Modeling tree growth, harvesting and regeneration from national forest inventory data:
A case study of Southern Belgium forest resources evolution.

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Context

The implementation of a sustainable forest policy depends on a good understanding of the impact of decisions taken on the evolution of forest resources. It is therefore essential to have accurate and continuously updated information on our forests and the main processes that govern their evolution (growth, harvesting, regeneration, etc.).

In order to predict the evolution of forest resources of Wallonia (Southern Region of Belgium), we are working on the development of **forest models adapted to a wide diversity of forest compositions and structures**.
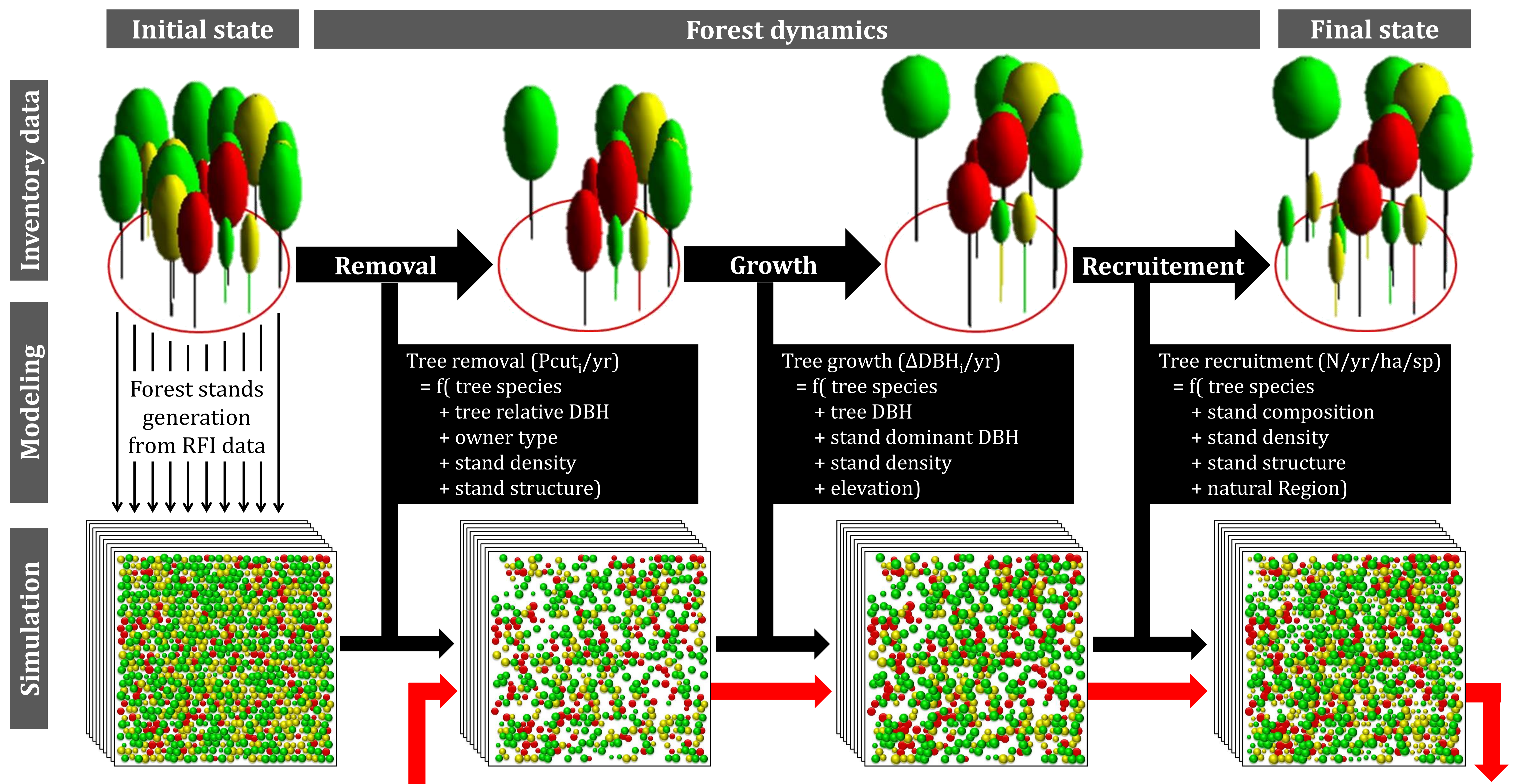
Data and modeling approach

Data were collected from 9590 permanent plots of the regional forest inventory of Wallonia (IPRFW), for a total of about 100 000 trees monitored between 1994 and 2015.

We developed **harmonized tree-level distance-independent models** of diameter growth, removal probability and recruitment density **calibrated for 22 species groups** (15 hardwoods and 7 softwoods). They were integrated into **SIMREG**, a forest simulation software that can **use inventory data to generate life-size forest** resources representation at a regional scale.

SIMREG was applied on the IPRFW data to simulate the evolution of the Wallonia's forest resources: 479 500 ha of productive forest and about 500 millions trees.

How does SIMREG works ?

Initial state	Forest dynamics			Final state

Inventory data

Removal → Growth → Recruitement

Modeling

Forest stands generation from RFI data

Tree removal (Pcut$_i$/yr)
= f(tree species
+ tree relative DBH
+ owner type
+ stand density
+ stand structure)

Tree growth (ΔDBH$_i$/yr)
= f(tree species
+ tree DBH
+ stand dominant DBH
+ stand density
+ elevation)

Tree recruitment (N/yr/ha/sp)
= f(tree species
+ stand composition
+ stand density
+ stand structure
+ natural Region)

Simulation

Results

If the current trends are maintained, the total commercial wood volume will increase by about 7% (or 9.5 million m^3) over the next 20 years. There will be a significant decrease in the main production species (Norway-spruce, -10 millions m^3) which is currently being replaced by Douglas-fir (+7.5 millions m^3) and various hardwoods.

Perspectives

SIMREG will be used to test various scenarios of management, natural disturbances and environmental changes in order to provide guidelines for policy makers and forest administration.

Prediction of the forest resources evolution

Total commercial volume (x 10E6 m^3) vs Year

Legend: Oak, Beech, Birch, Ash, Poplar, Maple, Hornbeam, Red oak, Alder, Cherry, Chestnut, Rowan, Black cherry, Locust, misc. Hw, Spruce, Douglas-fir, Scots pine, Larches, Black pine, Sitka spruce, misc. Sw

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