

Cemagref: Geographical distribution



Ile-de-France, Haute et
Basse-Normandie, Picardie,
Champagne-Ardenne,
Lorraine, Nord-Pas-de-Calais

● **Antony**

Bretagne,
Pays de Loire

● **Rennes**

Aquitaine,
Poitou-Charentes,
Midi-Pyrénées

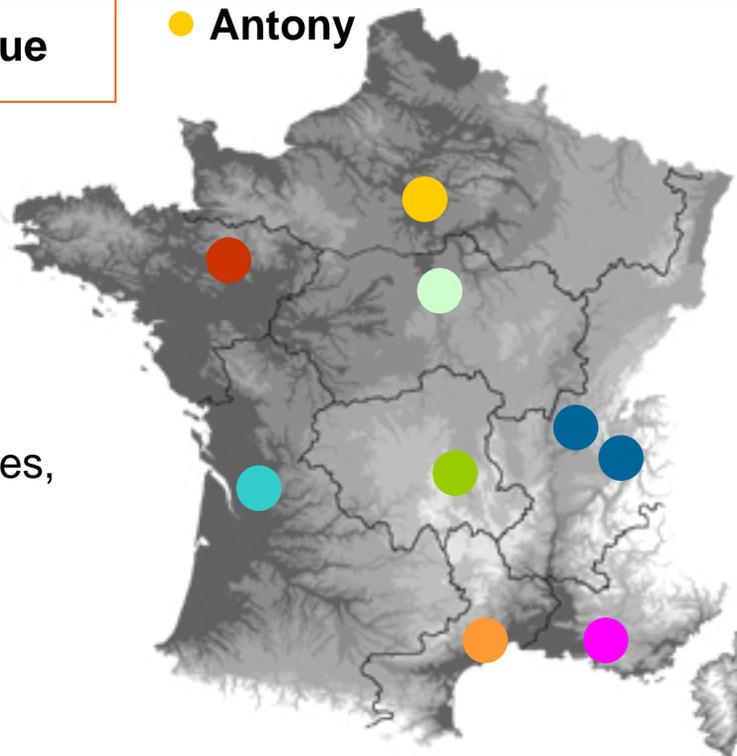
● **Bordeaux**

Auvergne, Limousin

● **Clermont-Ferrand**

Languedoc-Roussillon

● **Montpellier**



Centre,
Bourgogne

● **Nogent-sur-Vernisson**

Rhône-Alpes,
Franche-Comté,
Alsace

● **Lyon**

● **Grenoble**

Provence-Alpes-
Côte d'Azur, Corse

● **Aix-en-Provence**

Cemagref

Public Institution that exist since 1981

9 main centres

Staff : **1400**

450 Researchers, 200 PhD students
et 40 post-docs

Budget : **103 M€** where **26 M€** own
resources



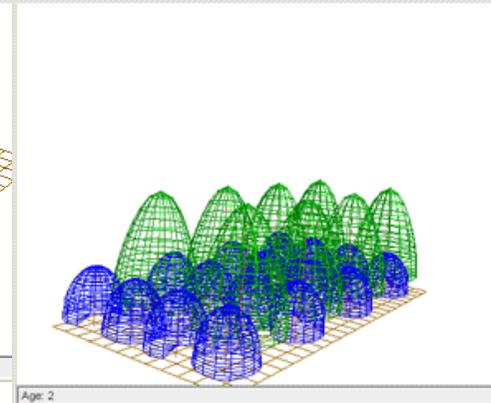
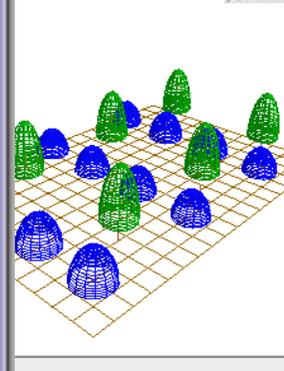
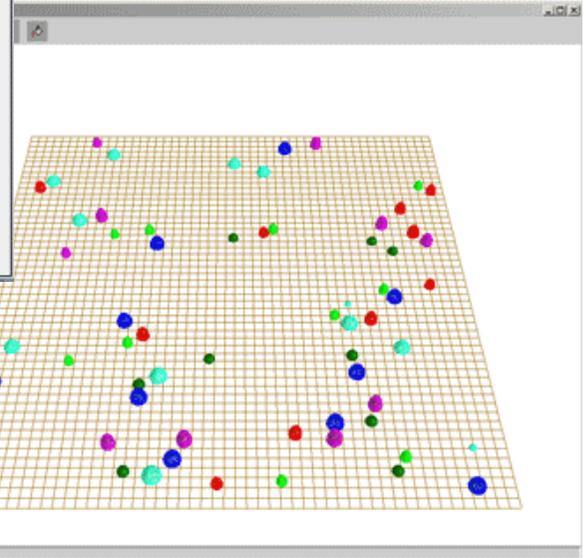
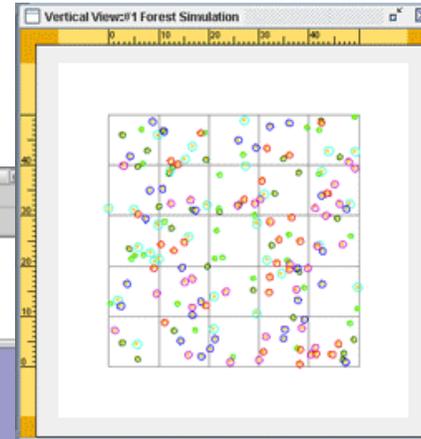
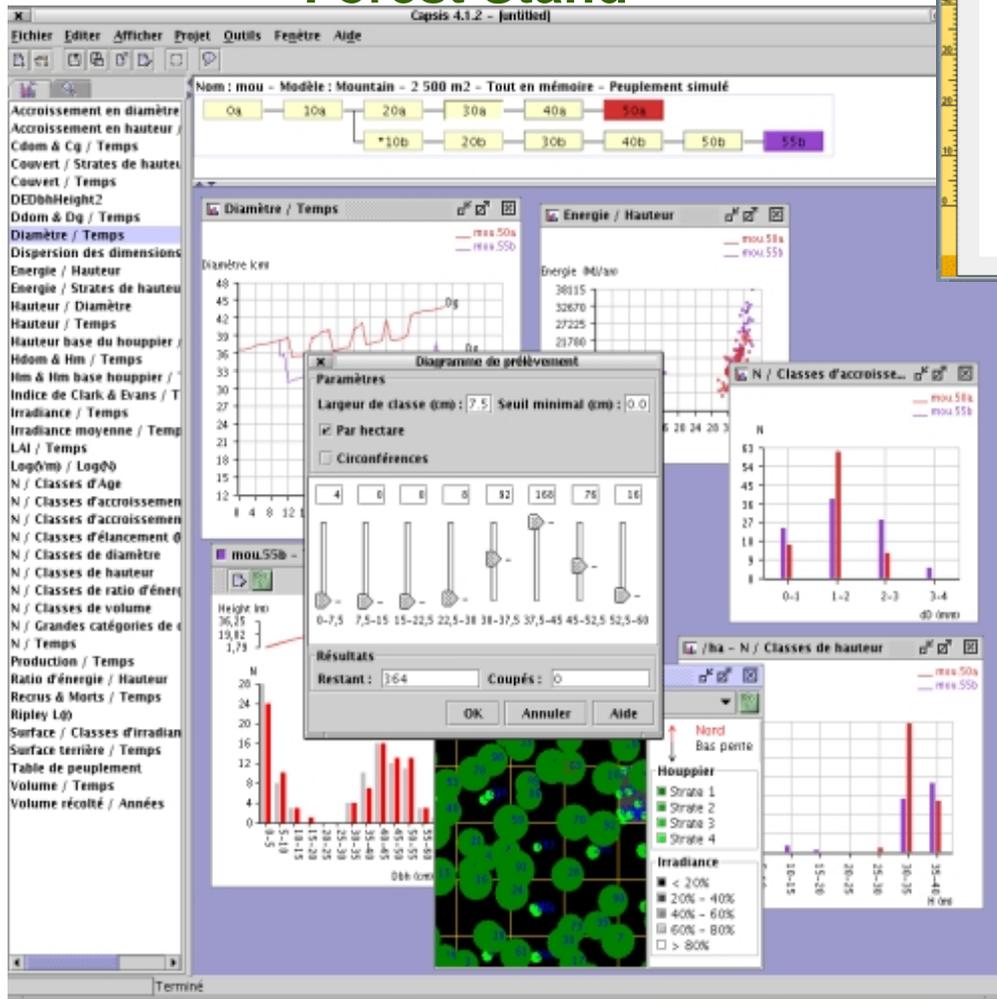
FOREST RELATED KEY TOPICS

- Biodiversity and forest habitat quality
- Dead wood as a surrogate for biodiversity quality
- Key indicator species
- Impacts in relation to climate change and adaptive forest management in mountain forests
- Multifunctional use of the forests (protection function)
- Adaptive management/ sustainable forests
- Forest energy



Modelling – Forest & Agriculture

- Forest models
 - Forest Stand



B. Courbaud

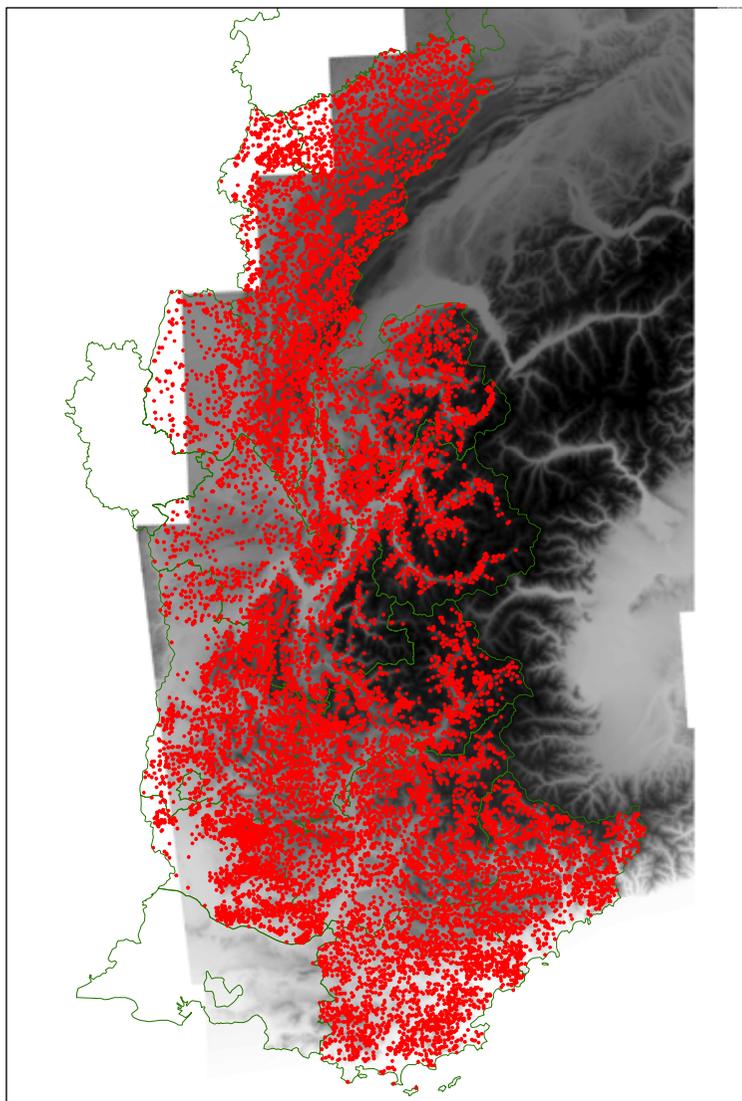
G. Vincent et al.



Sciences, eaux & territoires

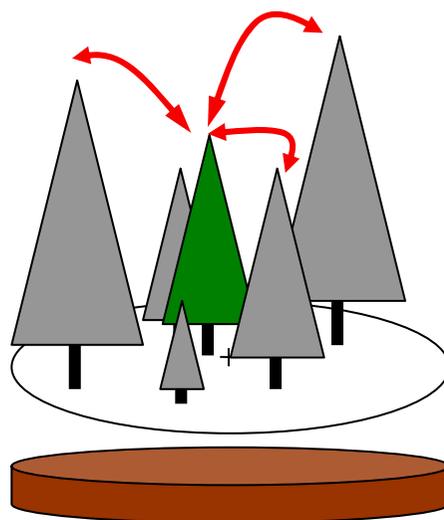
Réponse Croissance / Survie ~ Climat + Interactions biotiques

Données IFN: 18 000 placettes

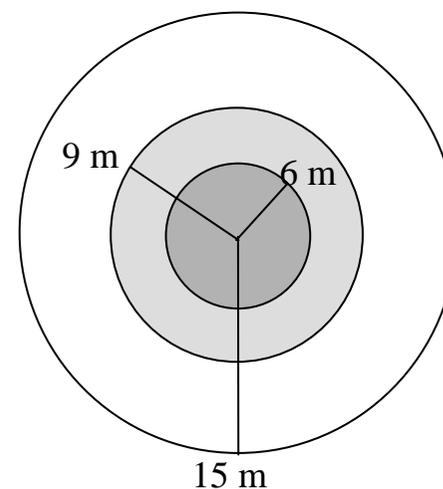


$$\text{Volume increment} = f(\text{taille}) * f(\text{compétition}) * f(\text{climat})$$

Croissance / Survie



Sol Géologie Topographie



et date

Climat

Projet BACCARA et INTERREG
France-Suisse



Mise en place des expérimentation Vercors (Automne 2008)



Forest habitat quality General method

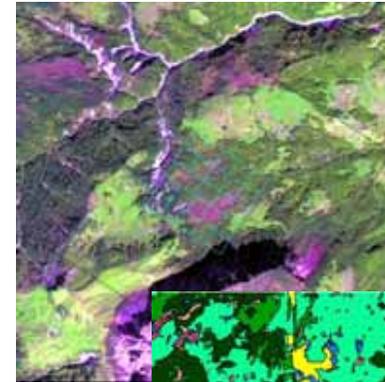
Geo-referenced species data, plot level data
dead wood data...

Indicators



Remote sensing, photo interpretation
Digital Elevation Model, vegetation
maps, ecological data,
...

Classification

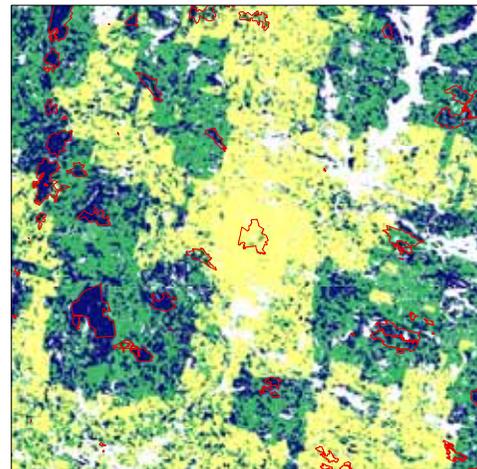


Geographic Information System

Overlapping, combining
and weighting information

Quality index

Modelling



Map of forest habitats quality

How to define forest quality ?

A Spatio-temporal approach



Sample of Cassini
Map (1760-1789)

- Forest Age

- Forest structure, complexity and heterogeneity

- Presence of key indicator species



Villard-de-Lans
public forest (Vercors)



Pygmy Owl (*Glaucidium passerinum*)

How to define forest quality ?



Sample of Cassini
Map (1760-1789)

- Forest Age

- Forest structure, complexity and heterogeneity

- Presence of indicator species



Pygmy Owl (*Glaucidium passerinum*)



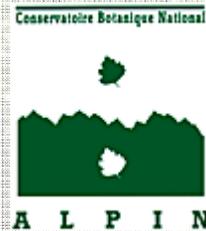
Villard-de-Lans
public forest
(Vercors)



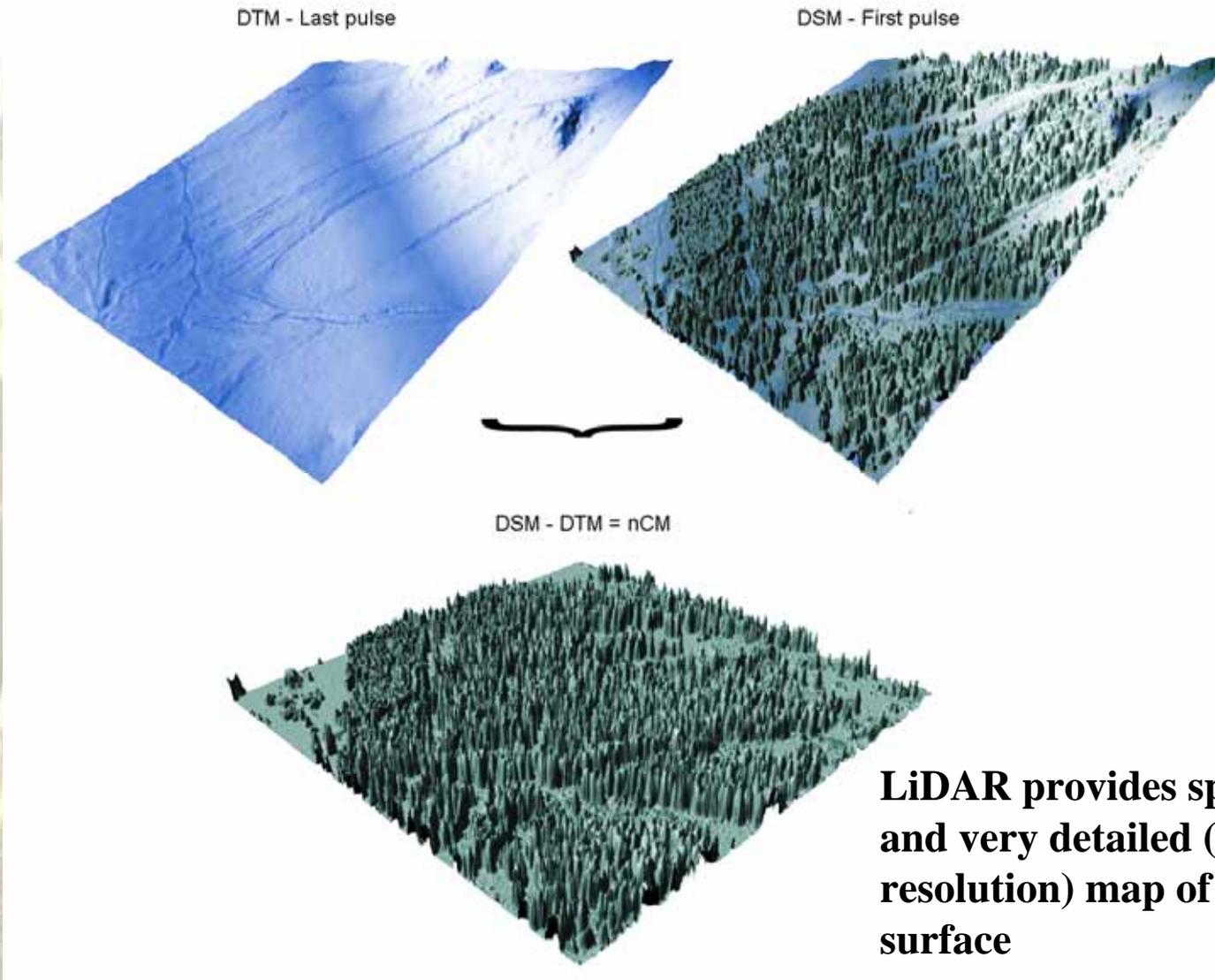
French Partners



1. Exchange and work with stakeholders and actors within the territory
2. Data gathering : plot level – species data – ecological data

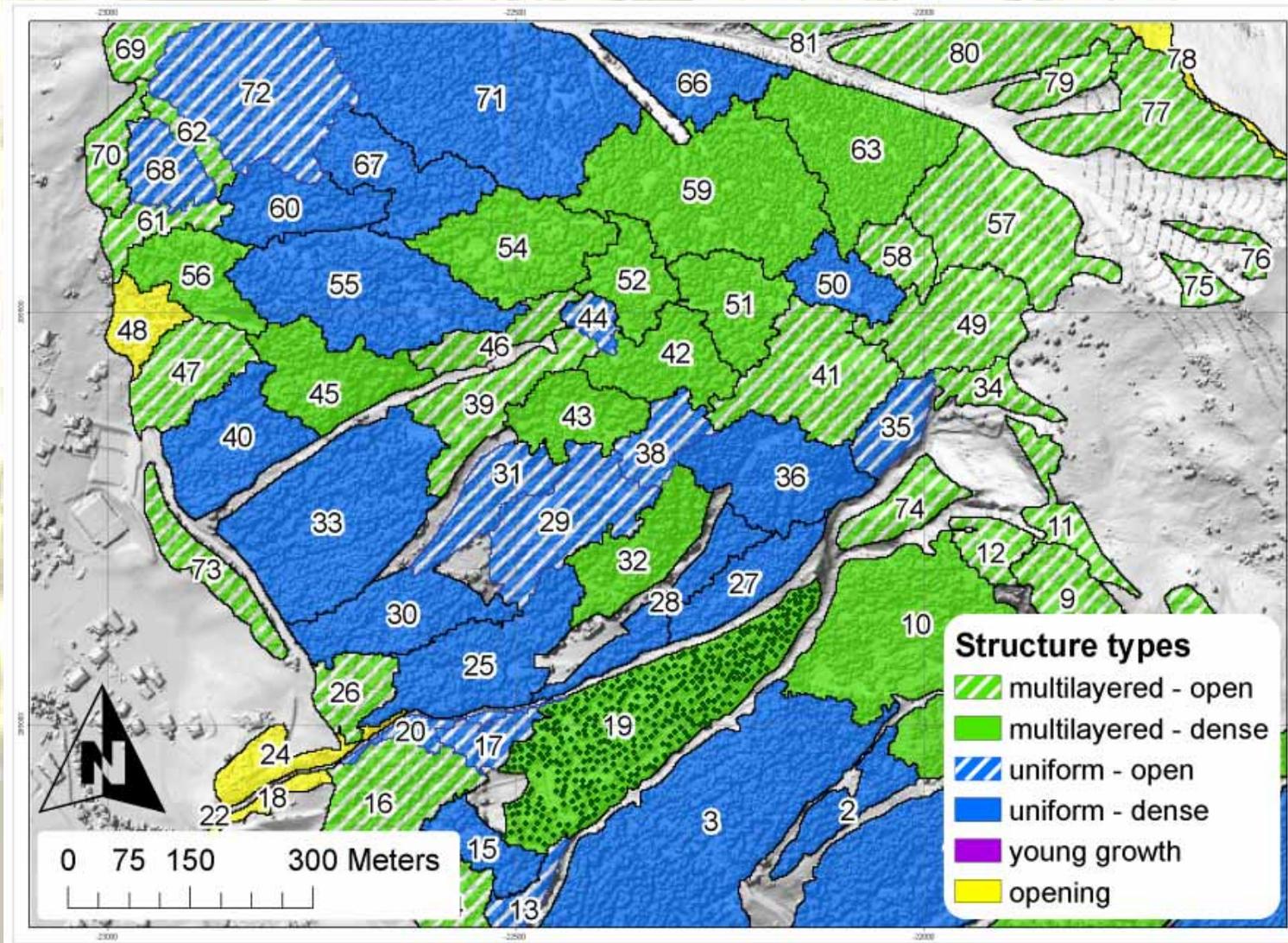


Laser scanning (LiDAR – Light Detection and Ranging) Forest Research Applications (Natural Hazard / Protection)

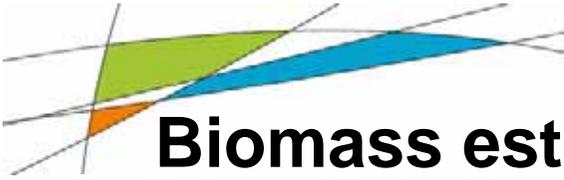


LiDAR provides spatially explicit and very detailed (< 1m resolution) map of the earth surface

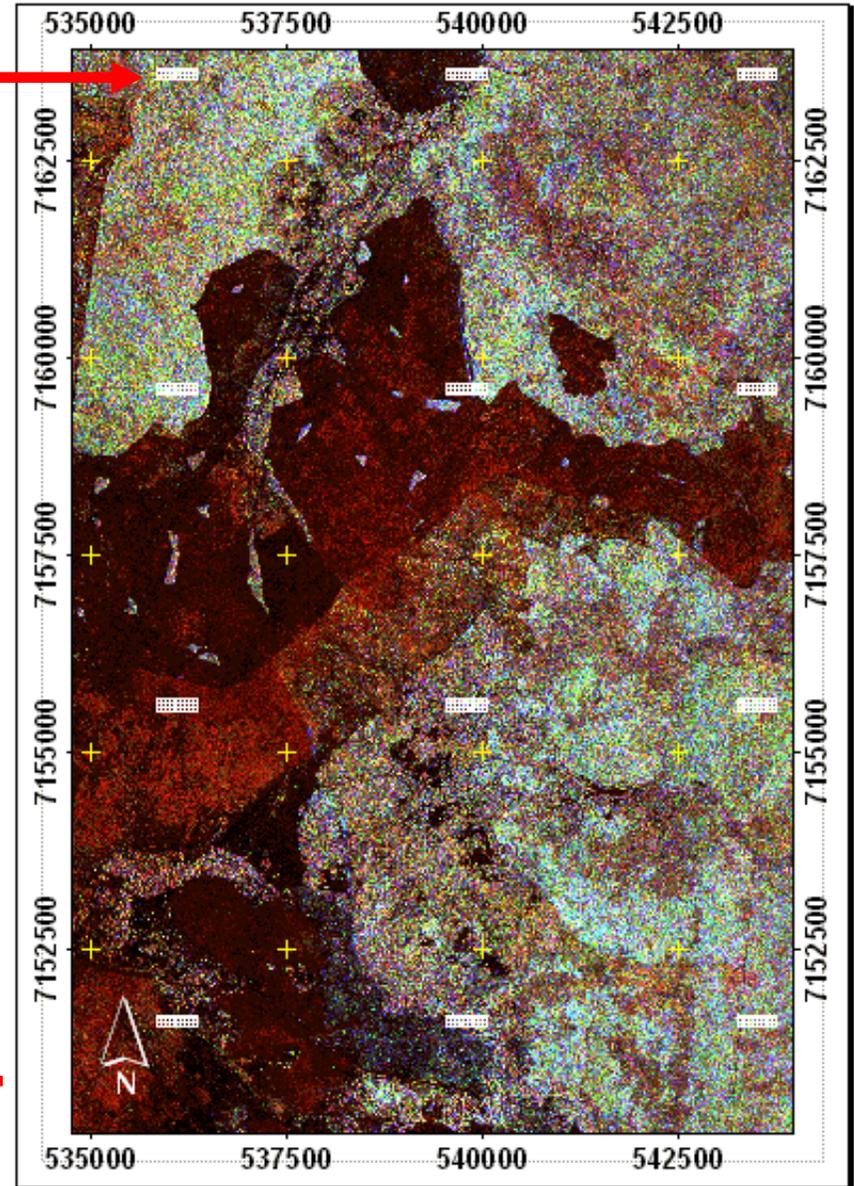
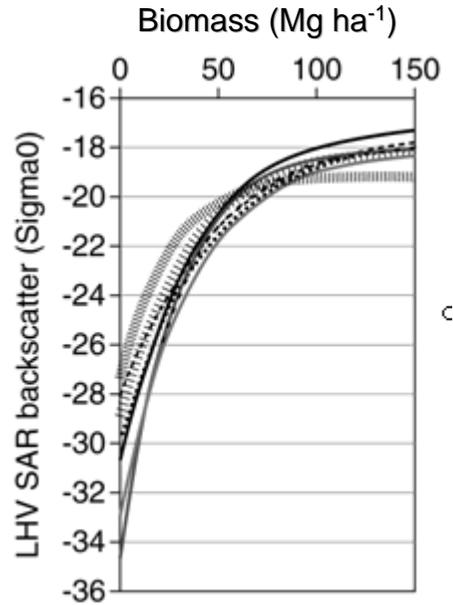
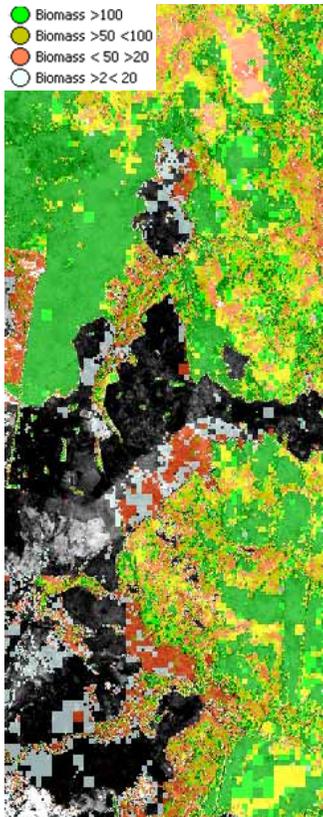
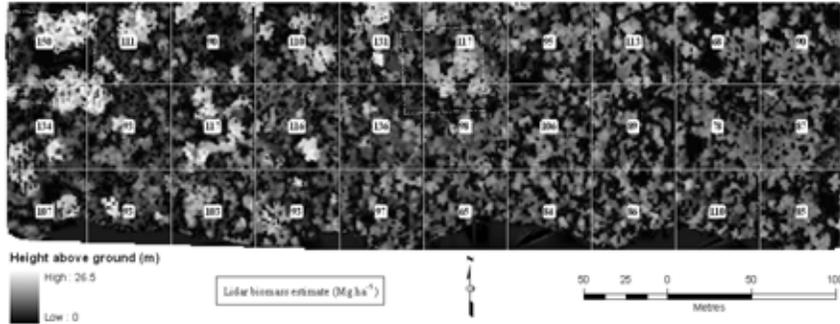
LiDAR based forest stand mapping

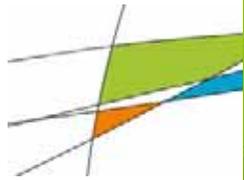


- nCM (normalised canopy model) - automatic mapping of both single-trees and forest stands.
- For forest stand mapping : use of multi-resolution segmentation.
- Landscape metrics at the stand level to characterise the structure of the stand



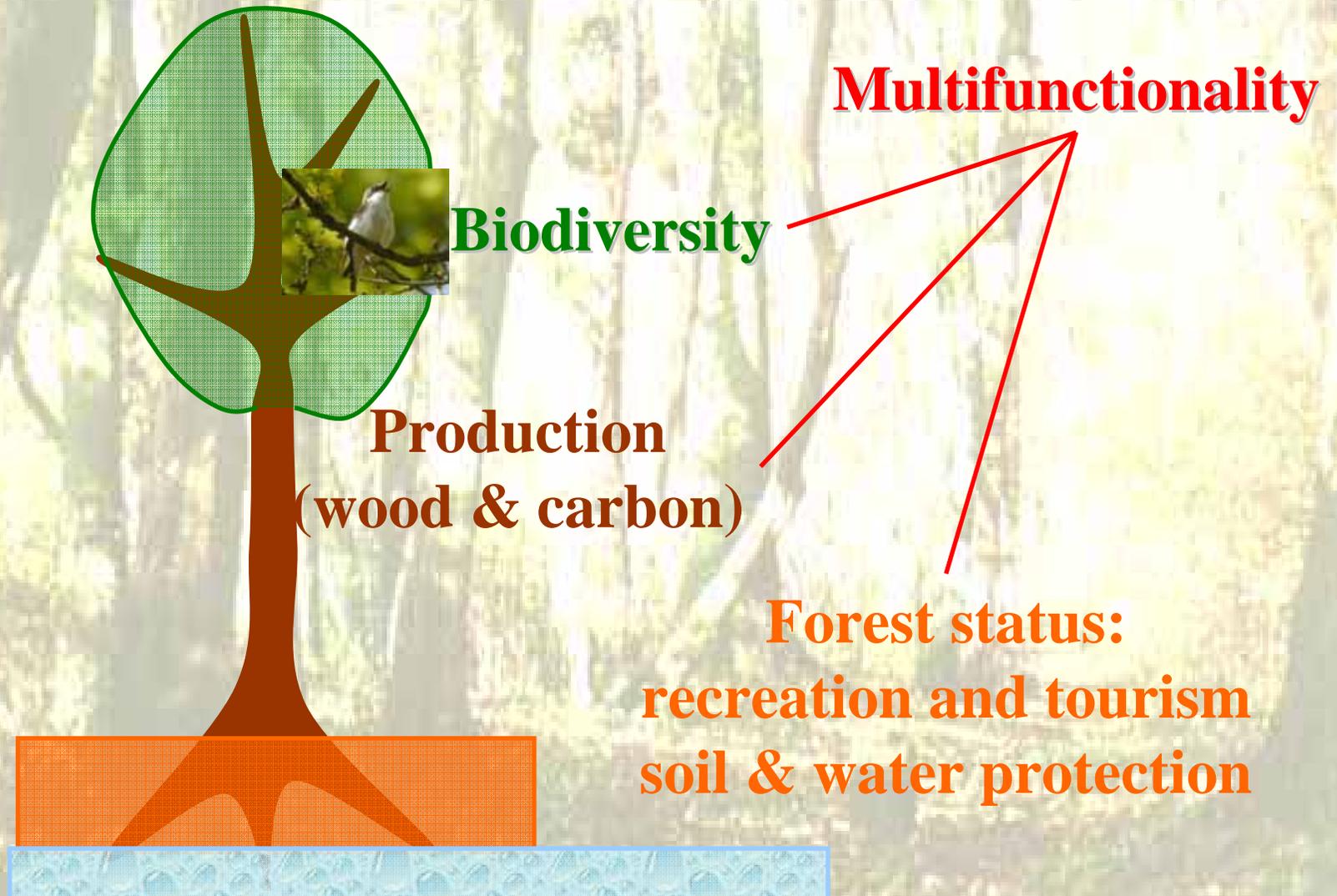
Biomass estimates: scaling from tree to landscape





- **DEVELOPMENT of a METHODOLOGY to MAP NATURAL and SEMI-NATURAL HABITATS for the WHOLE of the FRENCH TERRITORY**
- **A Remote Sensing Approach towards data integration**
- Michel Deshayes Cemagref/ENGREF Montpellier coordinating
- S. Luque coordinating Forests Habitats mapping

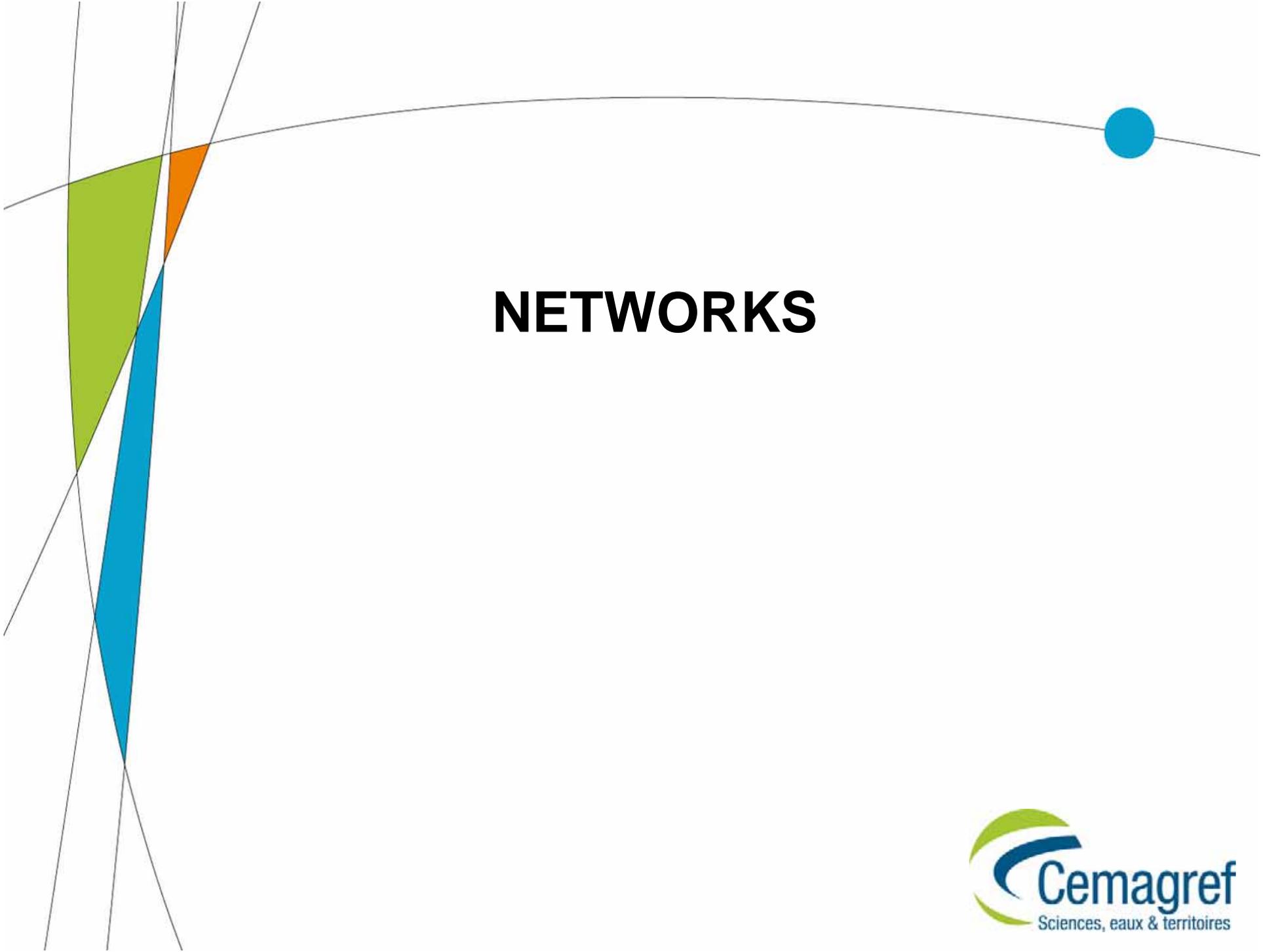
Evaluation criteria



A Forest Landscape Perspective

- There is a need for landscape ecological decision support tools
- Many ecological problems can only be understood and managed at landscape scales
 - Managing **disturbance**
 - Understanding **natural variability**
 - Assessing management plans in light of **global change**





NETWORKS



IUFRO - Division 8 – Forest Environment

8.01.00 – Forest ecosystem functions

8.01.01 – Old growth forests and forest reserves

8.01.02 – Landscape ecology

8.01.03 – Forest soils

8.01.04 – Water supply and quality

8.01.05 – European forest ecosystem research network (EFERN)

8.01.06 – Riparian and coastal ecosystems

8.01.07 – Boreal forest ecosystems

8.01.08 – Biogeochemistry and nutrient cycles

8.01.09 – Hydrologic processes and disturbances

8.01.10 – Forest fires

8.01.11 – Impact of wind on forests

8.02.00 – Forest biodiversity

8.02.01 – Key factors and ecological functions for forest biodiversity

8.02.02 – Forest biodiversity and resilience

8.02.03 – Humus and soil biodiversity

8.02.04 – Ecology of alien invasives

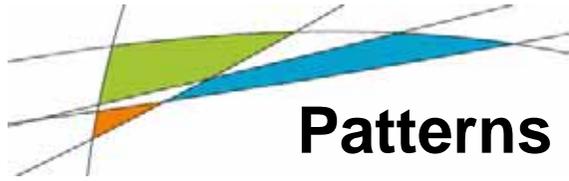
8.02.05 – Wildlife conservation and management

8.03.00 – Natural disasters

8.03.01 – Torrent, erosion and landslide control

8.03.02 – Snow and avalanches





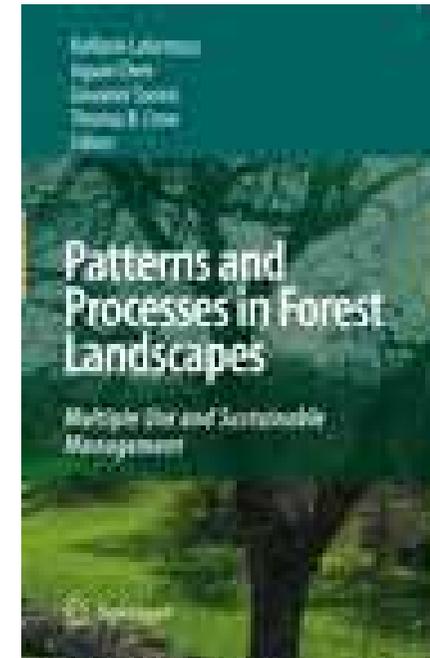
Patterns and Processes in Forest Landscapes

Multiple Use and Sustainable Management

published by Springer

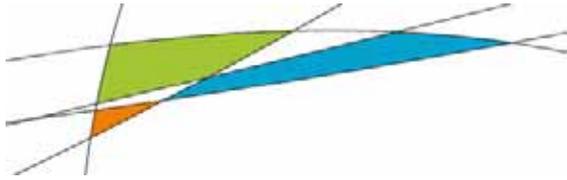


- Increasing evidence suggests that the composition and spatial configuration – the pattern – of forest landscapes affect many ecological processes, including the movement and persistence of particular species, the susceptibility and spread of disturbances such as fires or pest outbreaks, and the redistribution of matter and nutrients.



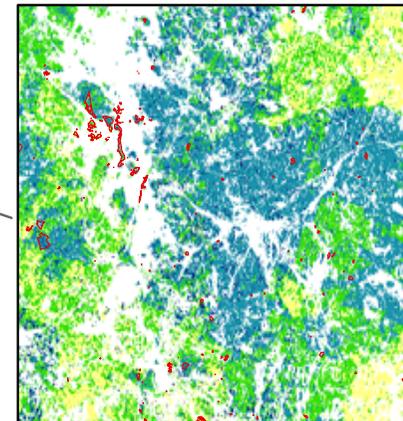
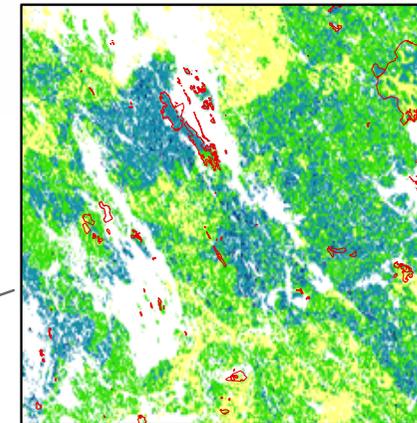
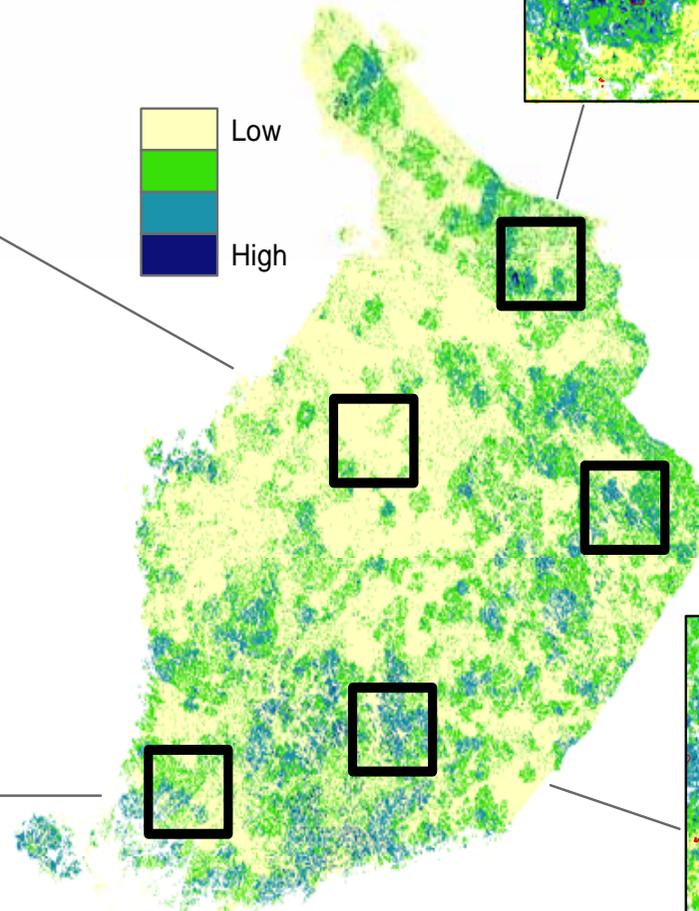
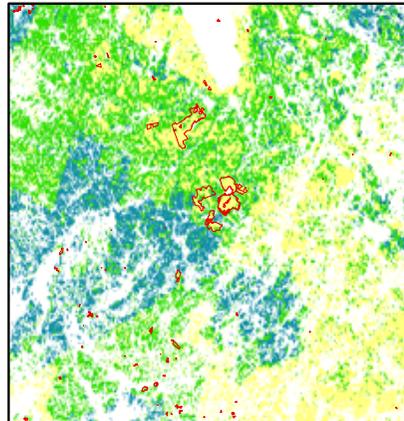
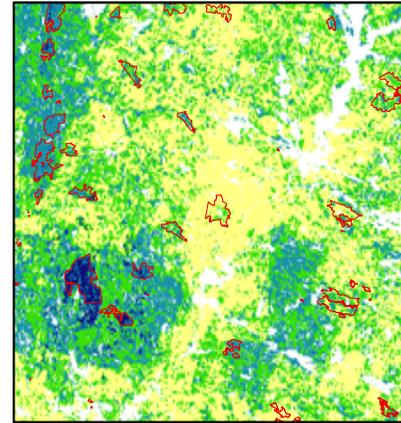
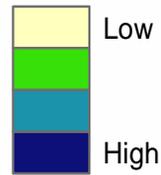
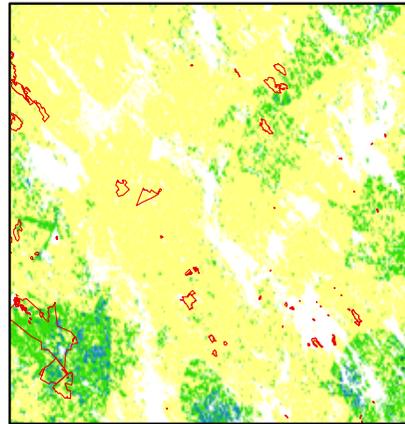
Luque, S. and Vainikainen N. 2008. Habitat Quality Assessment and Modelling for Biodiversity Sustainability at the Forest Landscape Level.





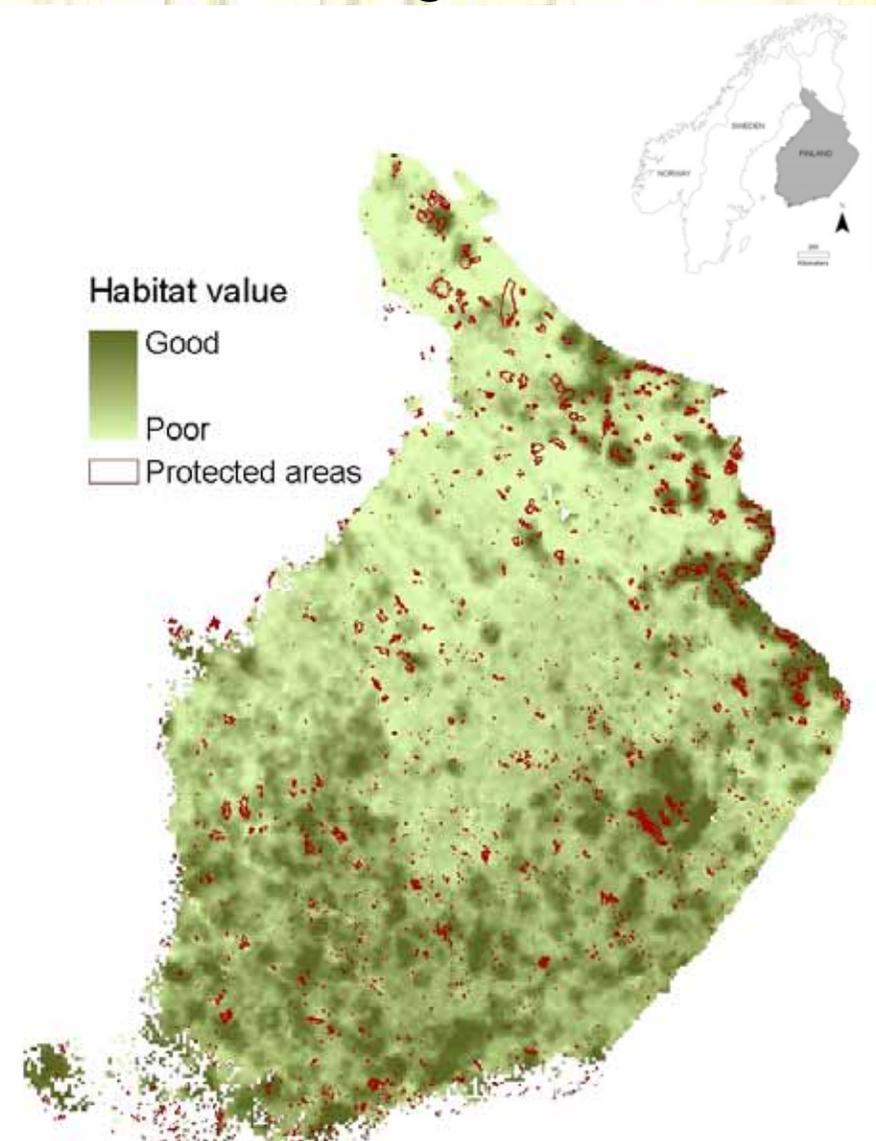
FORMER WORK WITH METLA

Herb Rich Habitat Quality Model



Habitat Quality Model & Protected Areas and Old Forest Conservation Programme

- We proposed to base the monitoring on high quality MS-NFI data to provide measurements of forest habitat quality based on forest structure & composition
- This approach offers the potential to directly predict quality (in terms of physical structure and plant species composition)



Luque, S. and Vainikainen N. 2008. in Patterns and Processes in Forest landscapes: Multiple Use and Sustainable Management. Springer publications

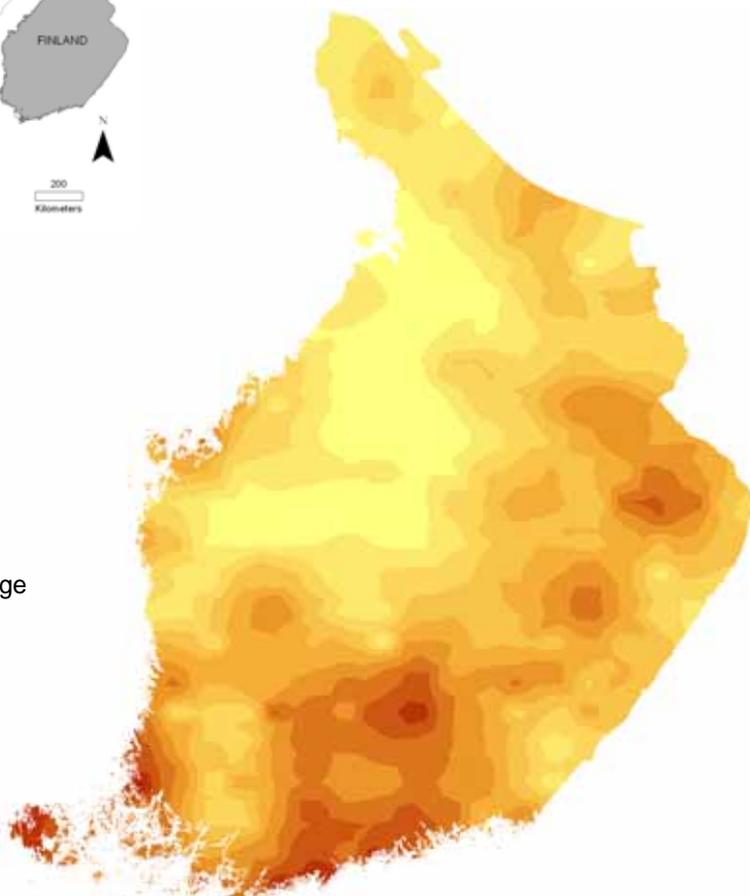
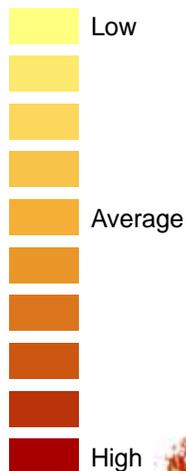


Habitat quality assessment and biodiversity value

- In boreal forest landscapes, where forest succession continuously alters stand and landscape characteristics, **there is not much evidence that fragmentation affects species persistence** (e.g., Schmiegelow and Mönkkönen 2002).
- **Habitat availability**, not the spatial configuration, is the primary concern (Andrén 1994; Fahrig 1998; Fahrig 2003).
- This effort constitutes the **first attempt done at the landscape level**, focusing on end users' needs, to use NFI data for biodiversity monitoring and management.



Contribution of Herb Rich Forest Habitat index classes in each forestry center



Forestry Center	Low	Average	High
Ahvenanmaa	15%	18%	64%
Etelä-Pohjanmaa	76%	20%	4%
Etelä-Savo	35%	44%	20%
Häme-Uusimaa	17%	37%	40%
Kainuu	57%	32%	10%
Kaakkois-Suomi	44%	40%	15%
Keski-Suomi	72%	24%	4%
Lappi	68%	23%	8%
Lounais-Suomi	37%	41%	21%
Pohjois-Karjala	33%	45%	20%
Pohjois-Pohjanmaa	75%	21%	4%
Pirkanmaa	30%	38%	29%
Pohjois-Savo	52%	36%	11%
Rannikko Etelärannikko	17%	31%	48%
Rannikko Pohjanmaa	56%	29%	13%



Multi-regional model applicable in determining the economically optimal regional allocation of conservation sites

ECOLOGICAL ECONOMICS 67 (2008) 232–243



available at www.sciencedirect.com



www.elsevier.com/locate/ecolecon



METHODS

Biodiversity value and the optimal location of forest conservation sites in Southern Finland

A. Maarit I. Kallio^{a,*}, Riitta Hänninen^a, Nina Vainikainen^a, Sandra Luque^b

^aFinnish Forest Research Institute, Unioninkatu 40 A, 00170 Helsinki, Finland

^bCemagref, Institute for Agricultural and Environmental Engineering Research, 2 rue de la Papeterie, BP 76, F-38402 Saint-Martin-d'Hères Cedex, France

ARTICLE INFO

ABSTRACT

The scenarios presented provide information about the economic impacts of conservation choices on the forest sector

Application of a multi-goal integer function which includes biodiversity and economic values



available at www.sciencedirect.com



journal homepage: www.elsevier.com/locate/envsci



Cost-effective forest conservation and criteria for potential conservation targets: a Finnish case study

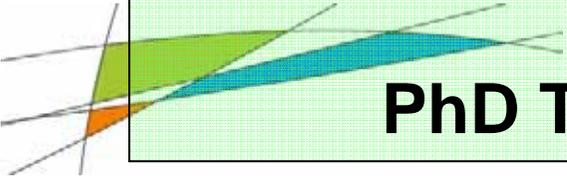
Artti Juutinen^{a,*}, Sandra Luque^b, Mikko Mönkkönen^c, Nina Vainikainen^d, Erkki Tomppo^d

^a Department of Economics, P.O. Box 4600, University of Oulu, Pentti Kaiteran katu 1, FI-90014 Oulu, Finland

^b Cemagref, Institute for Agricultural and Environmental Engineering Research, 2 rue de la Papeterie, BP 76, F-38402 Saint-Martin-d'Hères Cedex, France

^c Department of Biological and Environmental Science, P.O. Box 35, University of Jyväskylä, FI-40014 Jyväskylä, Finland

^d Finnish Forest Research Institute, Unioninkatu 40 A, FI-00170 Helsinki, Finland



PhD Thesis that started October 2008

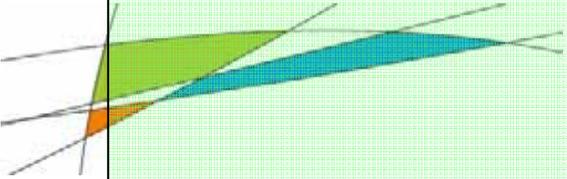
UNIVERSITE JOSEPH FOURIER
SCIENCES. TECHNOLOGIE. SANTÉ



2008 – 2011 **Development of forest habitat quality indicators for biodiversity assessment within an ecosystem service approach.** Bourse Présidence UJF
Mathilde Redon. S. Luque Direction

2008 – 2011 **Assessment of forest ecosystem services: A multi agent integrative approach.**

Co-direction Ph Delcros - S. Luque Direction - Ministère des affaires étrangères via convention Syria-France to Walaa Adra.



Future Challenges

- Quantify the effect **climate change** and its interaction with **pressures on forest ecosystems**
- Forest Biodiversity studies at **different spatio-temporal scales** : **forest habitat quality, dead wood as a surrogate for biodiversity quality**
- Forest **ecosystem services** : provide the **spatial context to bridge differences between economists and ecologists** - the *spatial representation and modelling-based approach* that allowed a common understanding to achieve applied results for sustainable use of forest resources
- Focus on Forest **landscape heterogeneity** in the face of near future environmental changes associated with global warming
- Forest Bio-energy related studies



Merci

Kiitos

