

Lecture given at the

WCS Workshop on Land Change Modeling for REDD

October 25– 29, 2010

Wildlife Conservation Society - Bronx Zoo
Bronx, New York, USA

Hosted by

Clark Labs and the Wildlife Conservation Society

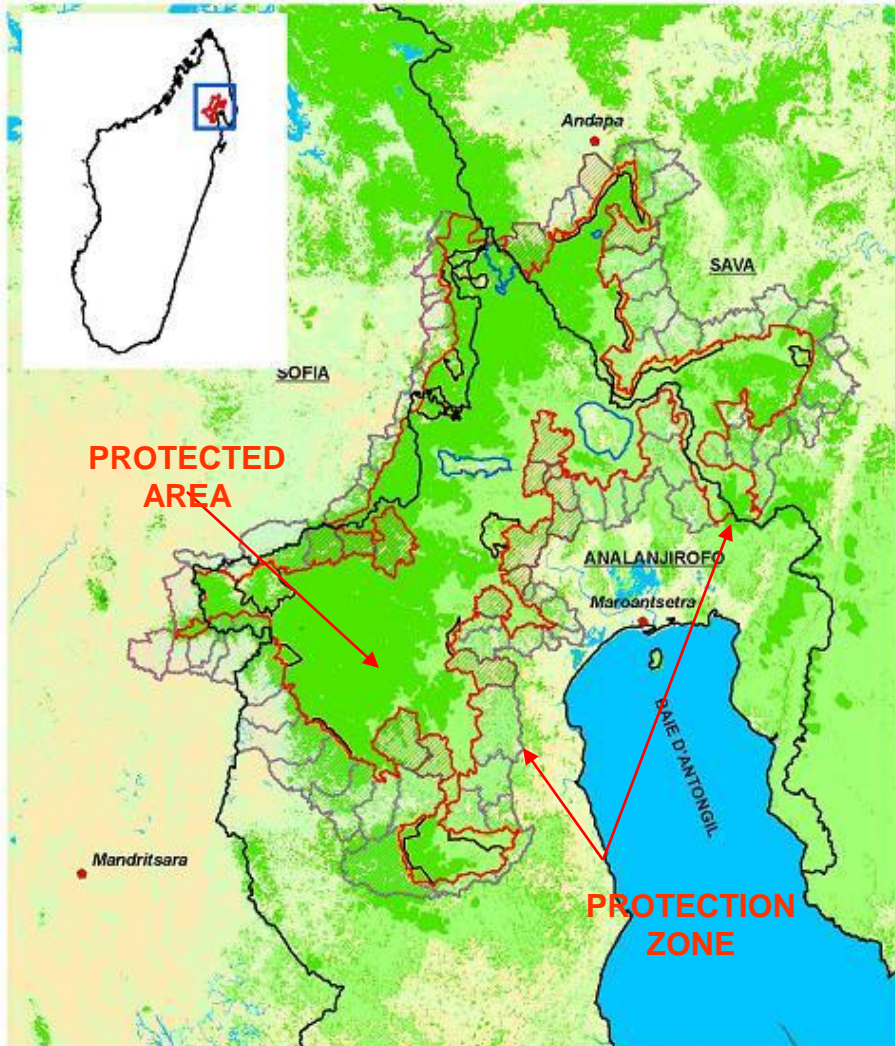


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USING IDRISI ON MAKIRA'S REDD PROJECT

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Wildlife Conservation Society

MAKIRA



- Establishment:
 - 2001 : Makira initiated
 - 2005 : Makira received temporary PA status
 - 2010 : Pending status for Makira
- Area :
 - Protected Area : 372,470 Ha
 - Protection Zone: 335,173 Ha
- Landscape :
 - Larger intact eastern rainforest
 - Exceptional biodiversity

HISTORY

- **June 2008:** WCS signs an agreement with GOM to market 9.1 million tons of Makira Protected Area forest carbon through 2033 (current contract thru 2012).
- **2008:** Market volunteer 7\$/ton a total amount equivalent to \$ 595 000 to use in 2 years
- **Since 2008:** work with Smart wood rainforest alliance for acquiring the CCBA (Climate Community Biodiversity Alliance) certification



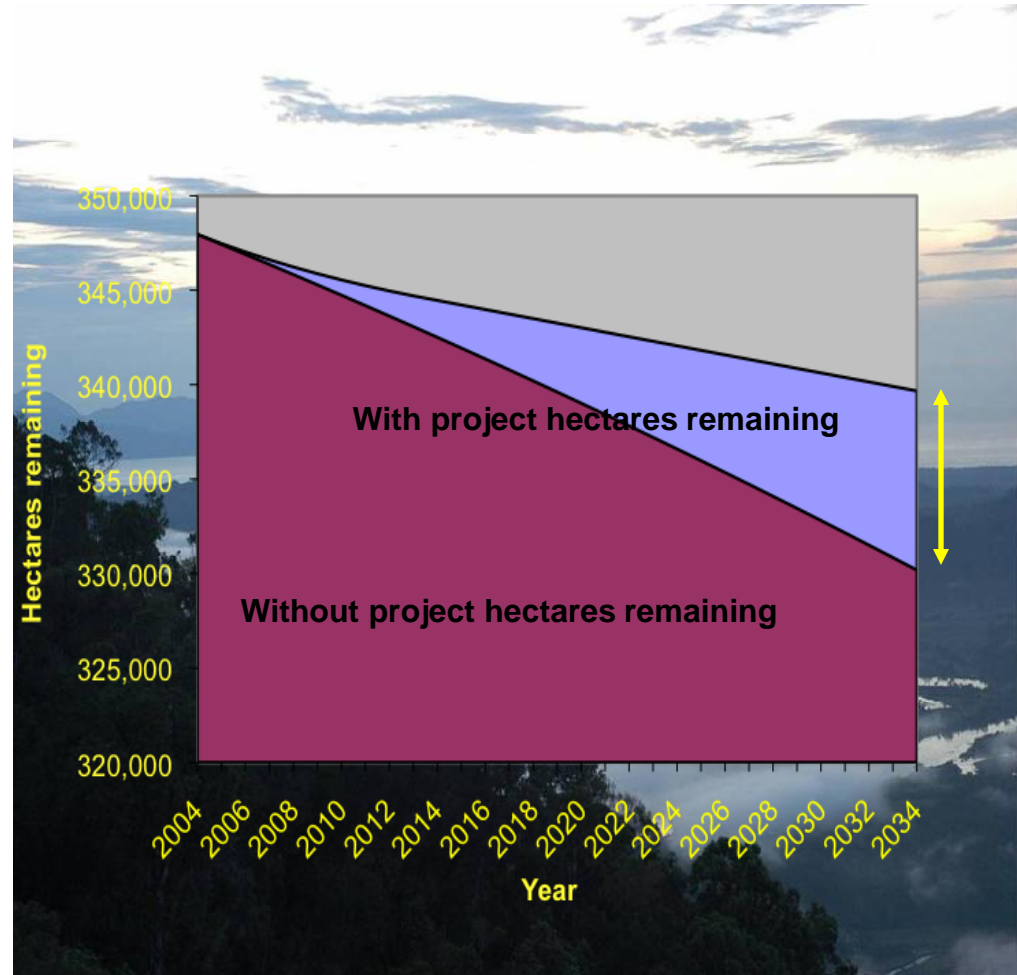
HISTORY

- 2008-2010: Elaborate the Project Design Document (VCS and CCBA)
- September 2008: Technical training of biomass inventory with "Winrock International" in Maroantsetra



CONCEPT OF THE BASELINE

- ❖ Without project carbon stock (diminution due to deforestation and degradation)
- ❖ With project carbon stock (diminution of deforestation and degradation)
- ❖ Carbon emission avoided by the project (credits)



REDD BASELINE using IDRISI

5 main steps

- Carbon stock quantification
- Historical trends
- Identification of the variables
- Creation of the model and projection of the rate and location of future deforestation
- Ex-ante estimation of carbon stock change under the project scenario

BASELINE: carbon stock quantification

02 steps on the field:

- Preliminary data
- Data for the baseline

5 strata for the preliminary inventory

- Intact forest (mid alt)
- Intact forest (low alt)
- Degraded forest (mid alt)
- Degraded forest (low alt)
- Savoka (SVK)

After calculation (based on pressure)

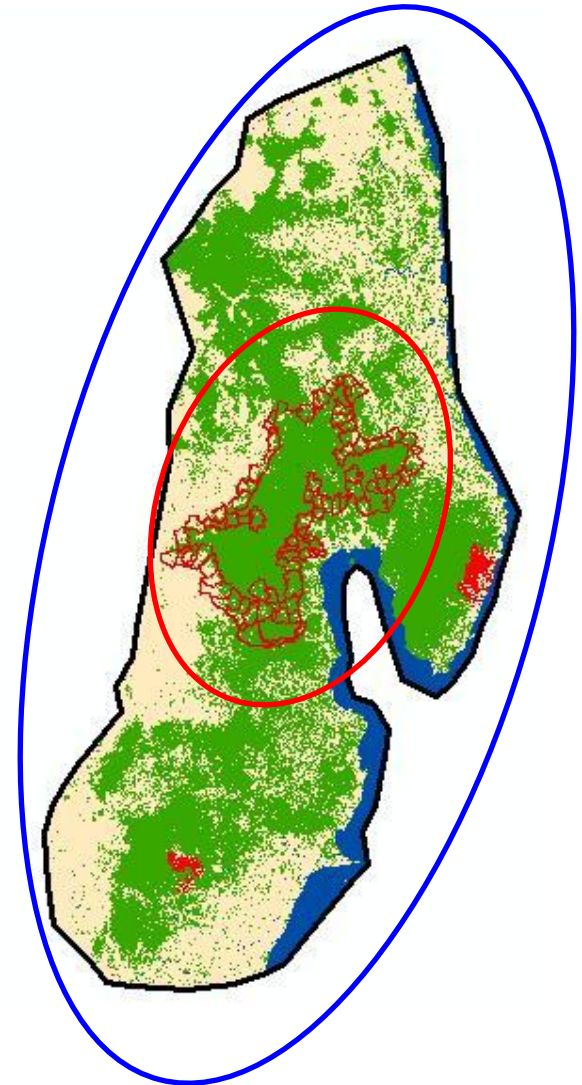
- Forest with high pressure
- Forest with low pressure
- Savoka



SPATIAL DELIMITATION (BioCF Methodology)

- The “project area” is the area in which the REDD project activity will be implemented and GHG emission reductions accounted.
- The « Leakage belt » is defined as the land area or land areas surrounding or adjacent to the project area in which baseline activities could be displaced due to the project activities implemented in the project area
- The “reference area” is the area from which information on historical deforestation is extracted and projected into the future to spatially locate the area that will be deforested in the baseline case.

The REFERENCE AREA is five times larger area than the project area and includes the project area and has the same forest dynamic



DEFINITION OF FOREST

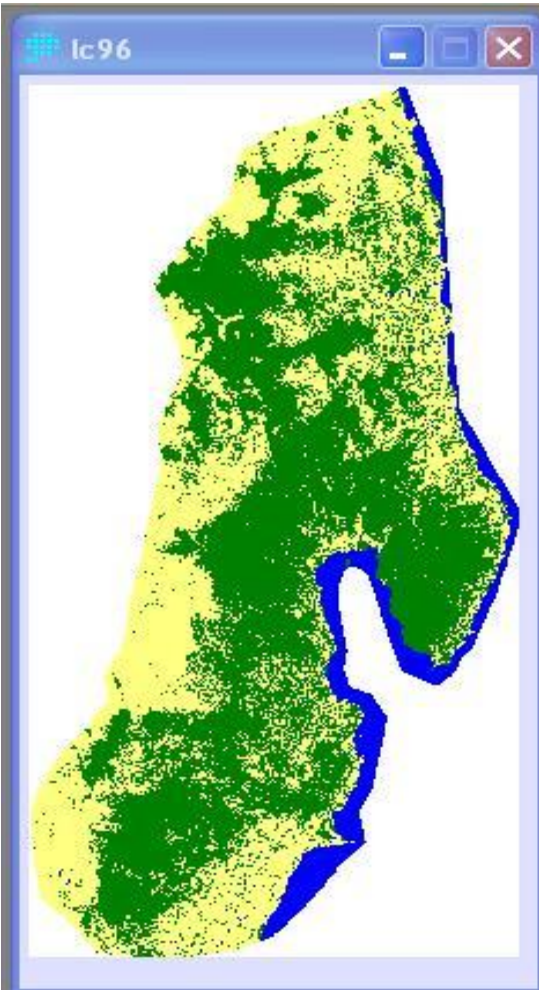
Madagascar National definition of forest (UNFCCC 2008)

- Over 30% canopy cover**
- Over 5 meters in height**
- In patches of over 1 Ha**

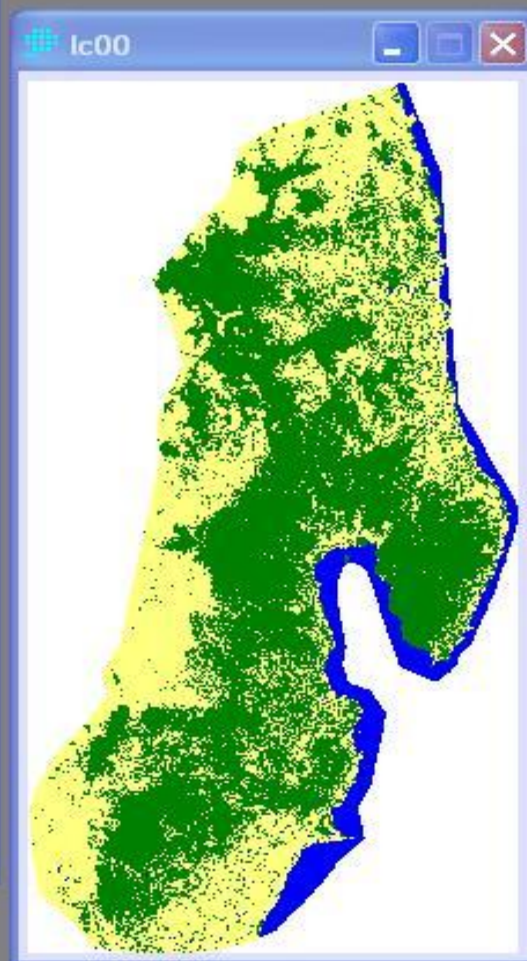
BASELINE: TIME SERIES

- 3 dates of land use data
1996, 2000 and 2005
- 1996 - 2000 : creation
and calibration of the
model
- 2000 – 2005 : validation
and adjustment of the
model

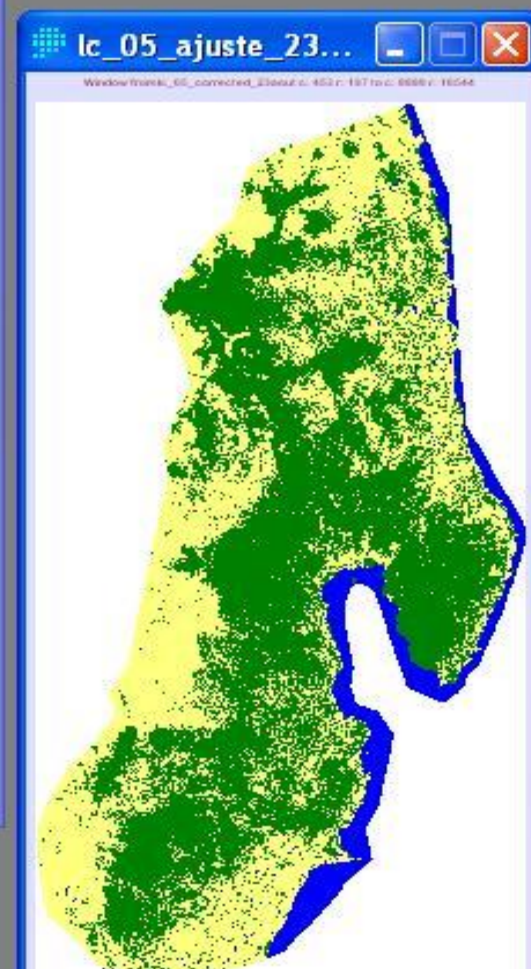




Rate 96_00 = 0.45%



Rate 00_05 = 0.09%



CAUSES OF DEFORESTATION

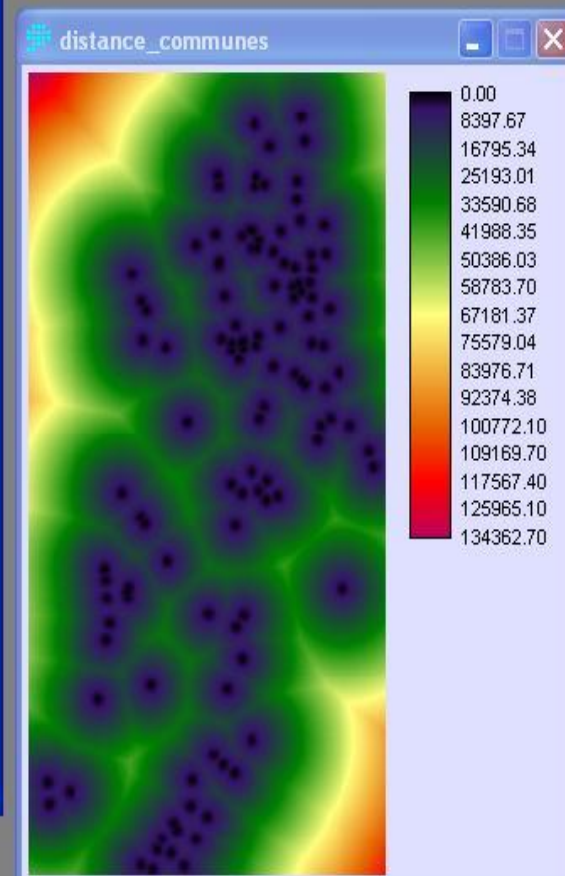
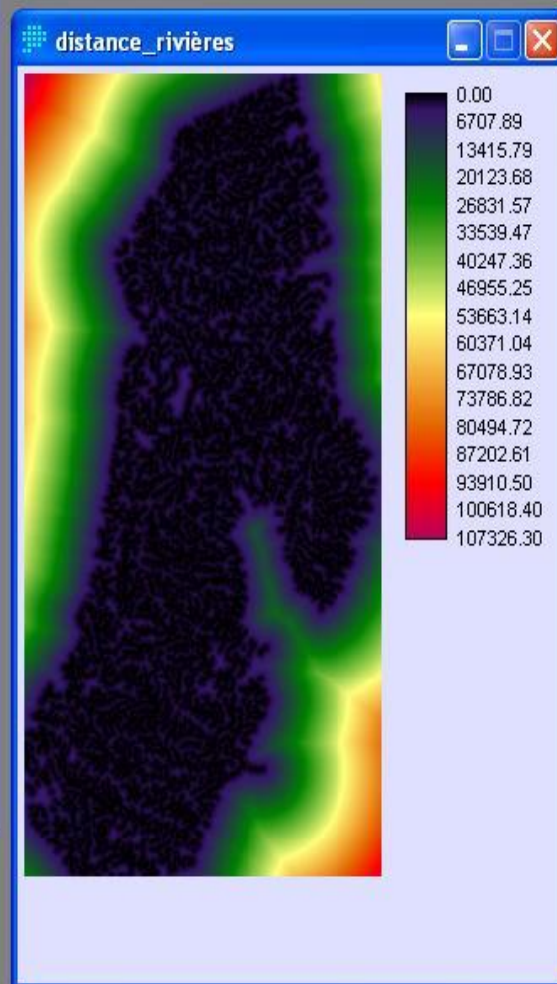
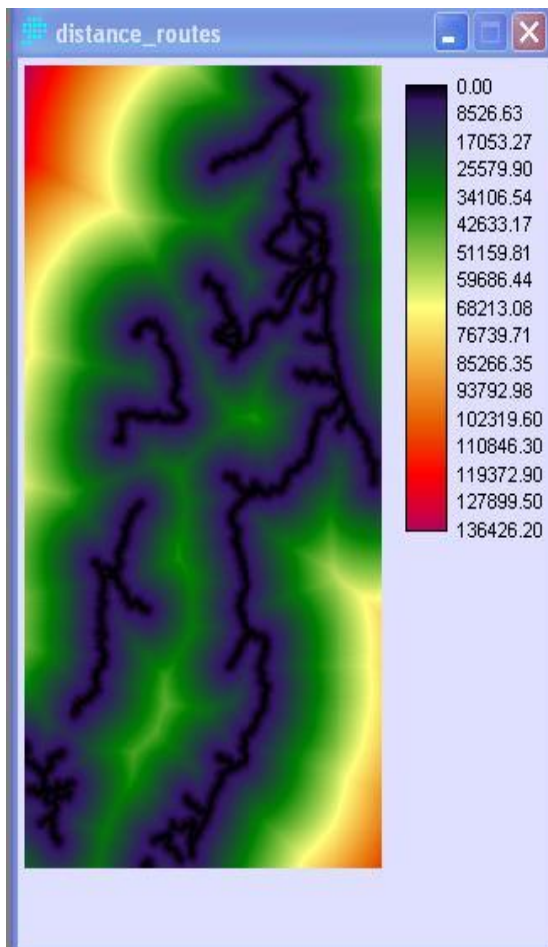
- The main drivers of deforestation in the Makira area include swidden agriculture, exploitation of timber, burning of forest land for cattle grazing, illicit commercial exploitation of the forests' hardwood species, bushmeat hunting and illicit commercial mining of quartz and precious stones

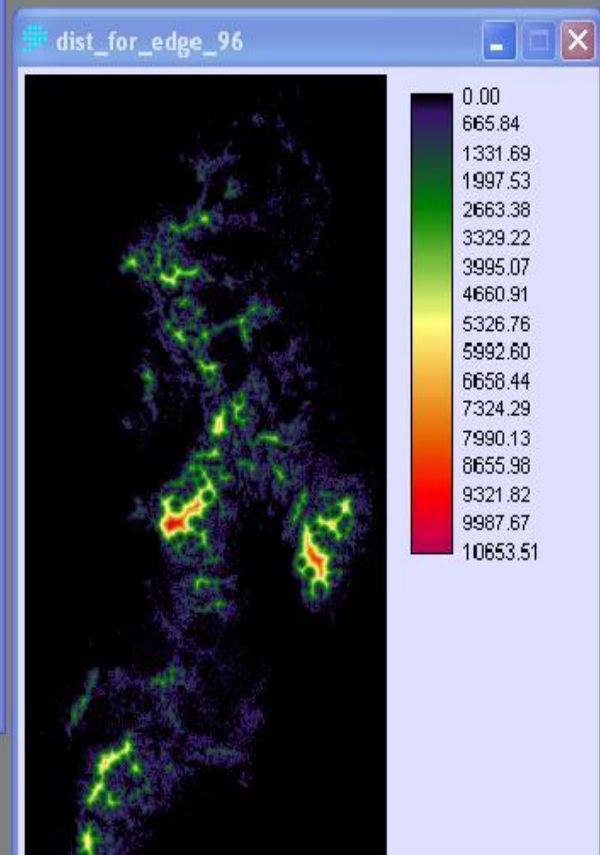
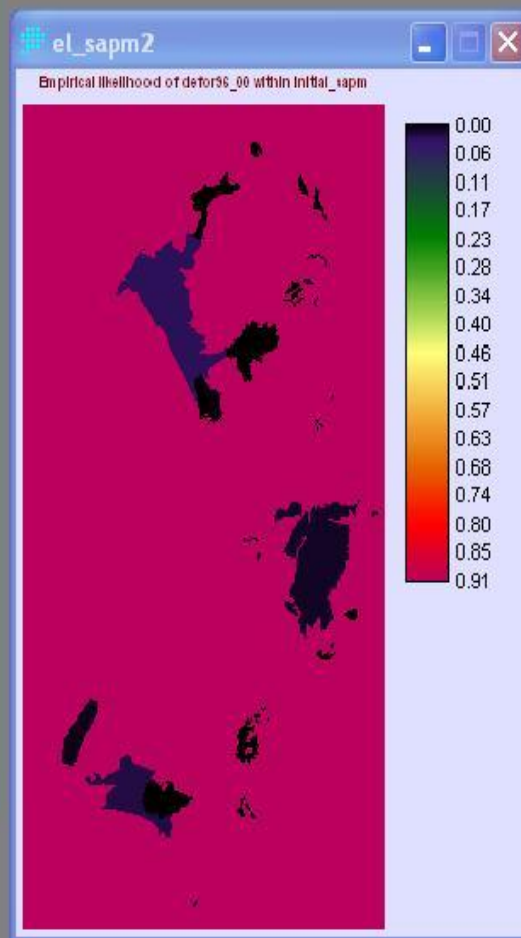
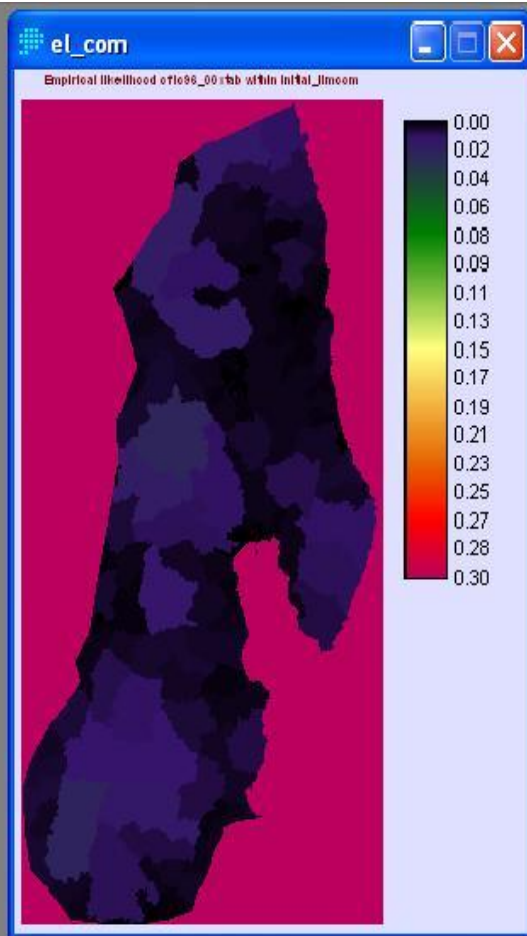
DEFORESTATION RATE

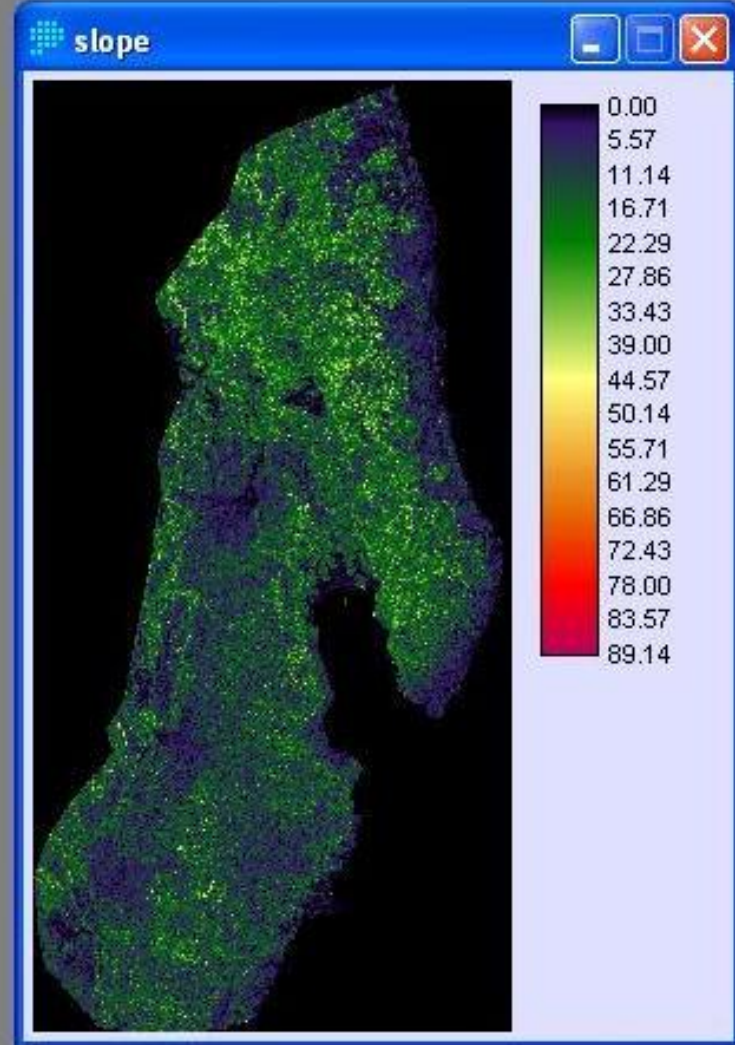
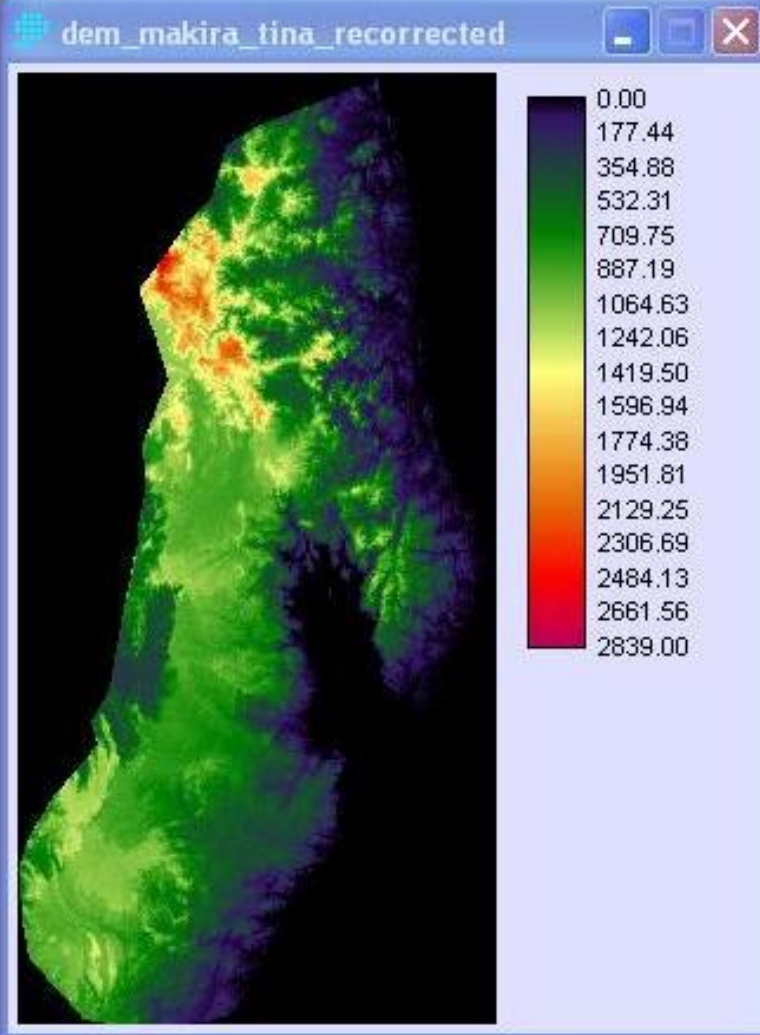
- **Rate 1996 – 2000 = 0.45% / year**
- **Rate 2000 – 2005 = 0,09% / year**
- **Rate 1996 – 2005 = 0.27% / year**

BASELINE : Identification of variables

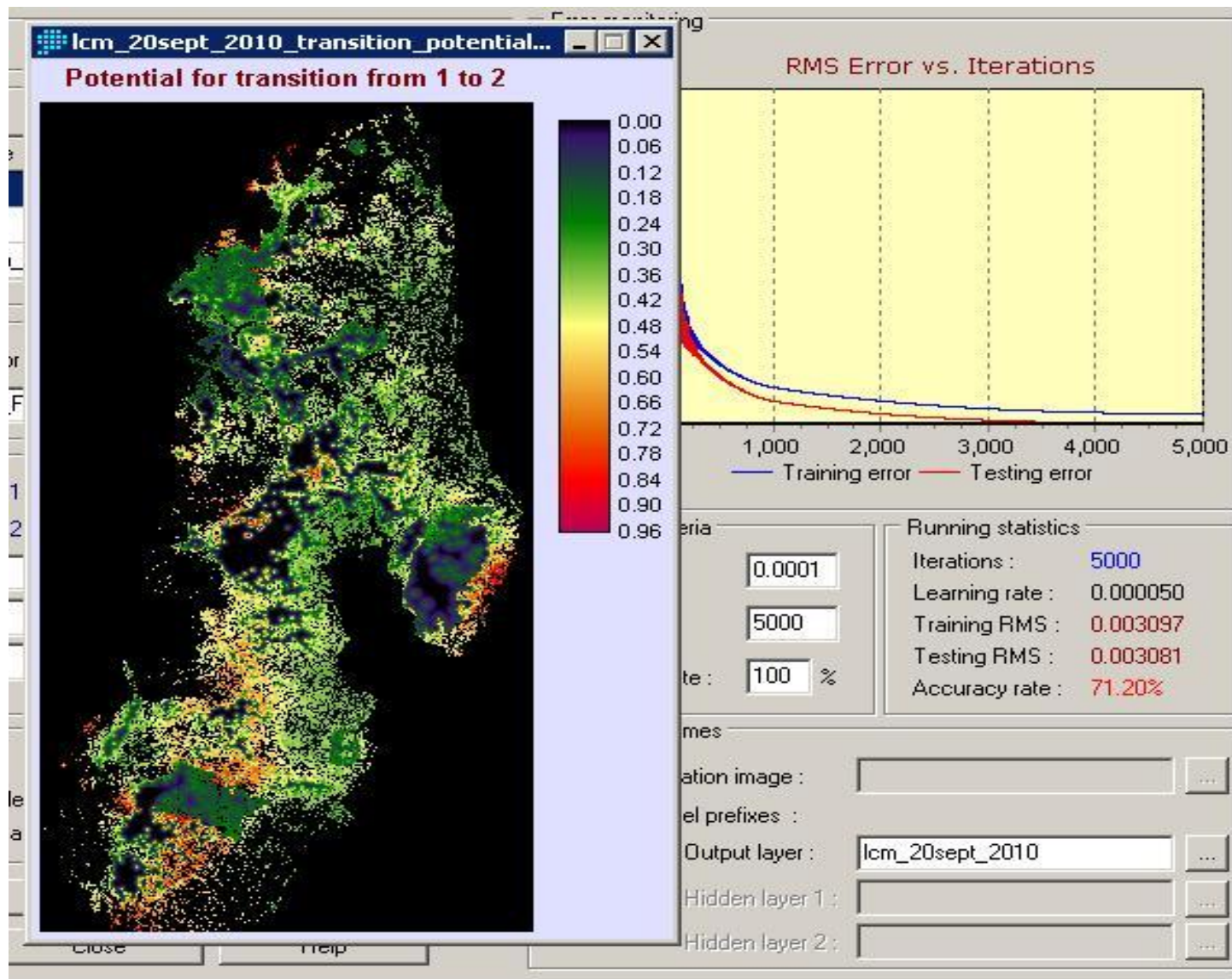
- **Distance to roads**
- **Distance to rivers**
- **Distance to localities (villages, district, communes)**
- **Slope**
- **DEM**
- **Evidence likelihood (communes)**
- **Evidence likelihood (protected area)**
- **Distance from edge to the inside of the forest**



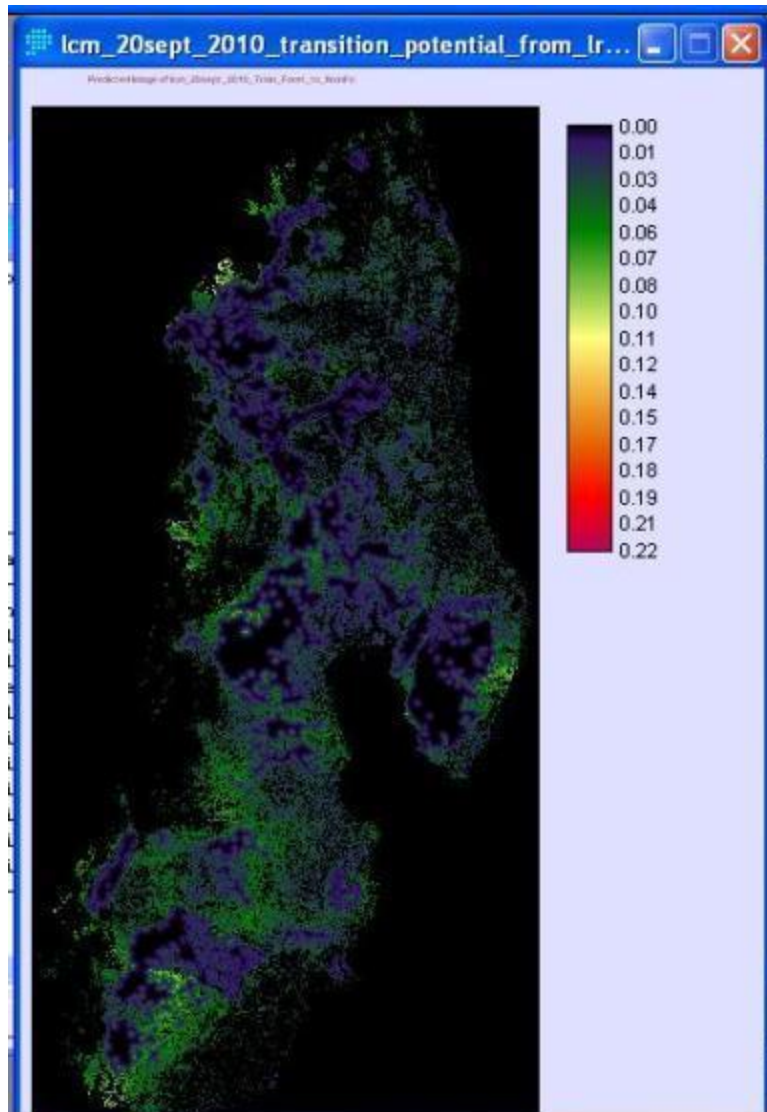




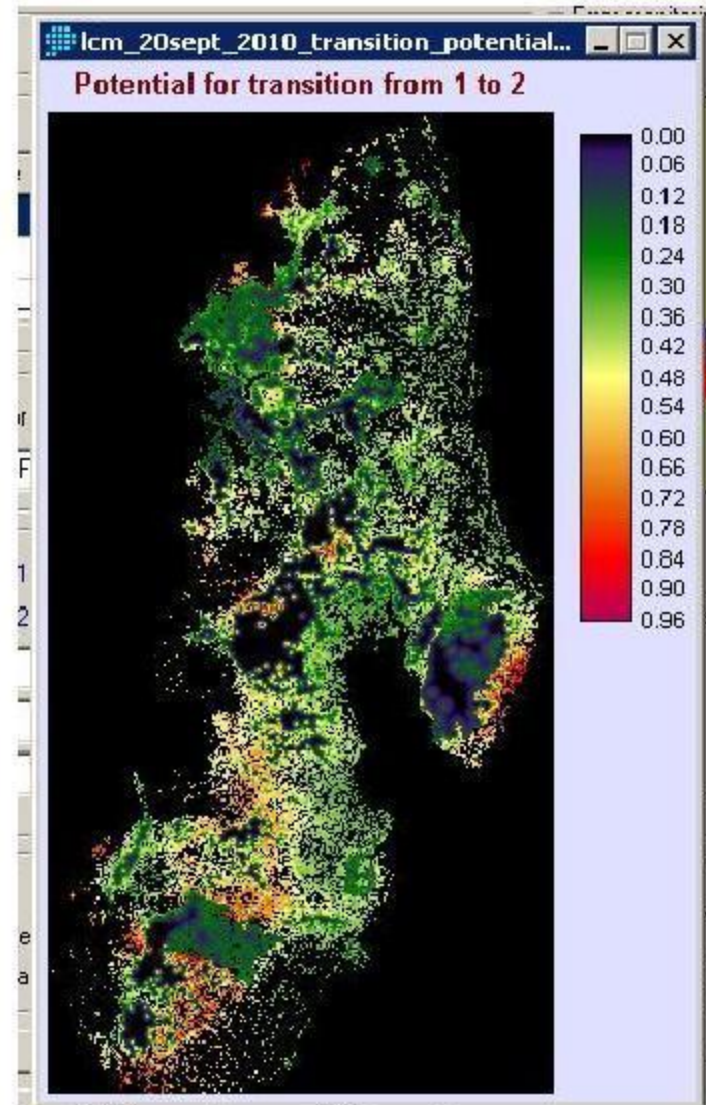
BASELINE : Modeling future scenarios



LOGISTIC REGRESSION



MLP NEURAL NETWORK



PREDICTION WITH STATIC VARIABLES

g Reformat Data Entry Window List Help

LCM

Land Change Modeler : ES

Change Analysis | Transition Potentials | Change Prediction | Implications | Planning

Change Demand Modeling

☒ Markov Chain Prediction Date : 2005 View / edit matrix
☐ External Model Matrix has been edited Restore original matrix

Dynamic Road Development

Change Allocation

Optional Components

☐ Dynamic Road Development
☐ Apply Infrastructure Changes
☐ Zoning - Constraints/Incentives

Prediction Date : 2005

Dynamic variable recalculation stages : 7

☐ Create AVI video Frame Rate (sec) : 0.5
☒ Create soft prediction

Soft prediction

Aggregation type : ☐ Maximum ☒ Logical OR

From :	To :	Include :
Foret	NonForet	Yes

Include all

Include none

☐ Display intermediate stage images

Run Model Output Prefix : landcov_predict_2005

Validation

Transition Probabilities Grid

Given : Probability of changing to :

	Foret	NonForet	Nuages	Eau
Foret	0.9865	0.0135	0.0000	0.0000
NonForet	0.0000	1.0000	0.0000	0.0000
Nuages	0.0000	0.0000	1.0000	0.0000
Eau	0.0000	0.0000	0.0000	1.0000

Save Close

	A	B	C	D
1	YEAR	RATE %	NON FOREST	FOREST
2	5	0.27	0.014	0.987
3	10	0.27	0.027	0.973
4	15	0.27	0.041	0.960
5	20	0.27	0.054	0.946
6	25	0.27	0.068	0.933
7	30	0.27	0.081	0.919
8				
9	non forest = (rate*year)/100			
10	forest = 1- non forest			

PREDICTION WITH DYNAMIC VARIABLE

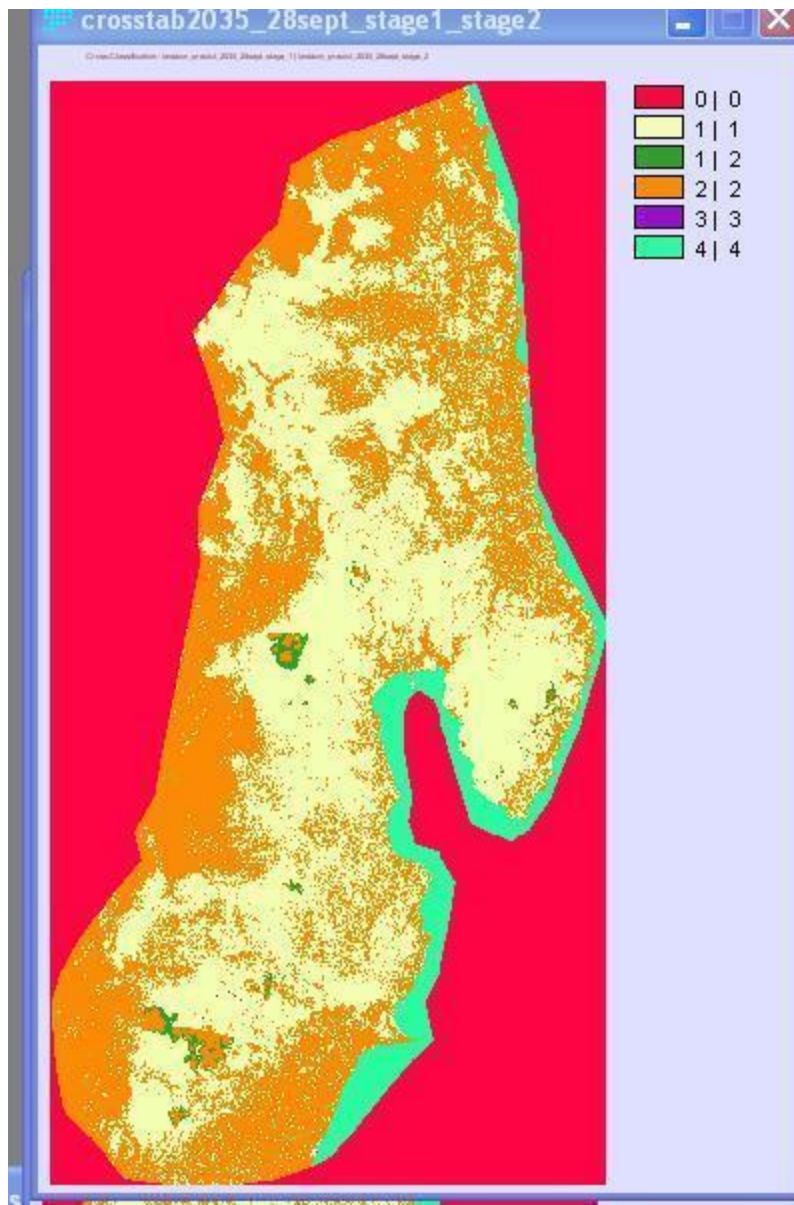
The screenshot displays the 'Land Change Modeler: ES' software interface. The main window has a menu bar with 'Change Analysis', 'Transition Potentials', 'Change Prediction', 'Implications', and 'Planning'. The 'Change Prediction' tab is active, showing the 'Change Demand Modeling' section. In this section, the 'Markov Chain' radio button is selected, and the 'Prediction Date' is set to '2035'. A 'View / edit matrix' button is visible, and a status message indicates 'Matrix has been edited'. Below this, the 'Dynamic Road Development' section is collapsed. The 'Change Allocation' section is also visible, with 'Optional Components' including 'Dynamic Road Development', 'Apply Infrastructure Changes', and 'Zoning - Constraints/Incentives'. The 'Prediction Date' is set to '2035', and 'Dynamic variable recalculation stages' is set to '7'. The 'Create soft prediction' checkbox is checked. The 'Soft prediction' section shows 'Aggregation type' set to 'Logical OR'. A table with 'From:', 'To:', and 'Include:' columns is present, with one row highlighted in blue. The 'Run Model' button is at the bottom, and the 'Output Prefix' is 'landcov_predict_2035'. A 'Validation' section is at the bottom left.

Transition Probabilities Grid

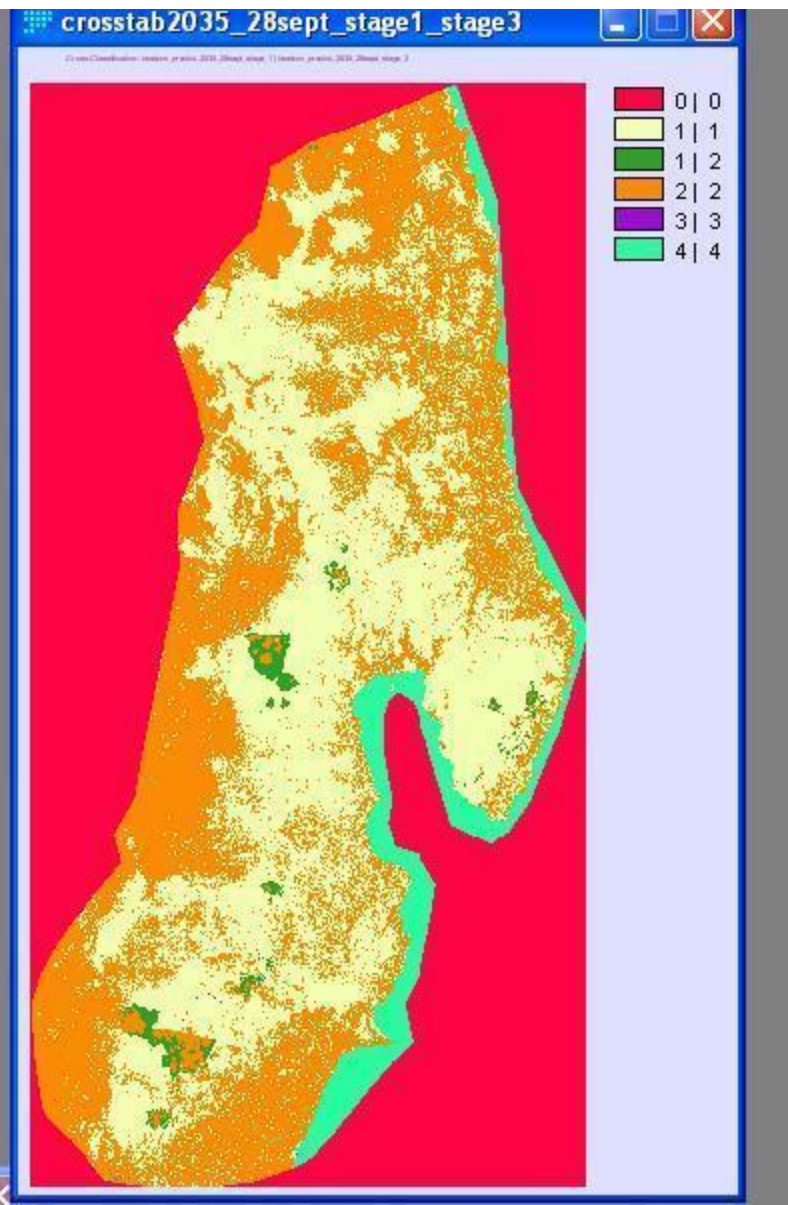
Given : Probability of changing to :

	Foret	NonForet	Nuages	Eau
Foret	0.9050	0.0940	0.0000	0.0000
NonForet	0.0000	1.0000	0.0000	0.0000
Nuages	0.0000	0.0000	1.0000	0.0000
Eau	0.0000	0.0000	0.0000	1.0000

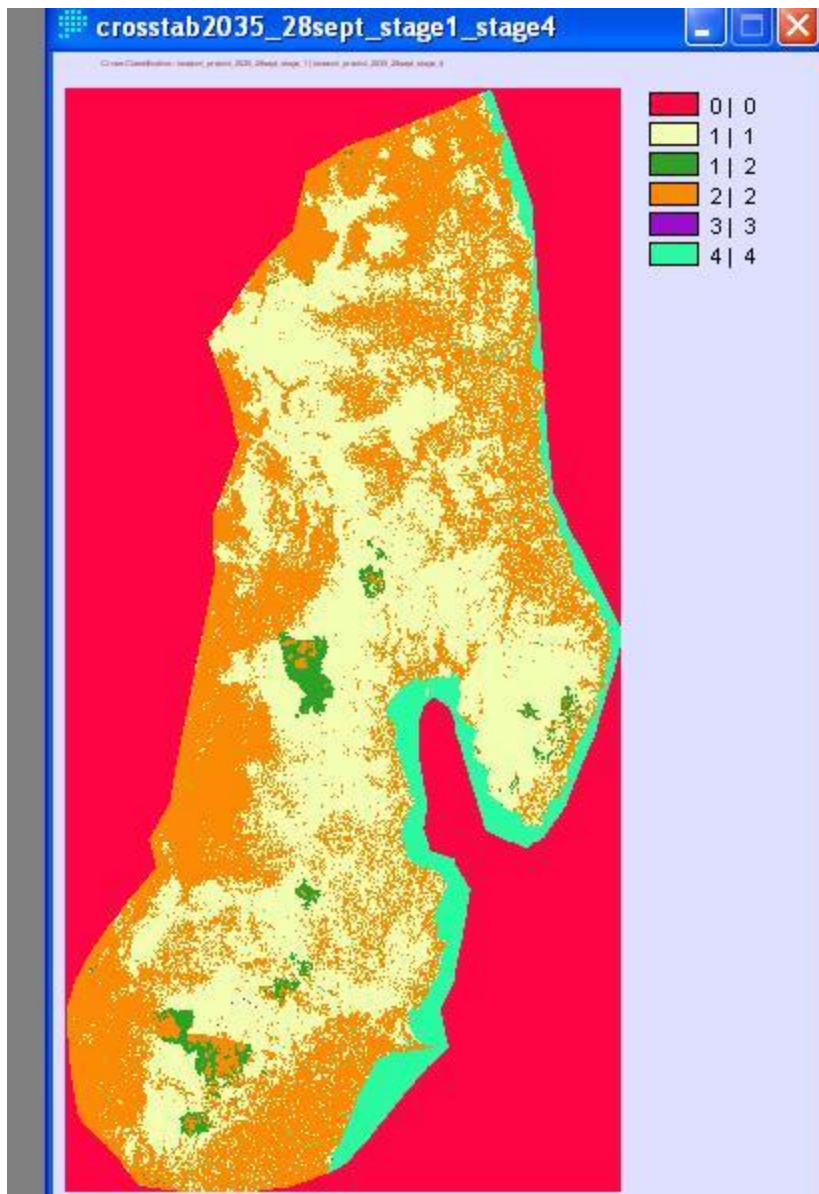
Save Close



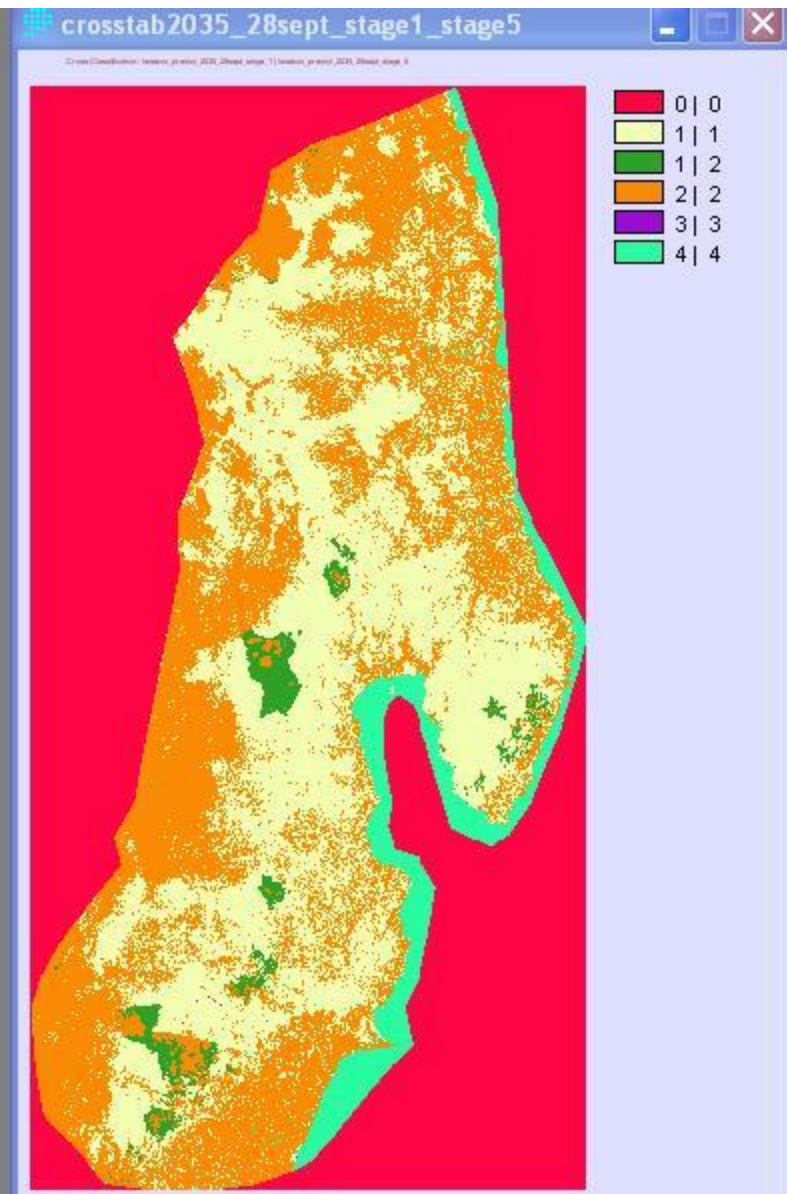
2005_2010



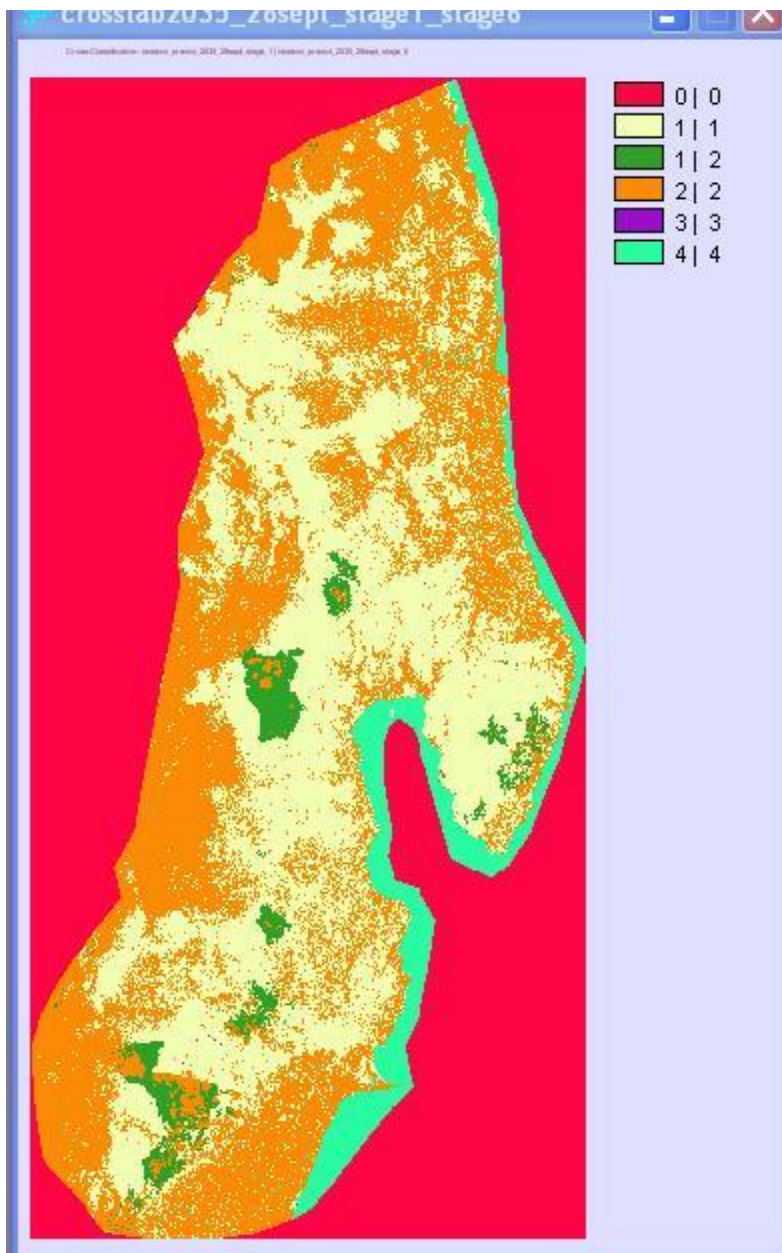
2005_2015



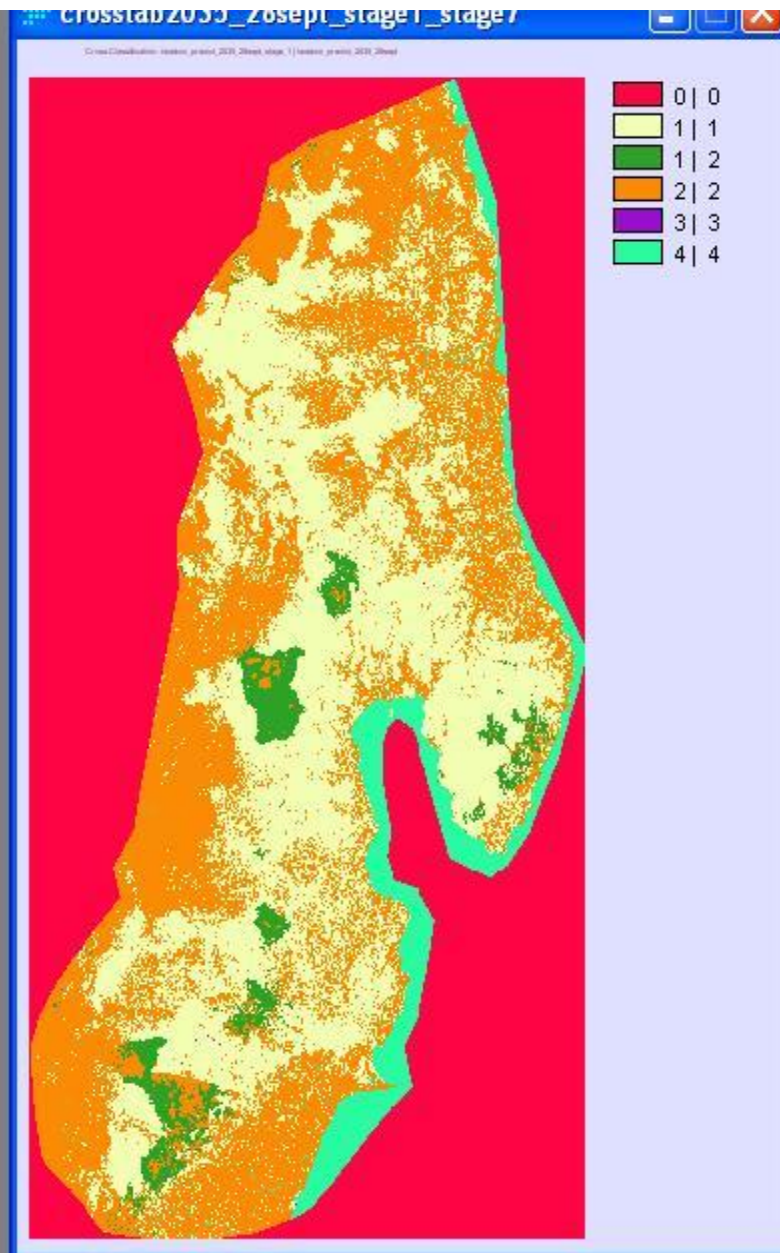
2005_2020



2005_2025

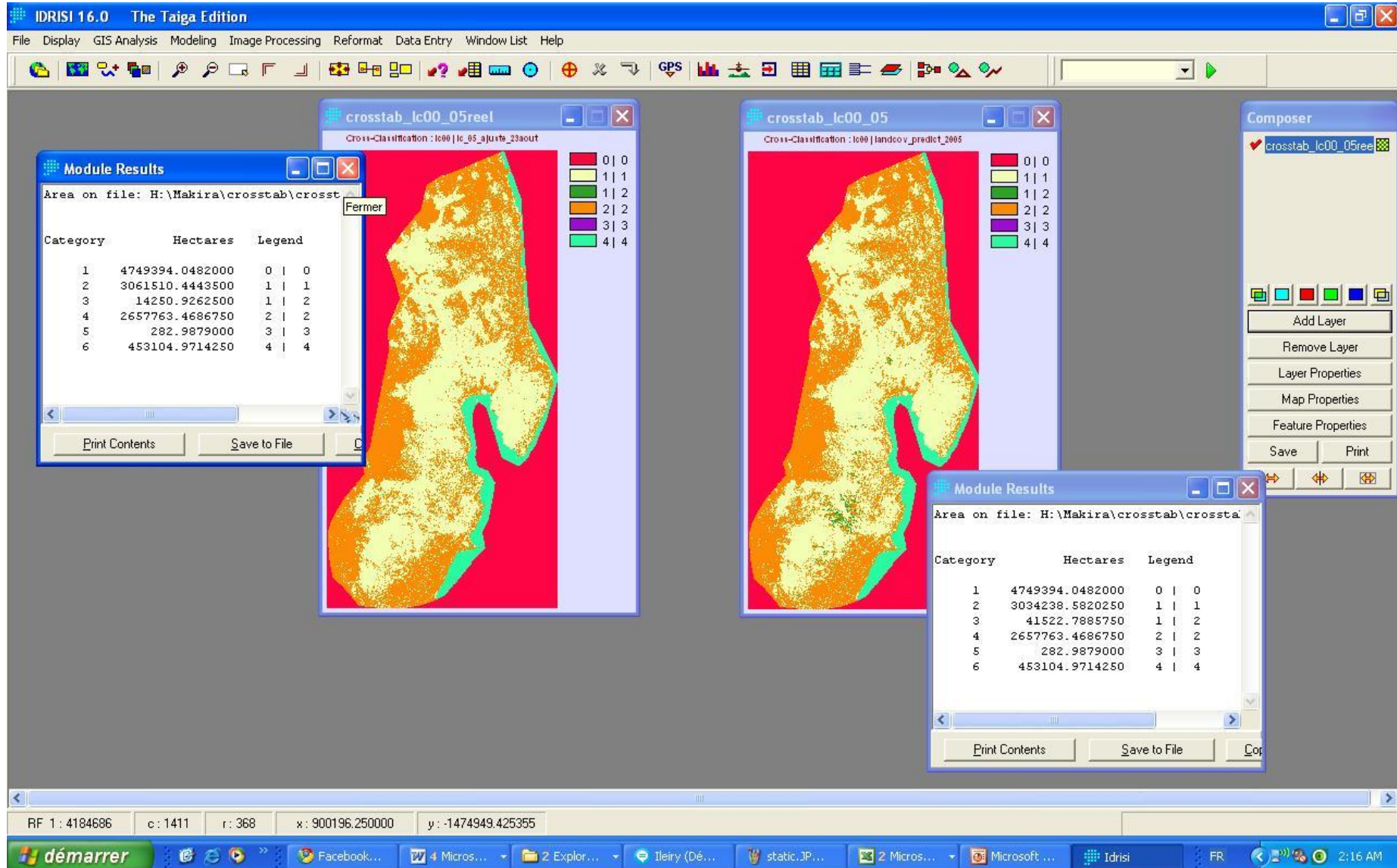


2005_2030



2005_2035

VALIDATION



ISSUES

- Need a high performance computer
- File size requires a big space disk
- Ram = or more than 2Go
- Some bugs

A scenic landscape photograph featuring a vast bay or fjord in the middle ground, surrounded by distant mountains. The foreground is dominated by a dark, dense forest of evergreen trees. The sky is filled with soft, wispy clouds, and the overall lighting suggests a calm time of day like dawn or dusk. The text "THANK YOU" is superimposed in a large, bold, black serif font across the upper portion of the image.

THANK YOU