Centre de
Coopération
Internationale en
Recherche
Agronomique pour
le Développement

Dynamic connection between Eucalypt-Dendro and ArGIS for the development of a forest management tool: where do we stand now ?

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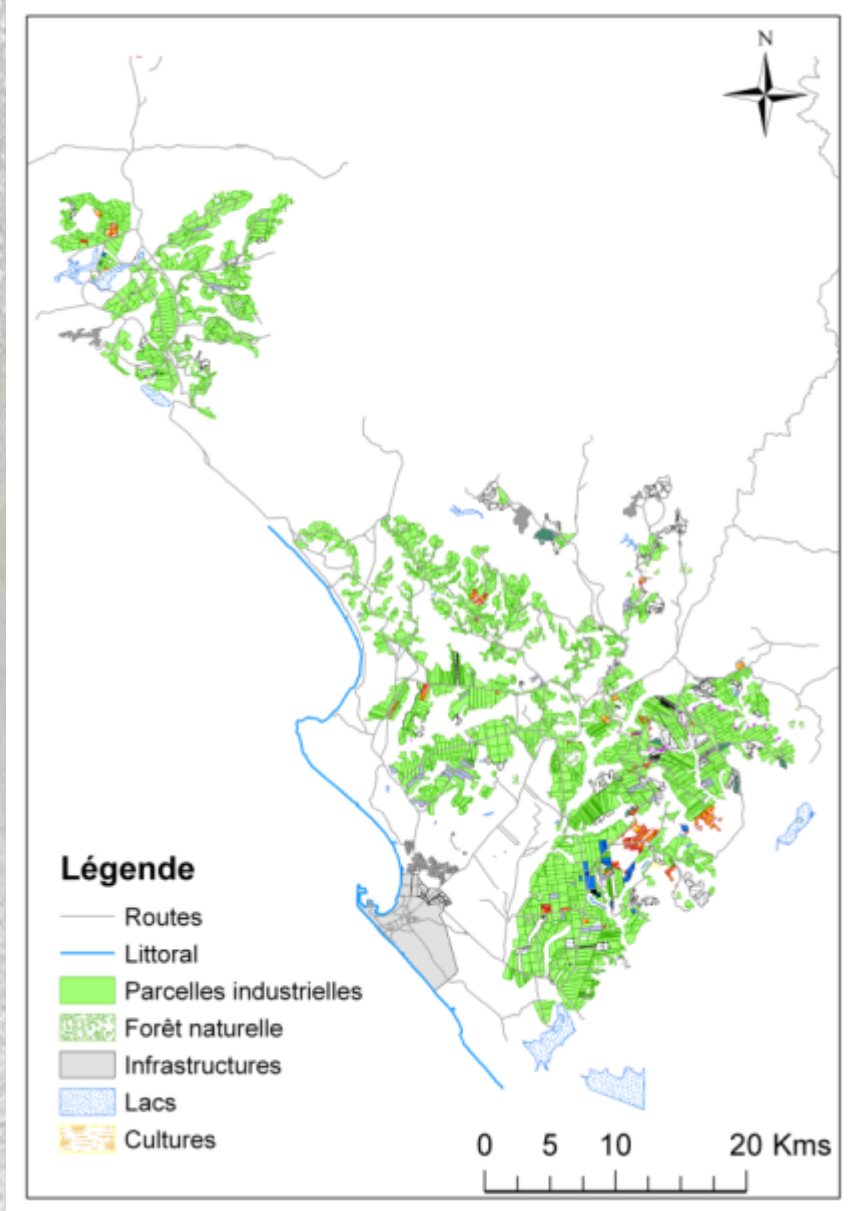
Context

GIS map of the current plantations



42000 ha
around 150 clones
more than 1000 stands

geographical complexity

A dynamic tool to:

- **predict stands evolution**
- **support for current management**
- **plan stands exploitation**

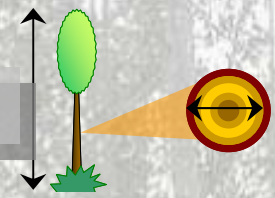
but also …

- **help for research**

Eucalypt-Dendro, a growth and yield model

- A single Tree Distance Indep. Model based on allometrical relationships
- A chain of models in 3 parts

Stand inventory, real or virtual, at an age A



1. Growth Module

Site fertility evaluation (constant in time)

Stand growth in dominant H

Stand growth in *basal area*

Depends
- *clone*
- *stand d*
(compet

At this time, we don't take into account of:
- **mortality**
- **climate**
- **fertilization / fires / *and so on* …**

Individual tree growth in Height

Individual tree growth in *basal area*

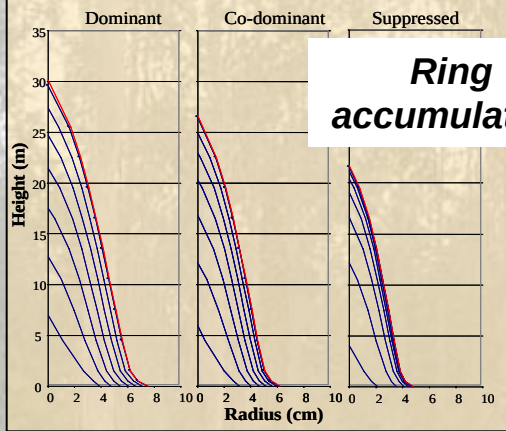
Inventory at A + 1 month

Eucalypt-Dendro, a growth and yield model

Inventory at A + 1 month

2. Wood Properties Module

Stem taper equation
(depends on *clone*)



Ring accumulation

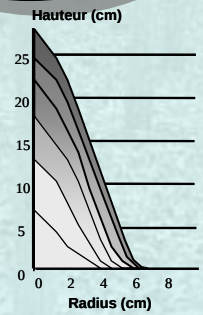
Volume for each tree

Set of biomass equations
for each part of the tree

Biomass
- **by tree compartment**
- **by ring**

3. Biogeo-chemical Module

Model for nutrients evolution in rings

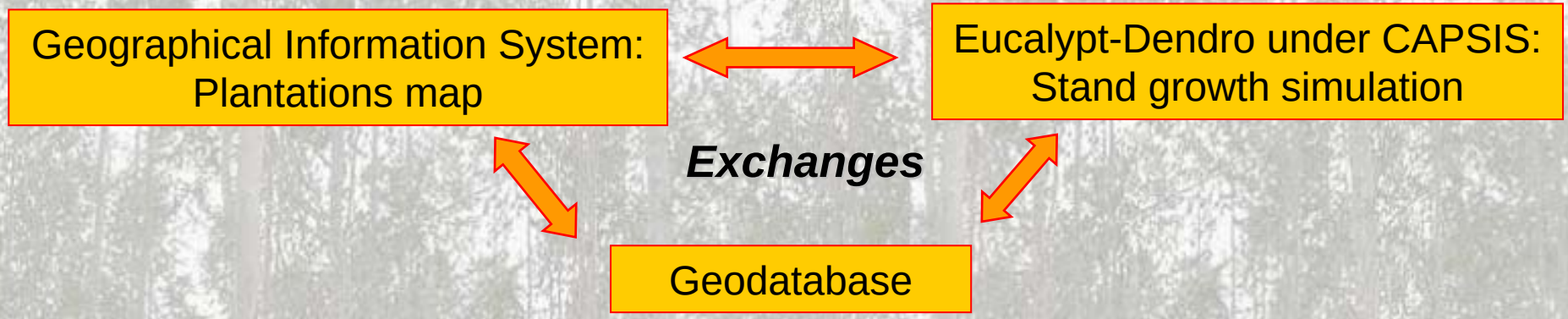


N P K concentrations in each ring

Set of nutrient content equations

Nutrient content N, P, K, Ca, Mg

Remind of the imagined system at the beginning



- **The GIS used as the GUI of the tool, CAPSIS used in script mode**
- **CAPSIS launched from the GIS**
- **Data transfered by file from the GIS to CAPSIS**
- **the GIS catches the simulation results as outputs (how?)**
- **the GIS visualizes the simulation results (how?)**

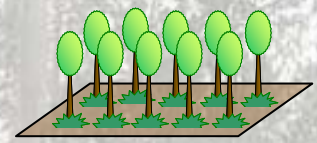
We chose ArcGIS (ESRI) Version 9

Remind of the geodatabase created

Lots of forest inventory data available since 1989

Database in 3 parts

- Data about stands characteristics



Name ? Clone ? Density ? Silvicultural interventions ? …

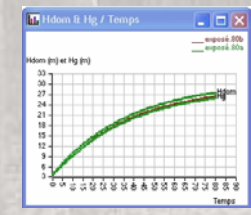
Kernel-DB

- Observed or mesured data on trees, environment…

Real-DB

- Simulated data by the growth model

Simulated-DB

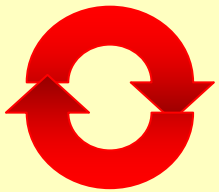


- We chose ACCESS
- Make the link between the database and the GIS data: a geodatabase = only one data source

A dynamic connection between CAPSIS and ArcGIS

Eucalypt-Dendro under CAPSIS

Simulation's running :
- one project created by stand
- growth is modelised until the choosen target date



- Selection of stands
- Simulation parameters

A VB Script launch CAPSIS + create a file

Data extraction from the RDB

CAPSIS drives DB by JDBC, SQL queries

Input data = real of virtual inventory

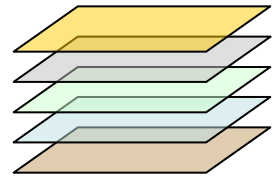
CAPSIS drives DB by JDBC, SQL queries

backup of the simulated data as output in SDB

G.I.S.

Simulated results preview (by VB script)

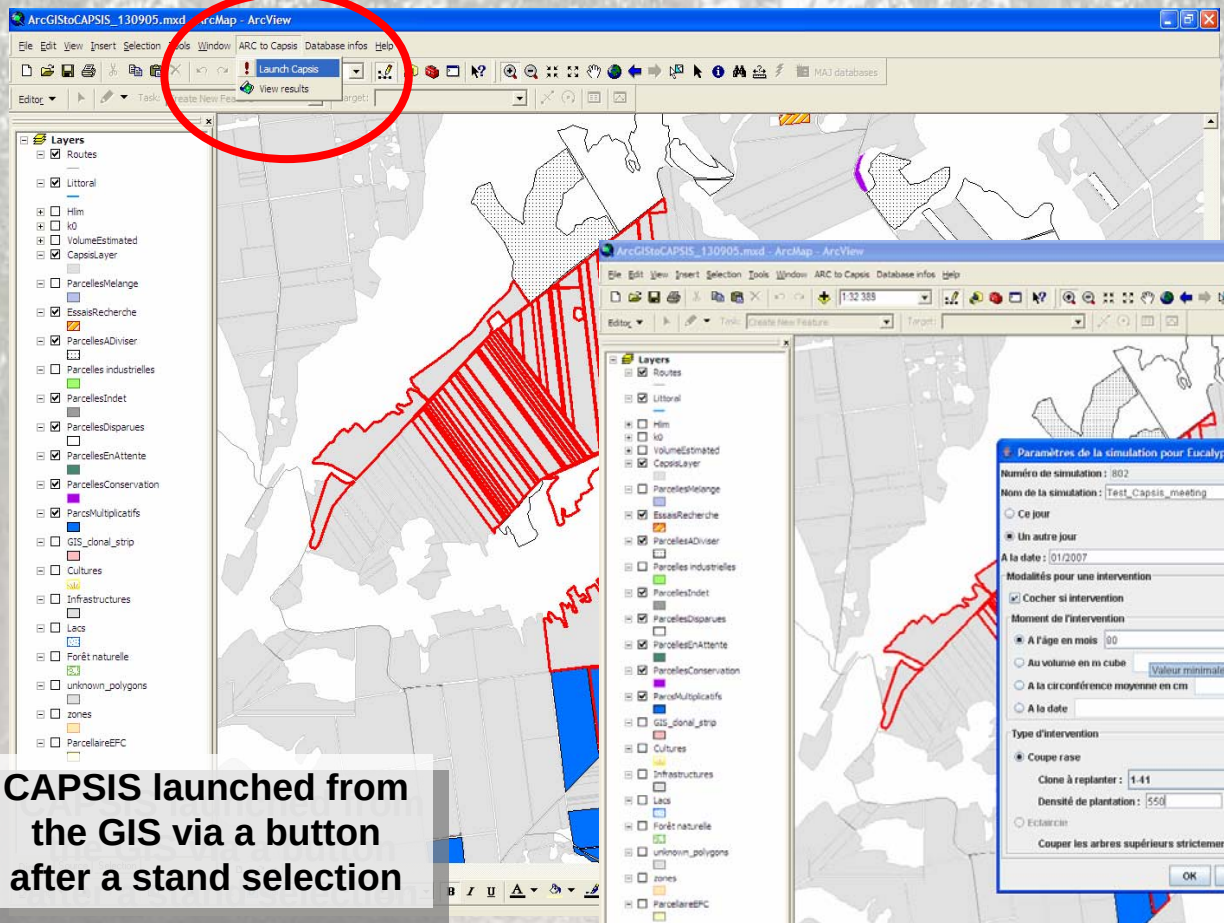
GEO DATABASE



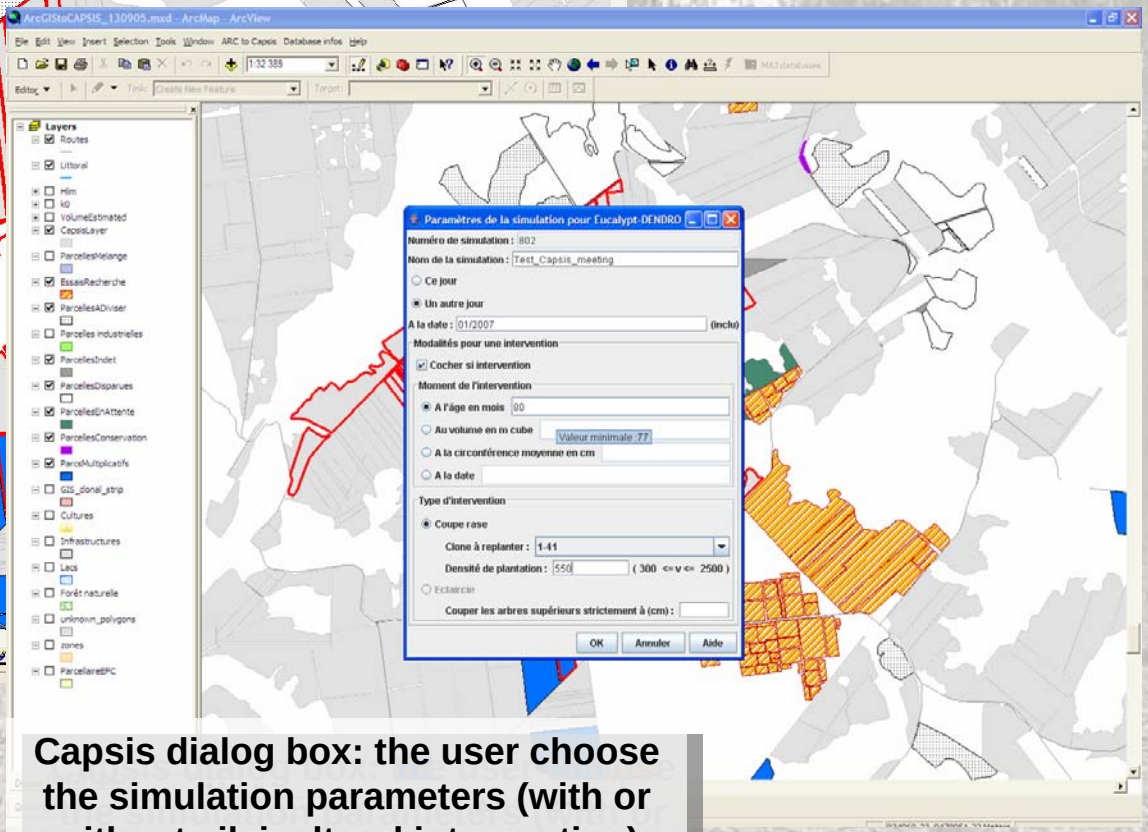
Kernel

Real | Simulated

What the user see…

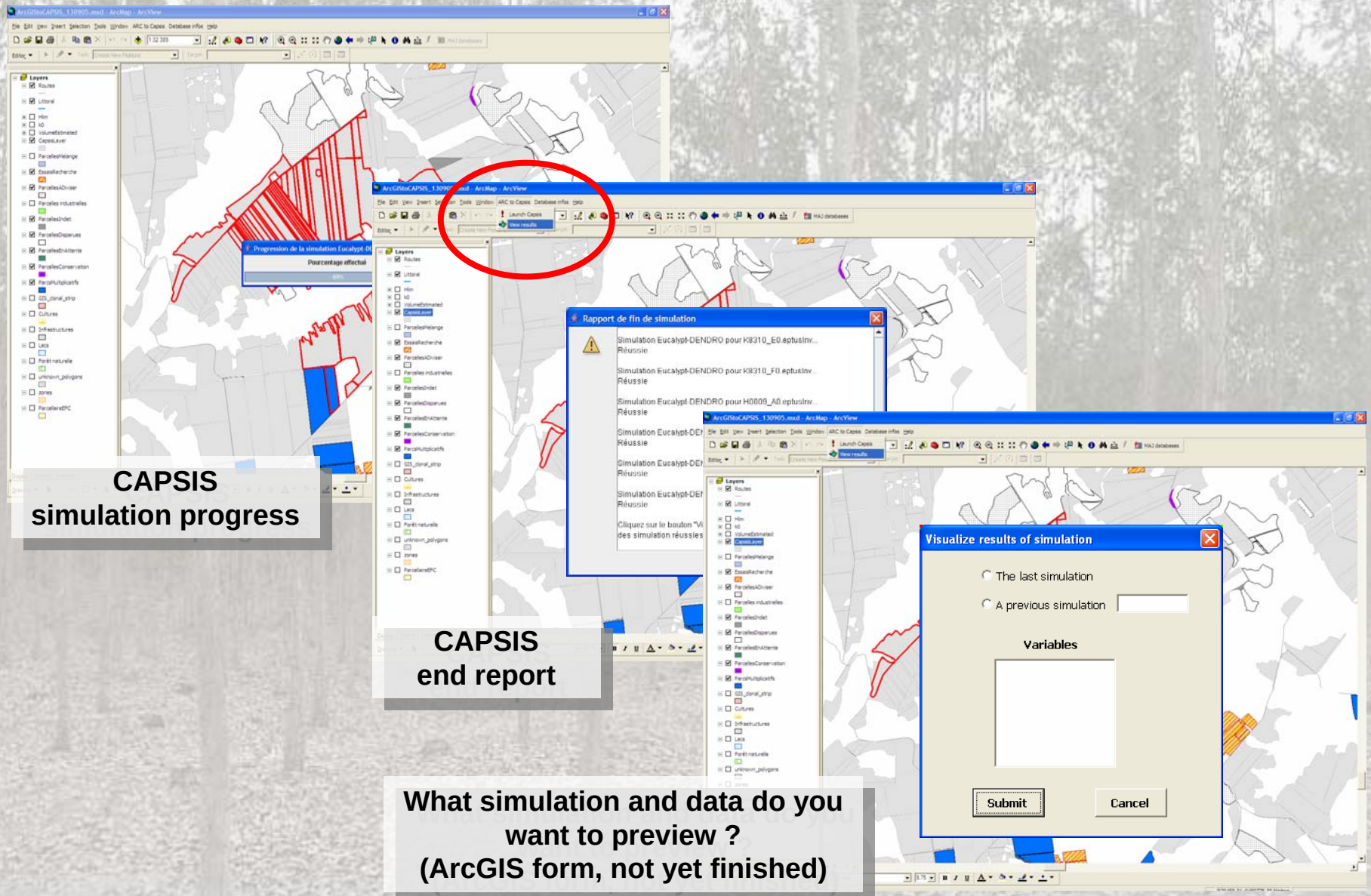


CAPSIS launched from the GIS via a button after a stand selection



Capsis dialog box: the user choose the simulation parameters (with or without silvicultural intervention)

What the user see…

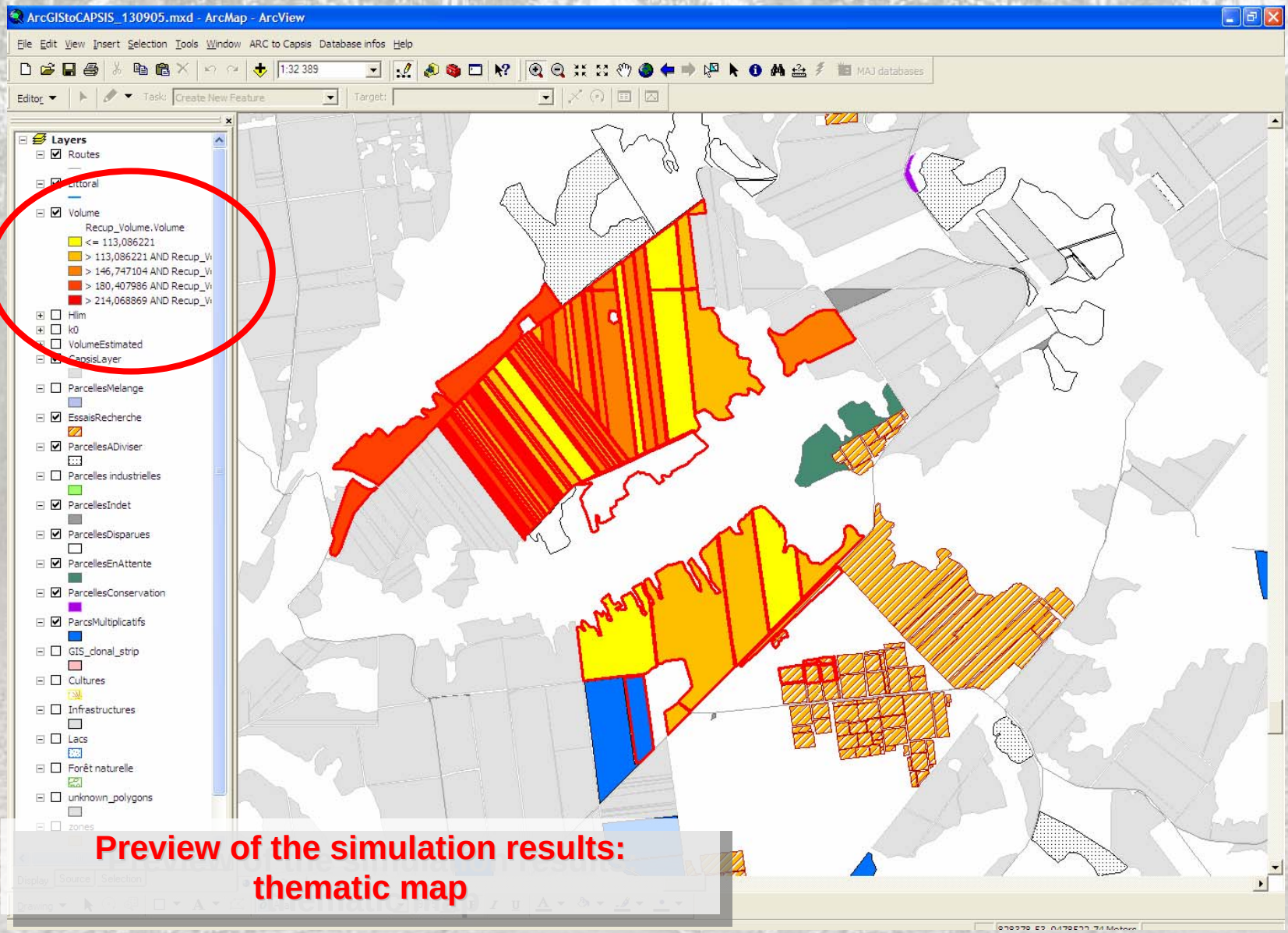


CAPSIS simulation progress

CAPSIS end report

What simulation and data do you want to preview ? (ArcGIS form, not yet finished)

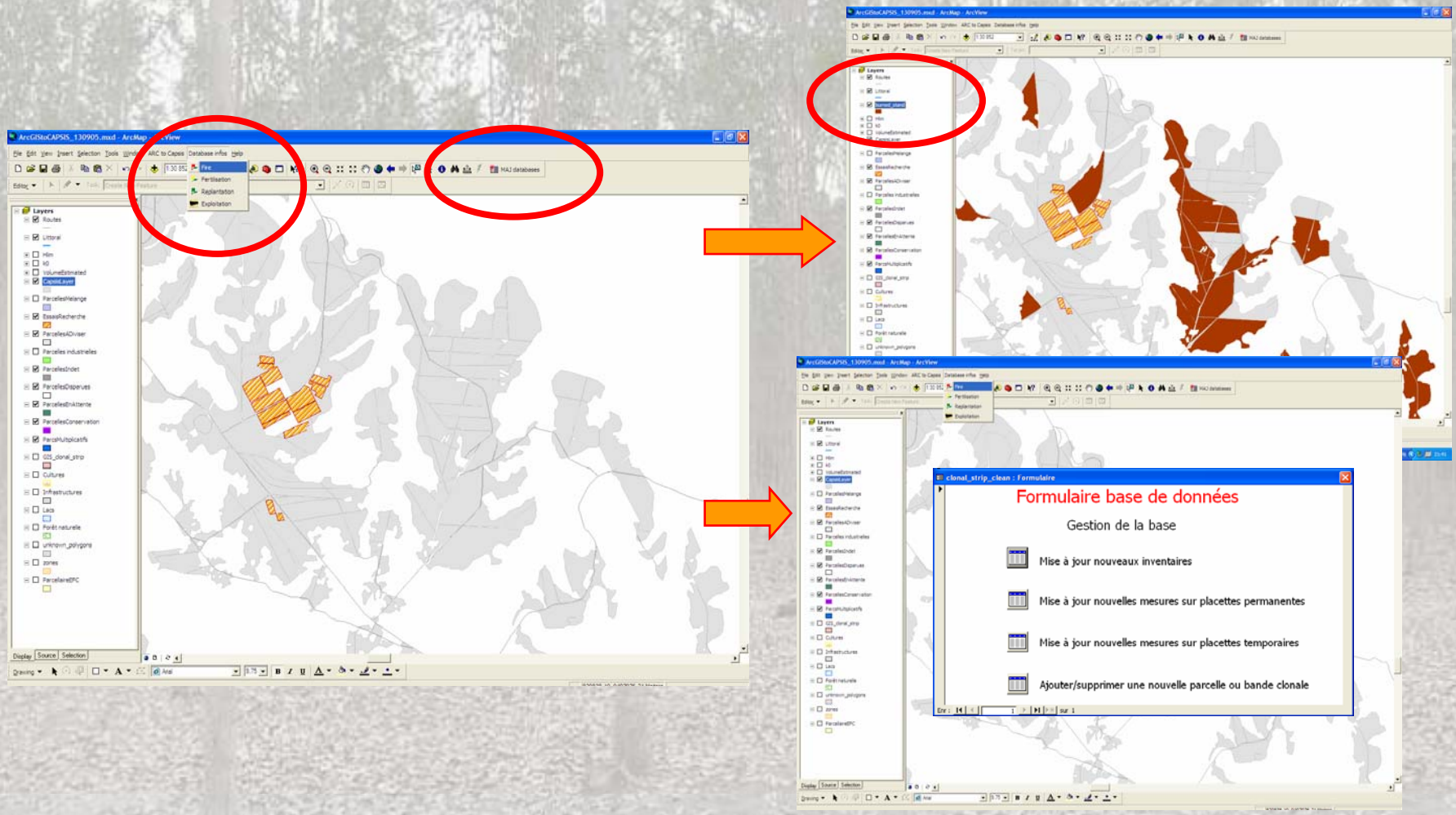
What the user see…



Preview of the simulation results: thematic map

Other functionalities by direct link between ArcGIS and its GDB

- Formatted queries to visualise current information on stands
- Database management: open Access forms under the GIS interface



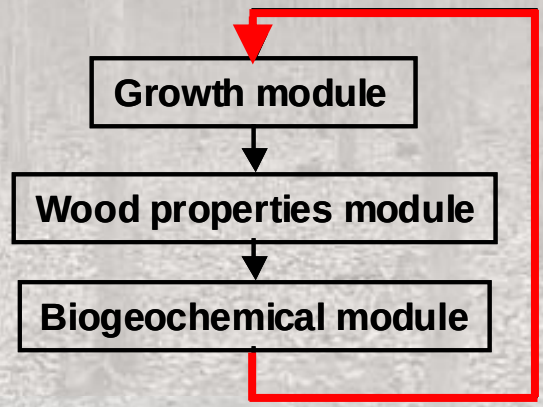
Assessment and next steps

- No important technical problem, but need lot of work under Capsis
- Positive interactions with forest managers

In progress:

- end of the silvicultural intervention procedure during simulation: development under Capsis will be finished soon
- some work under ArcGIS and the GeoDataBase
- work on the Growth model

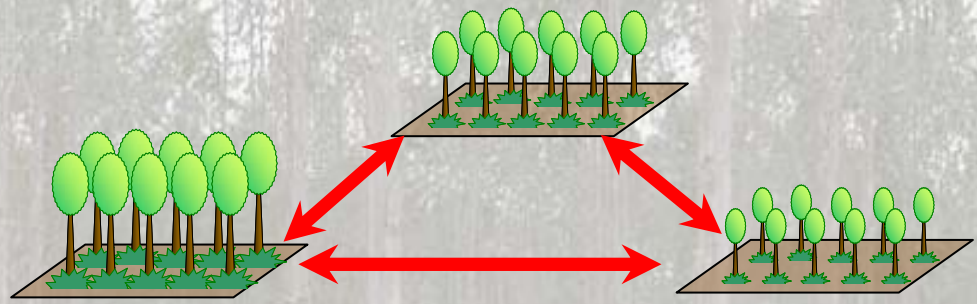
  - Growth model validation + calibration on other clones
  - Feedback of the bigeochemical cycling on Growth Module: Soil fertility evolution (litter fall)



GIS future applications

Exchanges and interactions between stands

Flows management



spatialized environmental data, MNT

Additionnal modules using this type of data as inputs


Thank you for your attention…