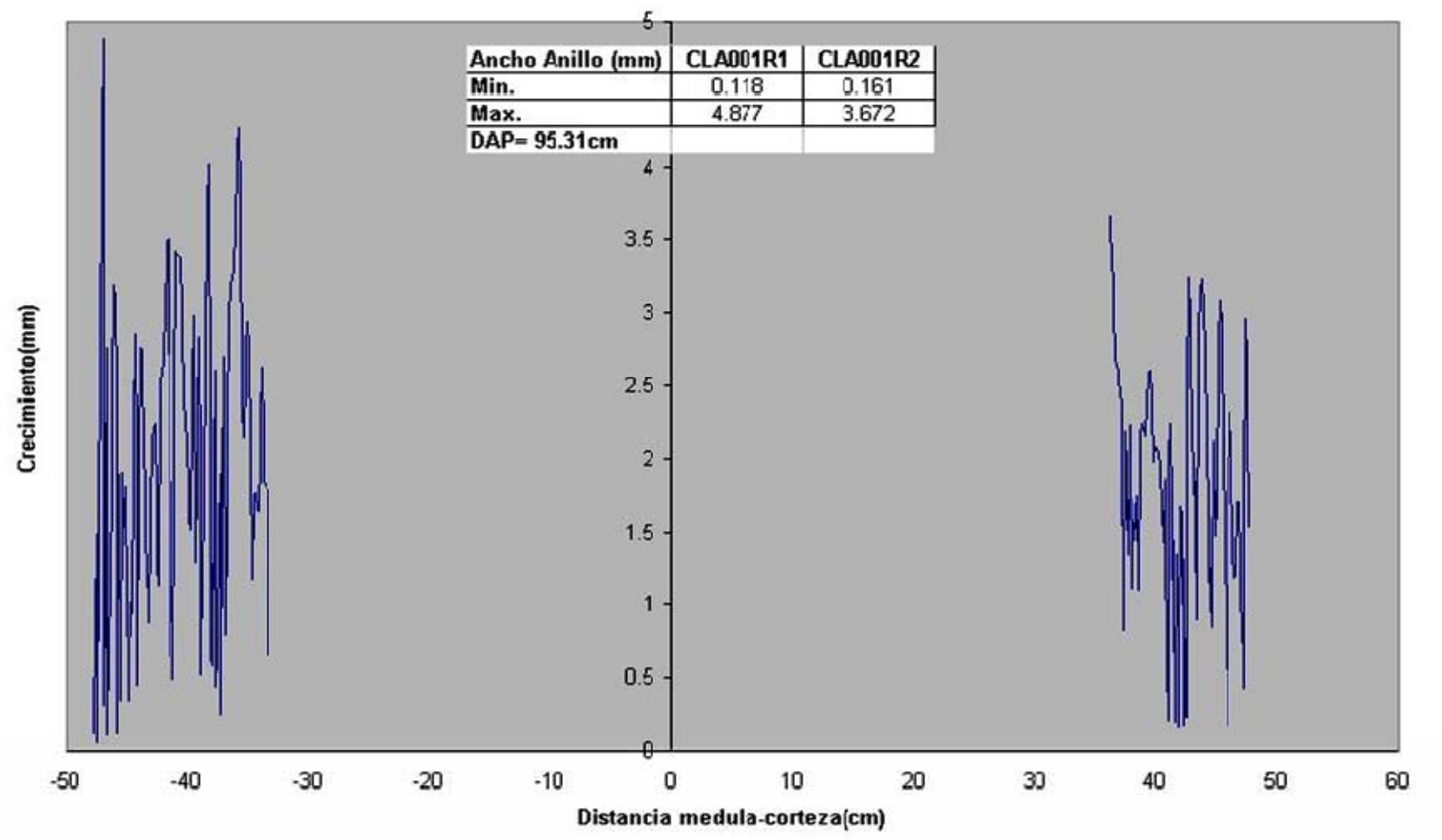
Shape and volume of the trees

5. *Radial growth* mensurationn



Shape and volume of the trees

6. Determination of the hollow of the trunk



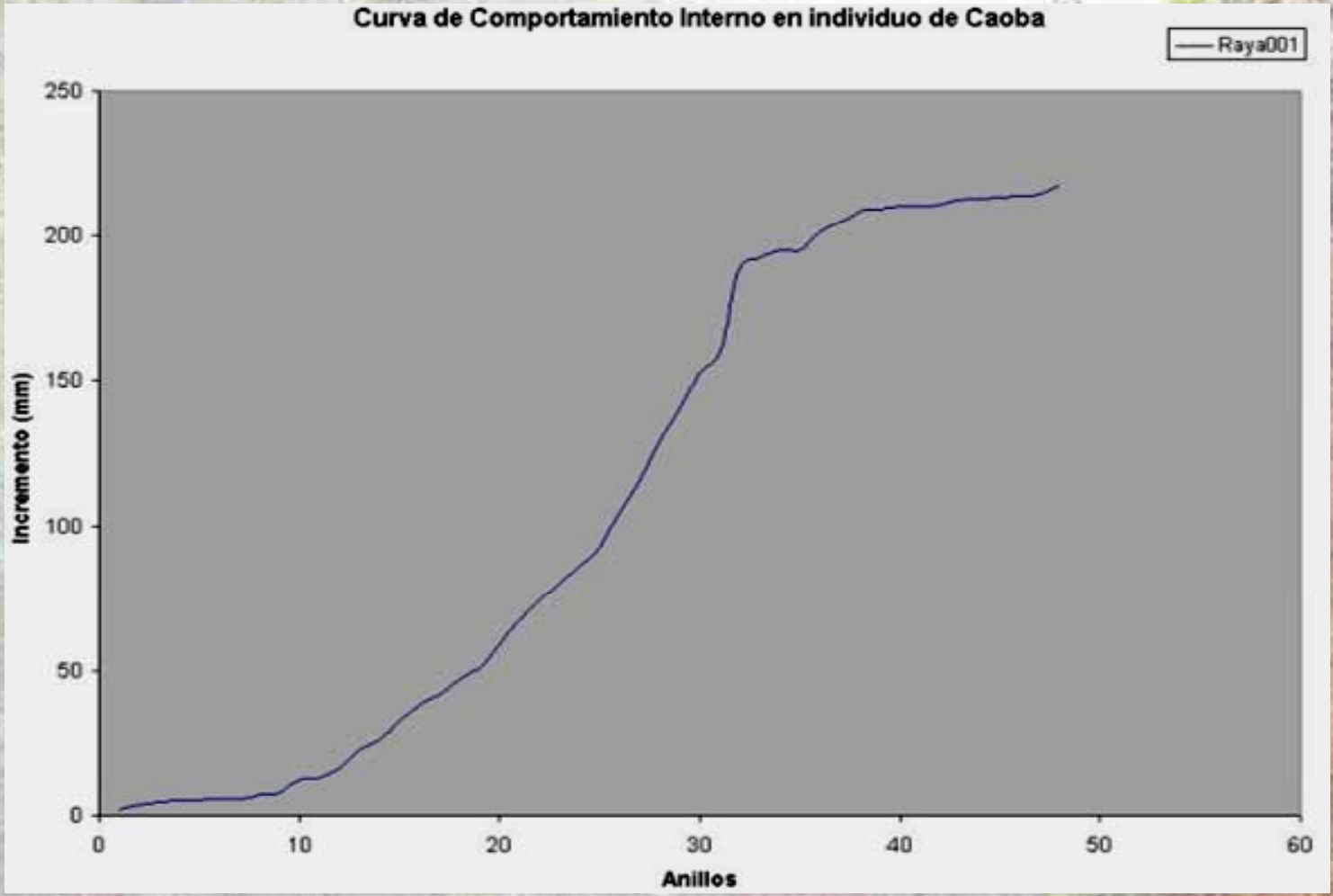
Shape and volume of the trees

7. Determination of the hollow of the trunk

Departamento	Nº Individuos sanos	%	Nº Individuos en proceso de deterioro interno	%	Nº Individuos con hueco	%	TOTAL árboles
Ucayali	20	71.43	2	7.14	6	21.43	28
Madre de Dios	19	76.00	2	8.00	4	16.00	25
TOTAL	39	73.58	4	7.55	10	18.87	**53**

Shape and volume of the trees

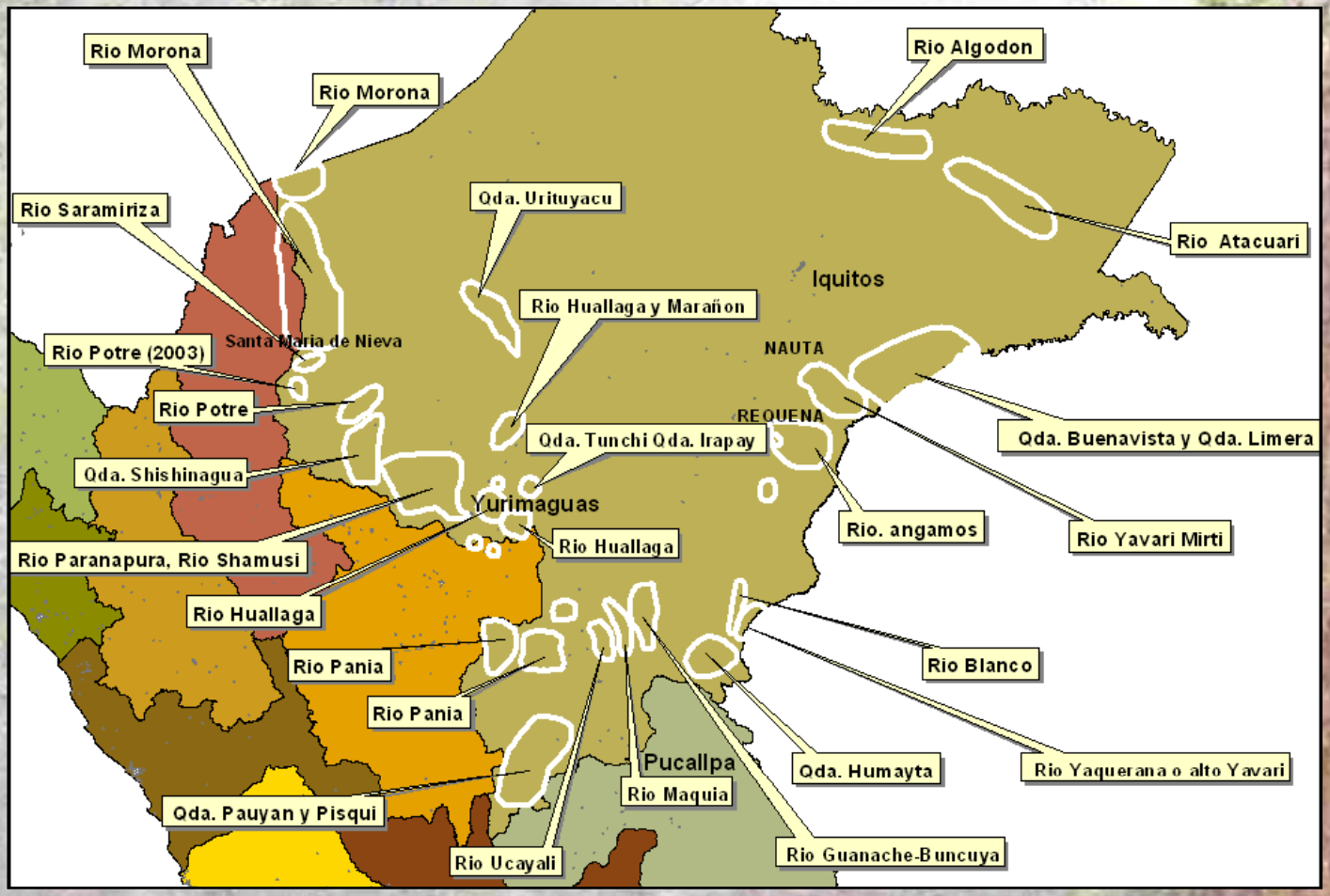
8. Asessing age and growth of the tree



Human Impact

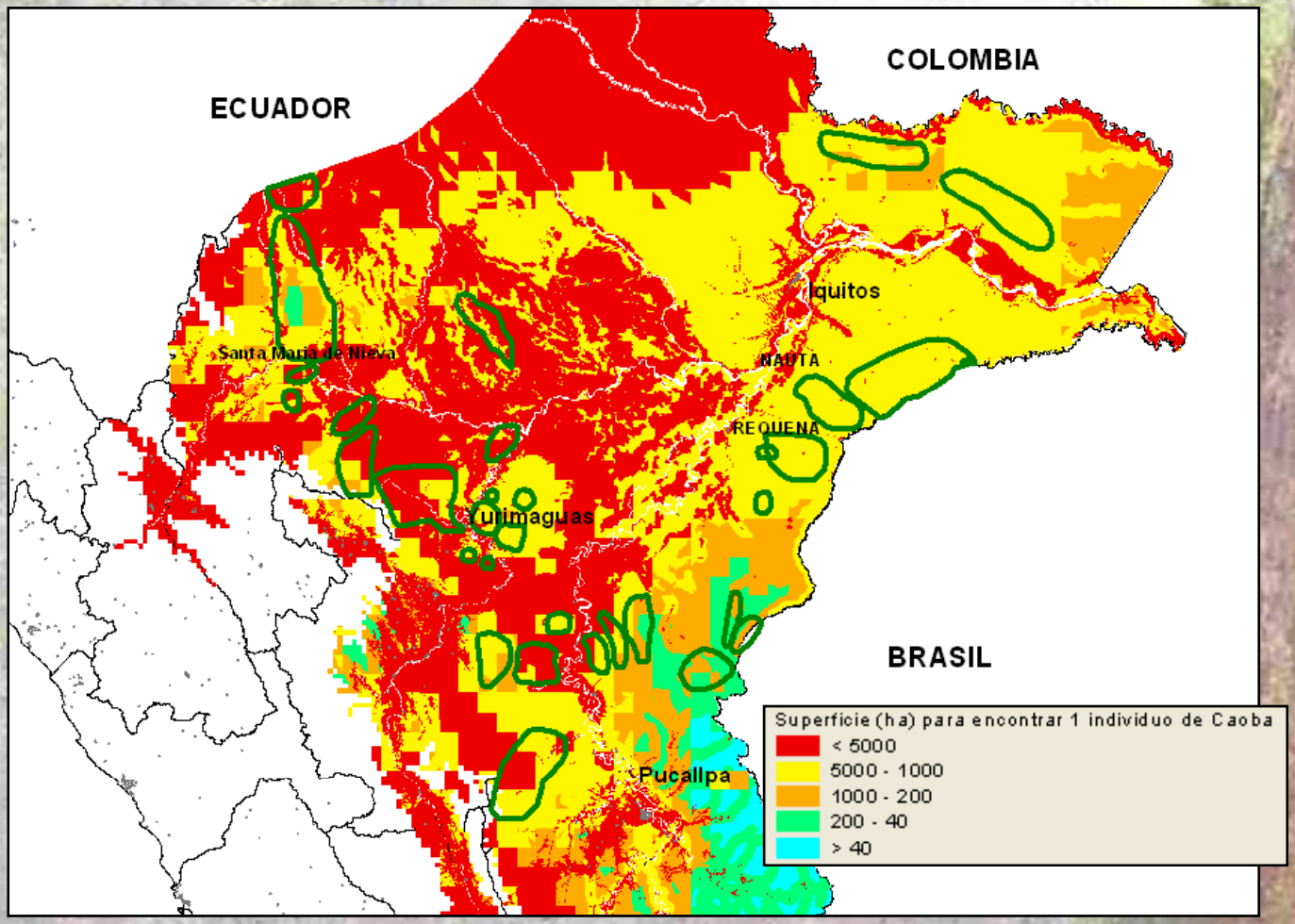
Human Impact

1. Historic area of mahogany's extraction - LOR



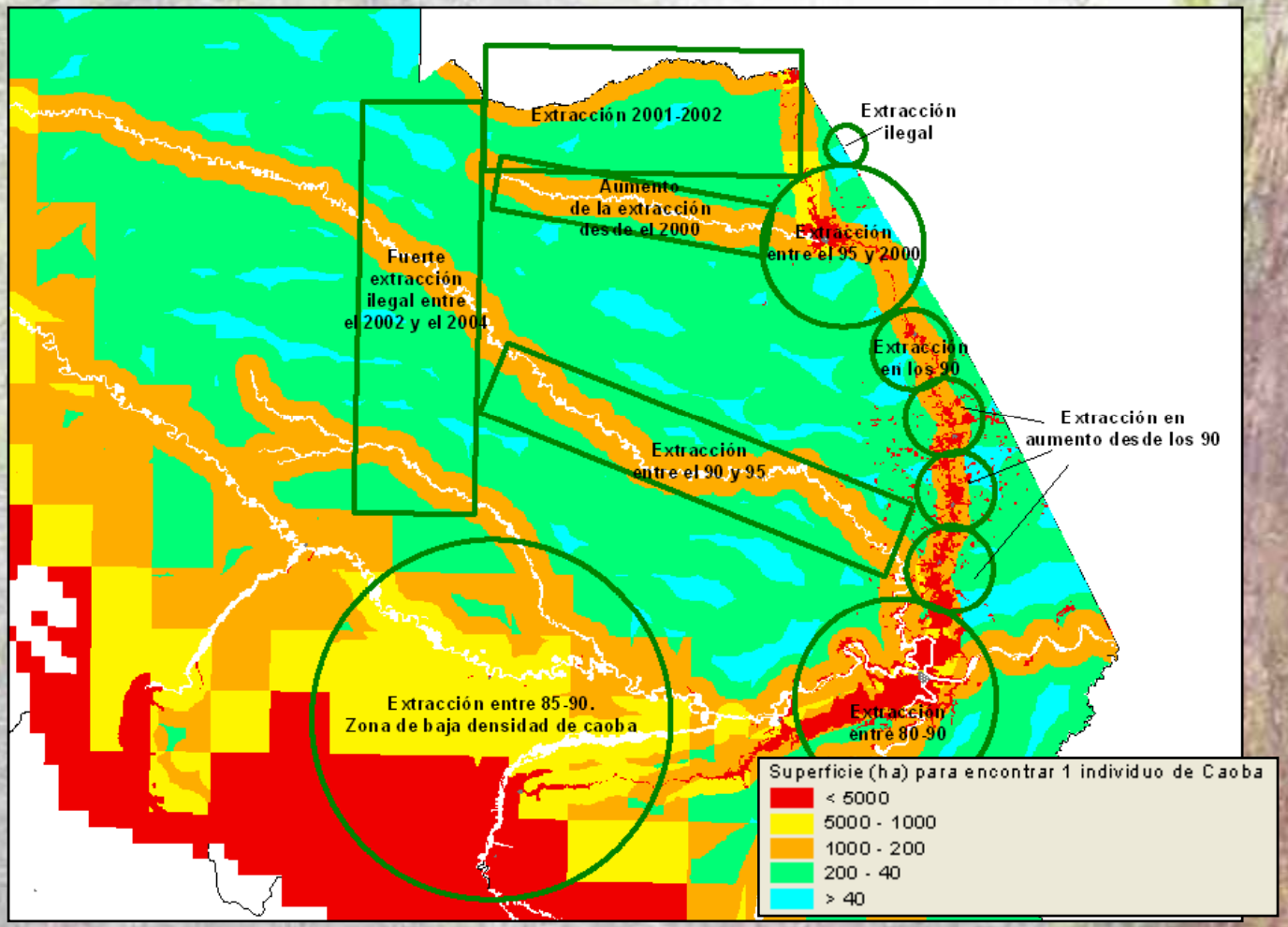
Human Impact

2. Extractive zones and forest distribution - LOR



Human Impact

2. Extractive zones and forest distribution - MDD



Conservation strategy


Proyecto UNALM-ITTO
PD 251 / 03 Rev. 3(F) "Evaluación de
las existencias comerciales y estrategia
para manejo sostenible de la
caoba (*Swietenia macrophylla*)
en el Perú"
"Conservemos la Caoba"