Forest map of the EU: What has changed since 1990
Forest fragmentation

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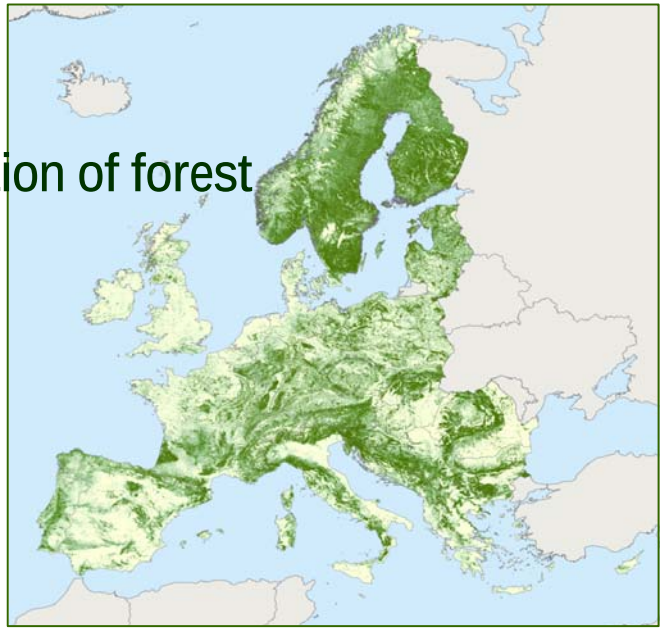
FOREST Action

Forest Protection Conference – EU Spanish Presidency, La Granja 06.04.2010

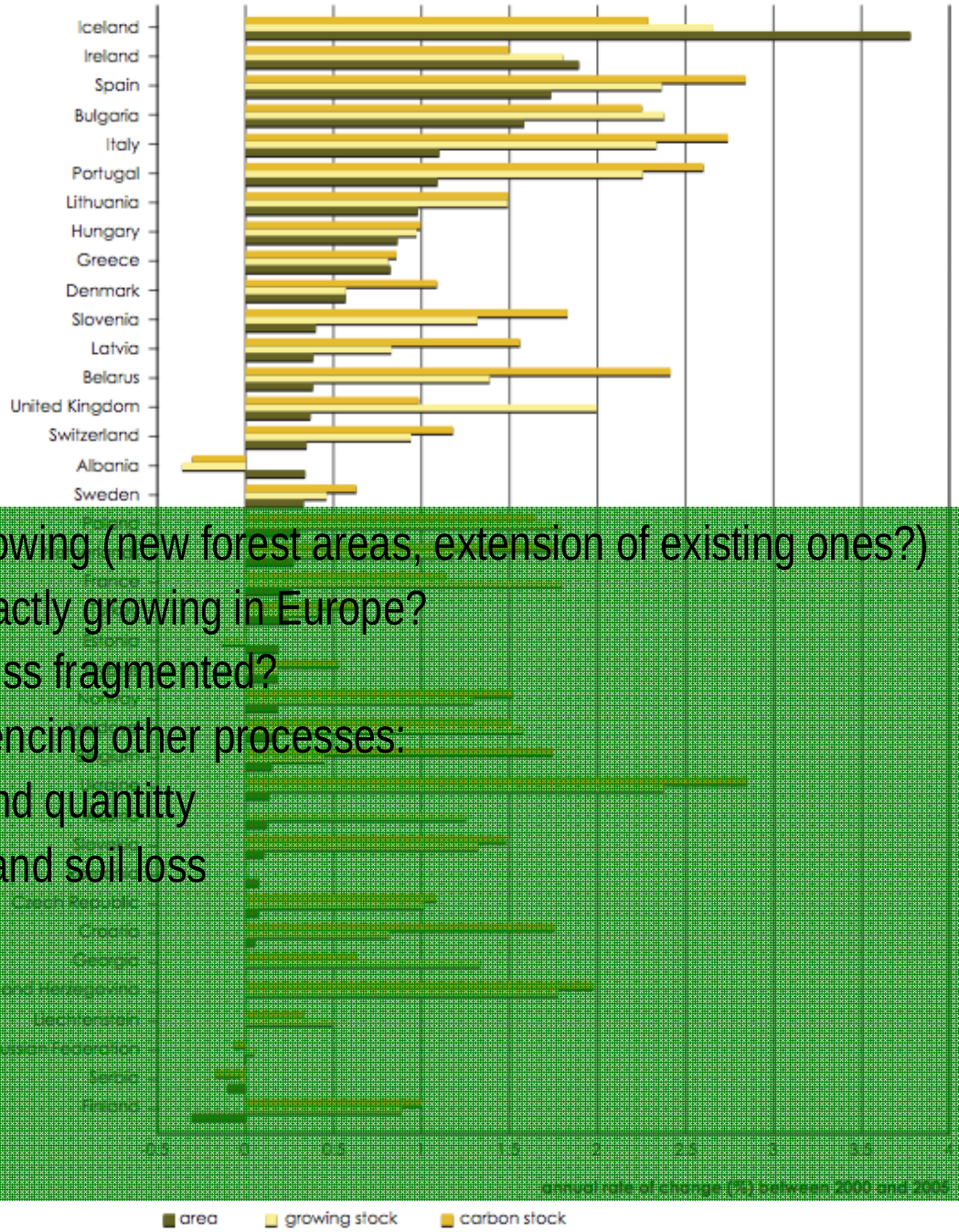
- Trends of forest area in Europe
- Need for a harmonized assessment of the spatial distribution of forest
- The EU Forest Map
- Analysis of forest fragmentation



Trends of forest area in Europe

Analysis of Forest area change:

MCPFE 2007 Report



How is forest area growing (new forest areas, extension of existing ones?)

Where are forests exactly growing in Europe?

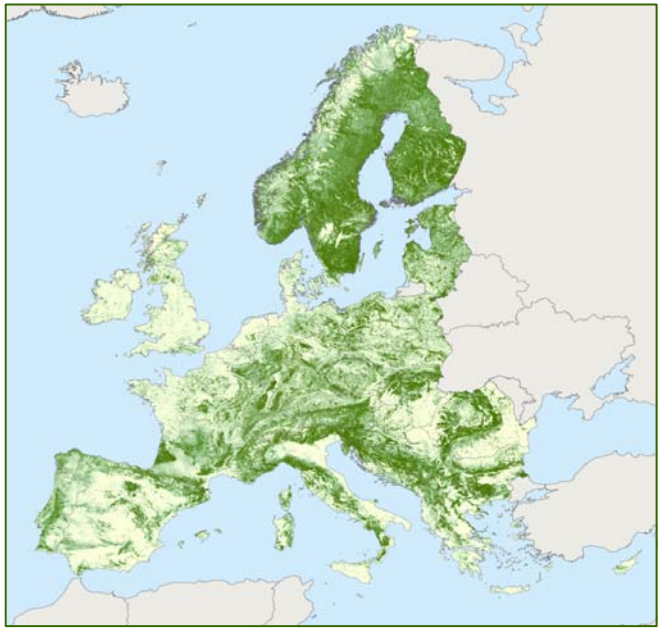
Are forests more or less fragmented?

How are forests influencing other processes:

- Water quality and quantitty
- Soil protection and soil loss
- Biodiversity
- Forest fires
- Pests
- other

JRC high resolution Forest Cover Maps 1990 – 2000 - 2006:

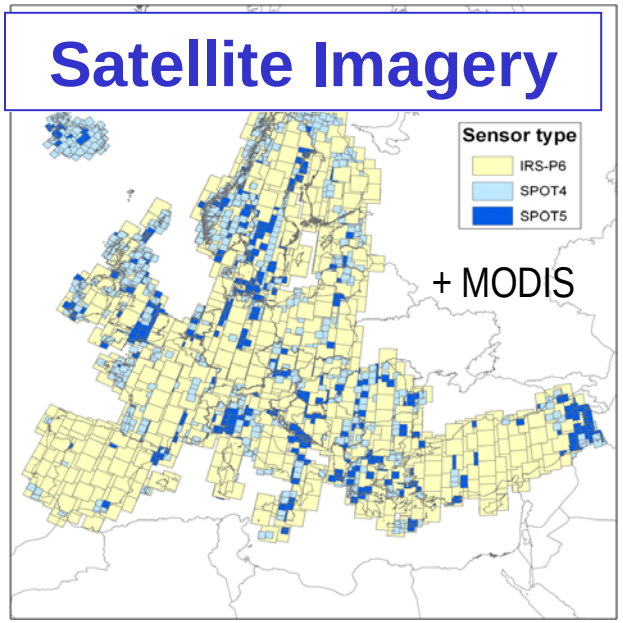
- **Consistent** over Europe, independent of **national boundaries**
- high level of **spatial detail** than currently available
- with high level of **geometric** (<25m) and **thematic accuracy**
- Classes: forest, non-forest, clouds/snow, water, no-data
- Coverage EU27 + CH, Balkan States, (NO+TR)
- compatible with **INSPIRE** standards



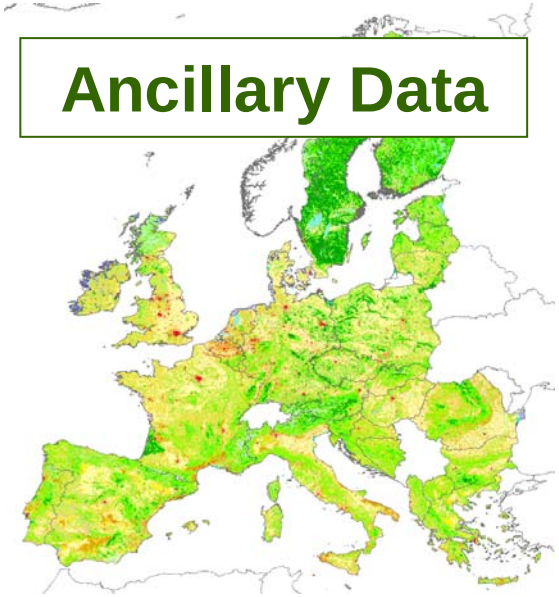
Multi-purpose for

- ❑ European decision making due to comparable forest information
- ❑ Transboundary studies related to forestry
- ❑ Input data for large area modelling with high spatial detail
- ❑ Basis for value-added products (forest species, forest fragmentation, etc)

Satellite Imagery

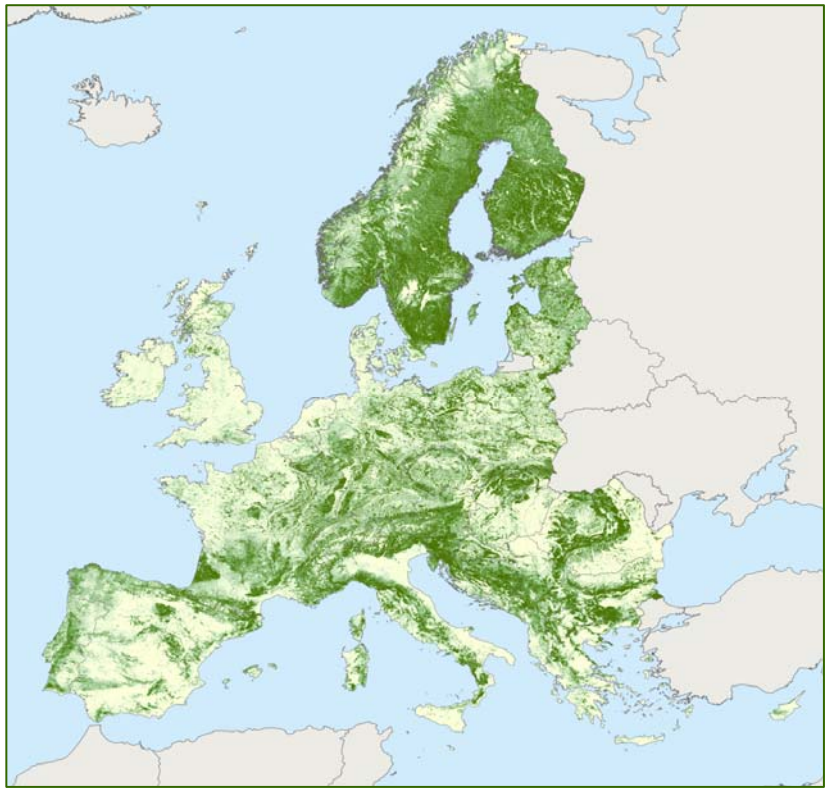


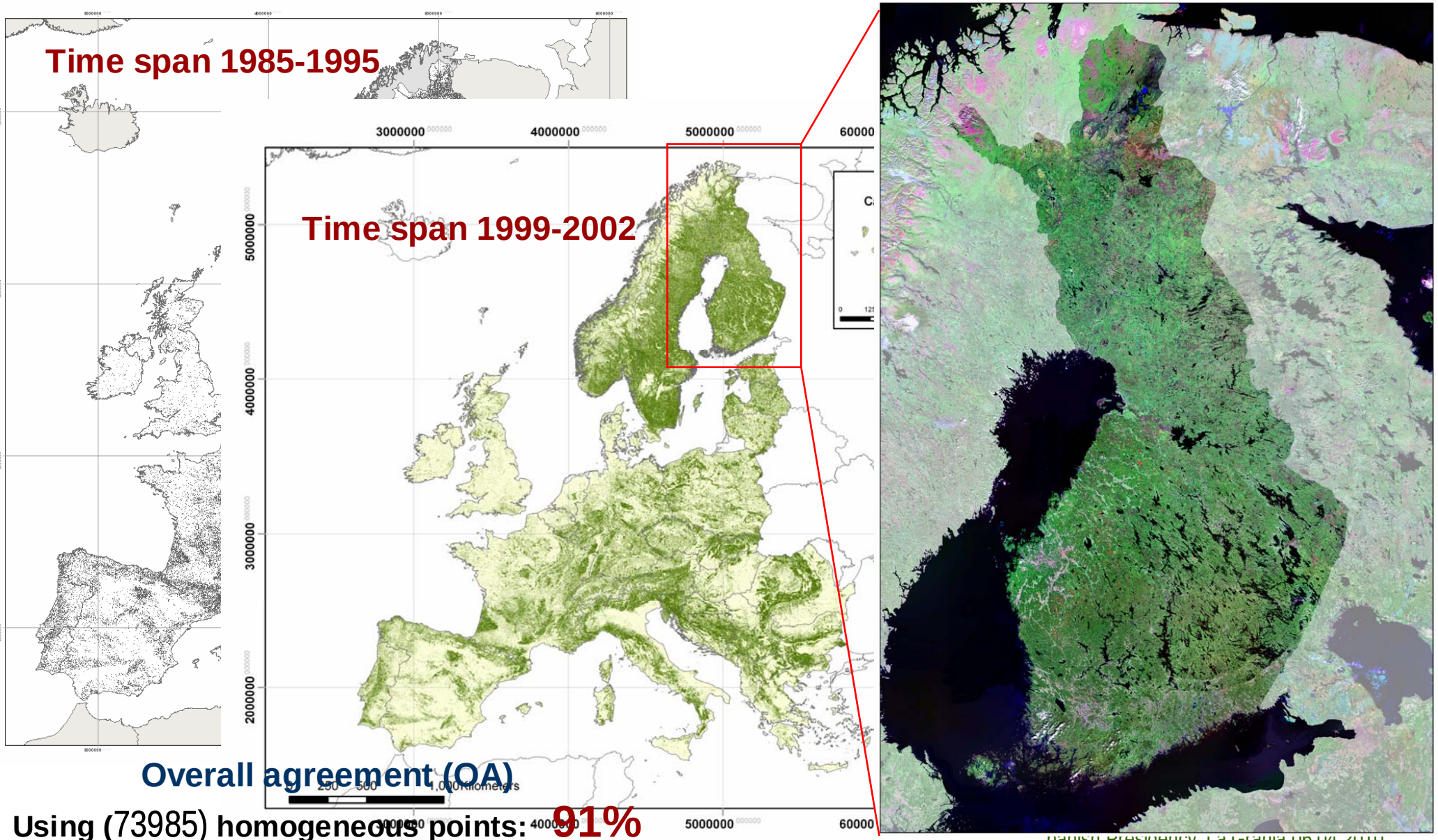
Ancillary Data



PROCESSING

Forest/Non-Forest Map

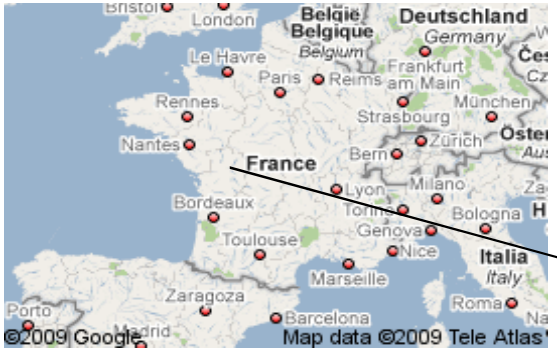




Overall agreement (OA)

Using (73985) homogeneous points: 91%

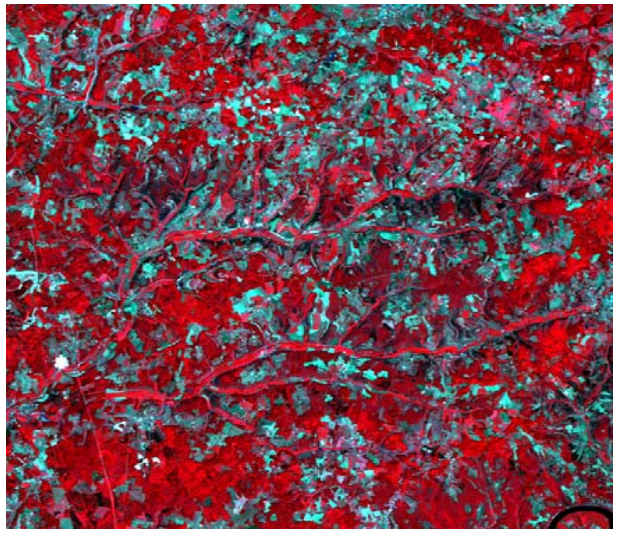
- Method: combination of remote sensing images:
  - High Resolution (20 m/23 m) multi-spectral data (SPOT/LISS3)
  - Medium Resolution (250 m) multi-temporal data (MODIS)
- Planning:
  - Validation of preliminary results: ongoing
  - Production of first Pan-European forest (type) map April 2010



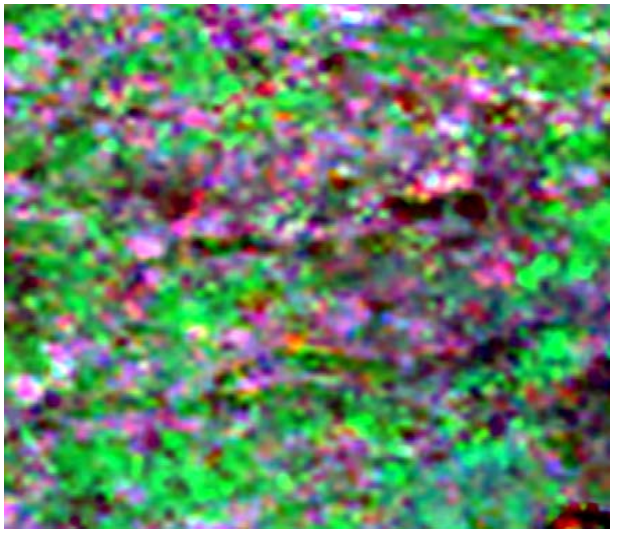
Data fusion

High Resolution multi-spectral image

Medium Resolution multi-temporal image



RGB: NIR, RED, GREEN

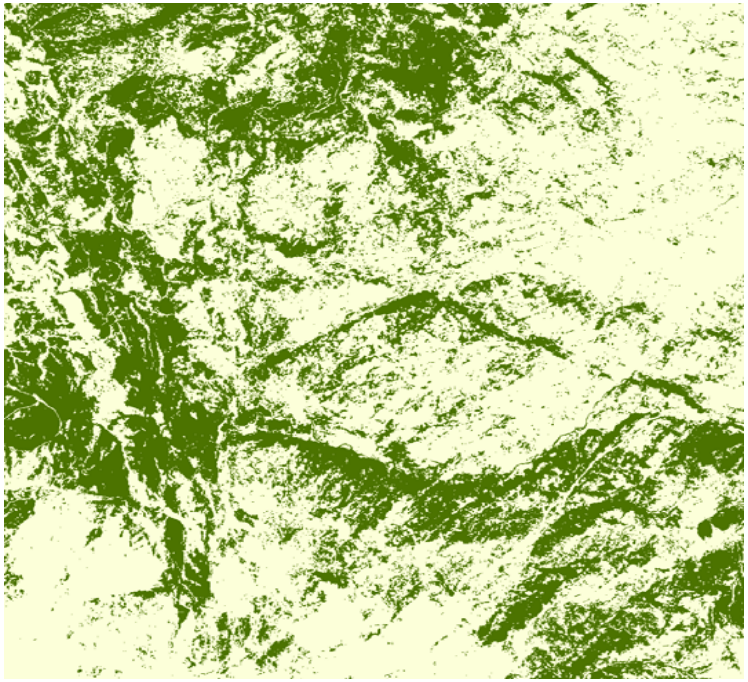


RGB: Feb, Jun, Oct

The European 2006 Forest (type) Map

Methodology

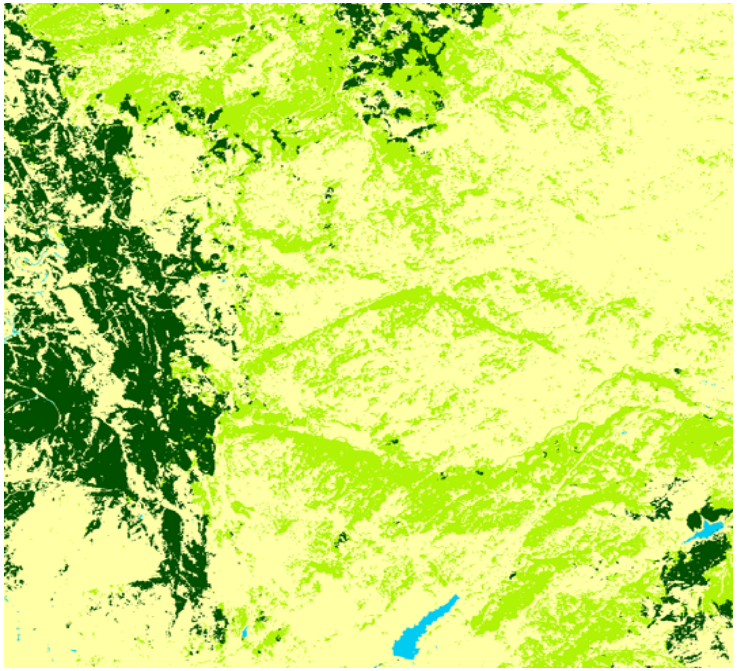
Forest/Non-Forest map



Non-Forest

Forest

Forest type map

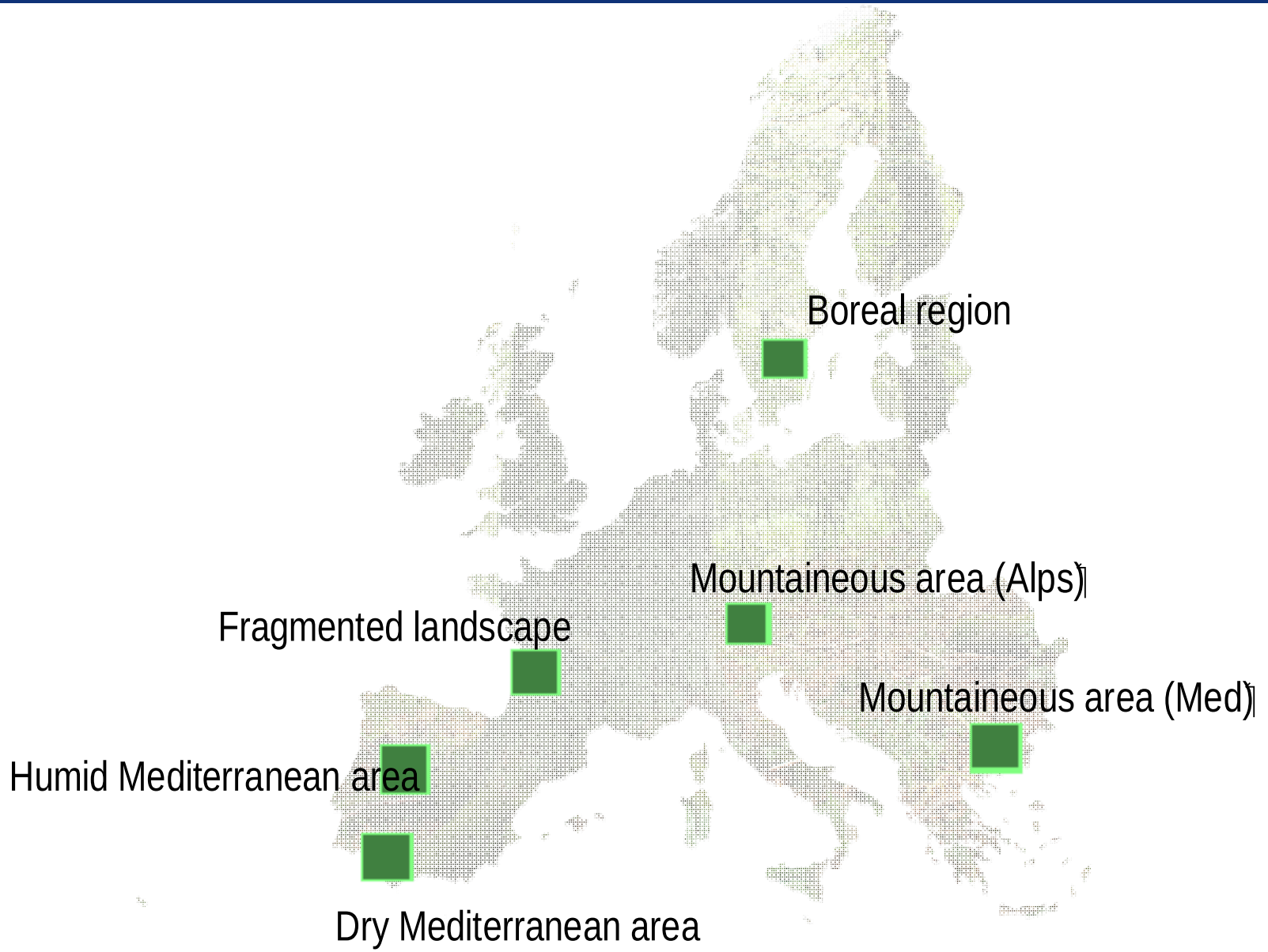


Non-Forest

Broadleaved Forest

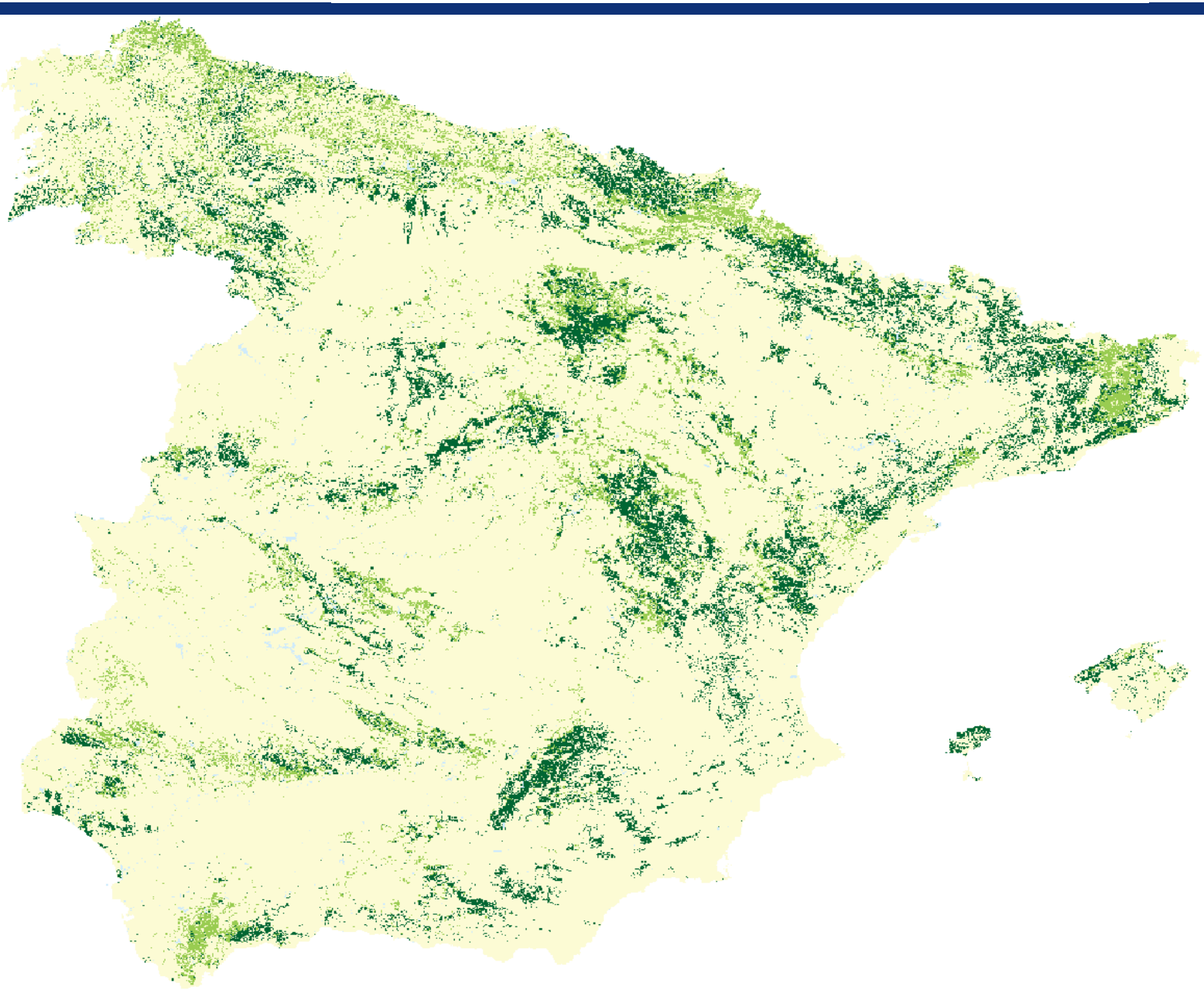
Coniferous Forest

Water


Boreal region
Mountaineous area (Alps)
Fragmented landscape
Mountaineous area (Med)
Humid Mediterranean area
Dry Mediterranean area

The European 2006 Forest (type) Map

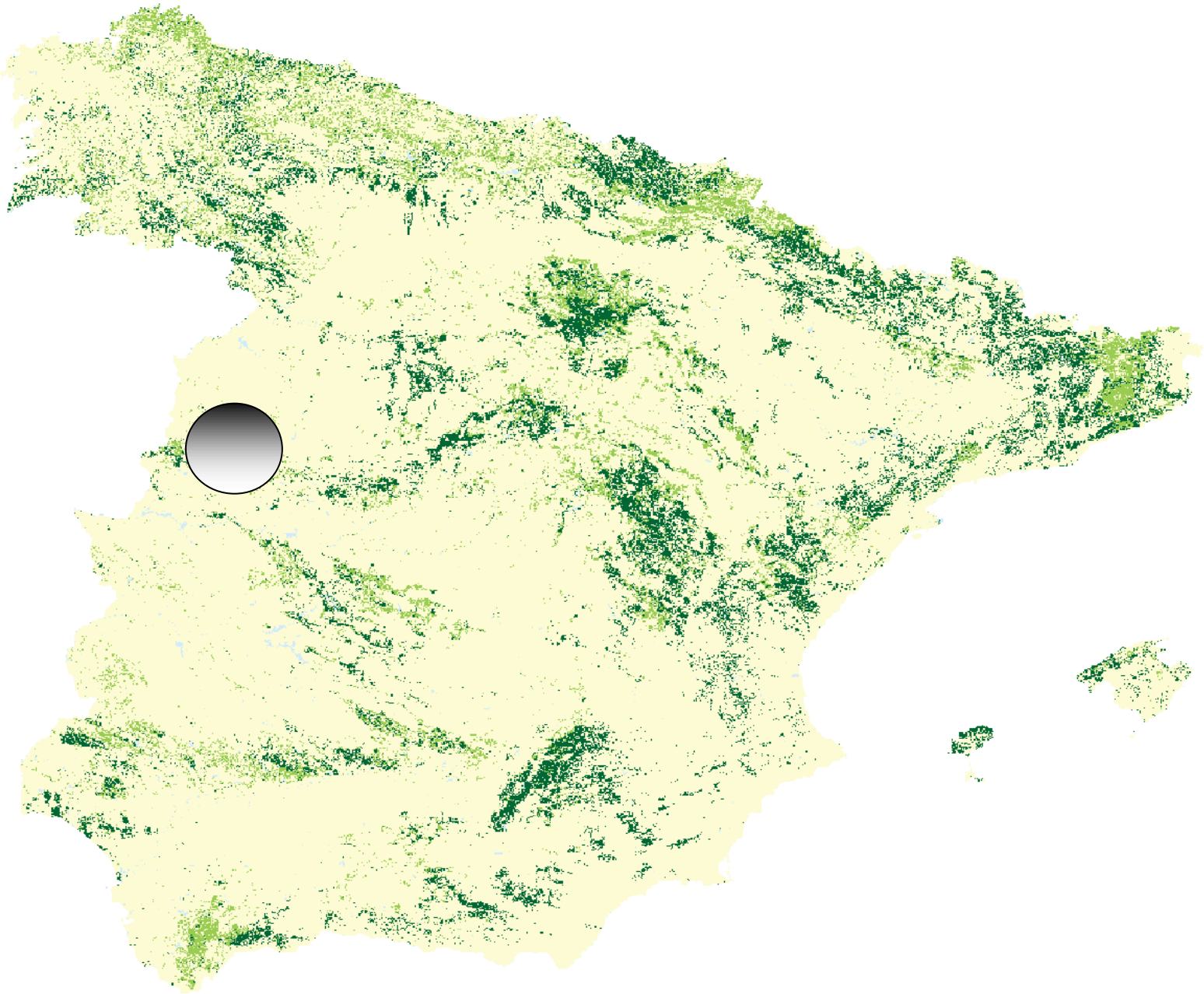
First assessment of map accuracy



2010

The European 2006 Forest (type) Map

First assessment of map accuracy



2010

The European 2006 Forest (type) Map

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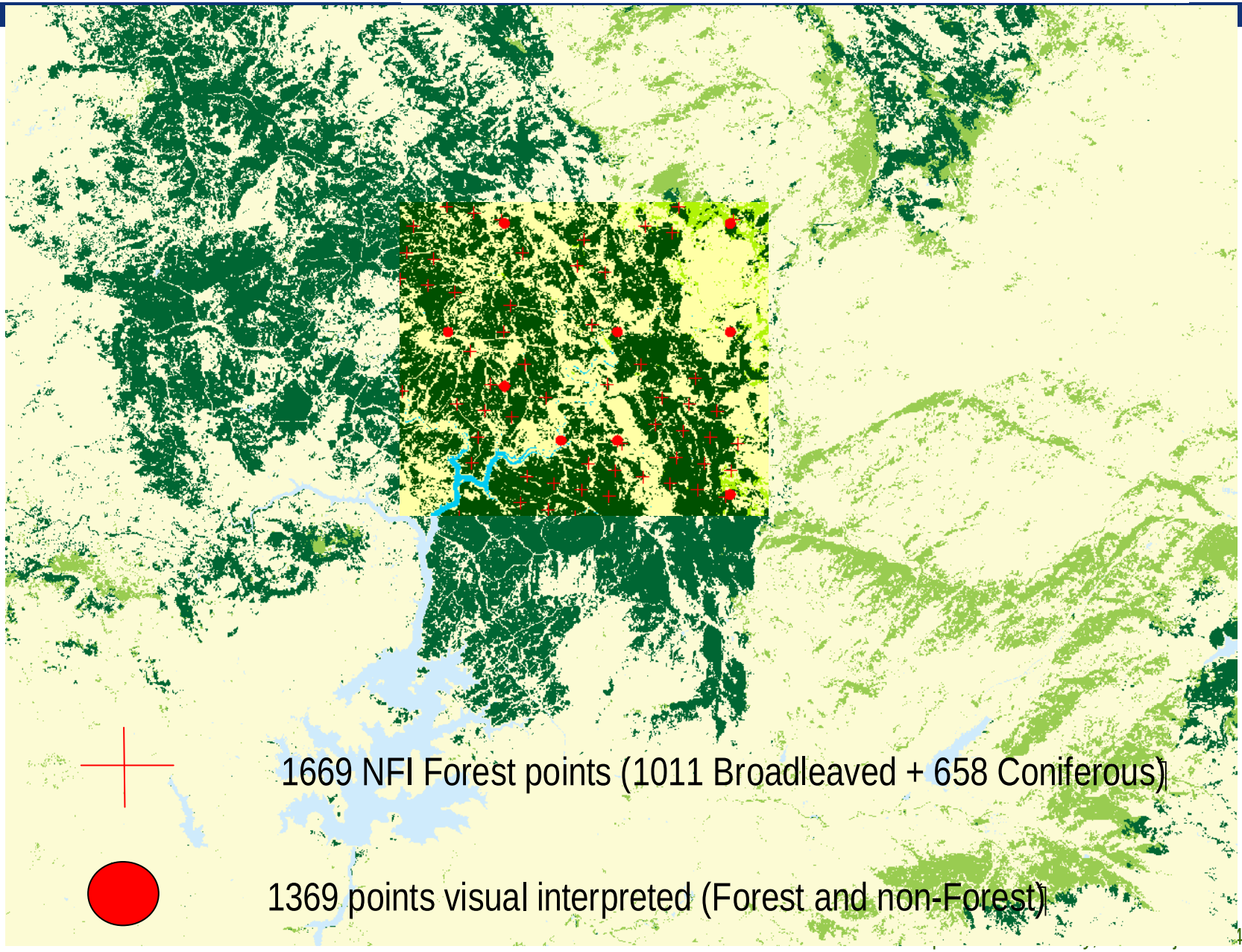
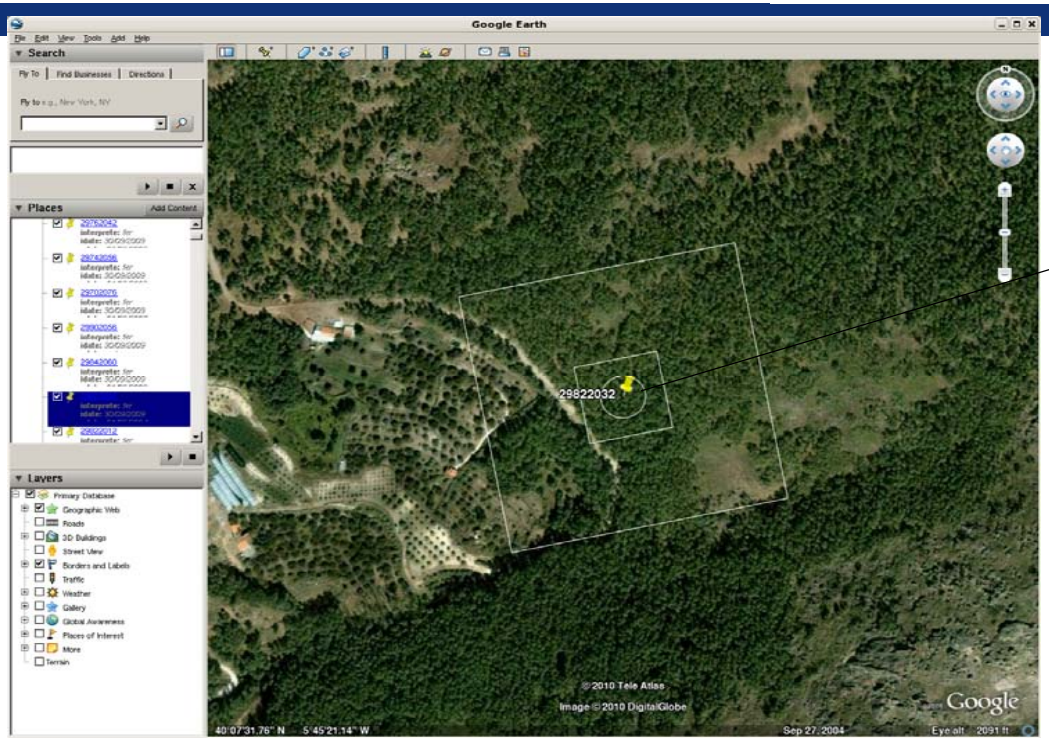




Point id 29822032:

Land cover: Broadleaf

Crown cover: 75-100%

Open/dense forest

Non-Forest (NF)

Broadleaved Forest (BF)

Coniferous Forest (CF)

Water (W)

Visual interpretation

Overall Accuracy Forest/Non-Forest: 88%

Overall Accuracy Forest types: 82%

NFI (Spain)

Overall Accuracy Forest types: 88%

Political context:

Forest protection, Biodiversity Communication, Green infrastructures in Post-2010

- MCPFE 4.7 Indicator 'Landscape level Forest Spatial Pattern"

(included in the MCPFE 2007 report, in preparation for MCPFE 2011)

- SEBI2010 Indicator "Fragmentation and Connectivity of ecosystem"

(included in the EEA 2008 State of Europe's forests report, and to SEBI indicator reports 2007, 2009)

Forest Spatial Pattern:

Spatial arrangement or configuration of forested ecosystems across the landscape.

Forest Fragmentation:

Fragmentation refers to forest loss and isolation (loss of connectivity); breaking up of large habitats into smaller parcels.

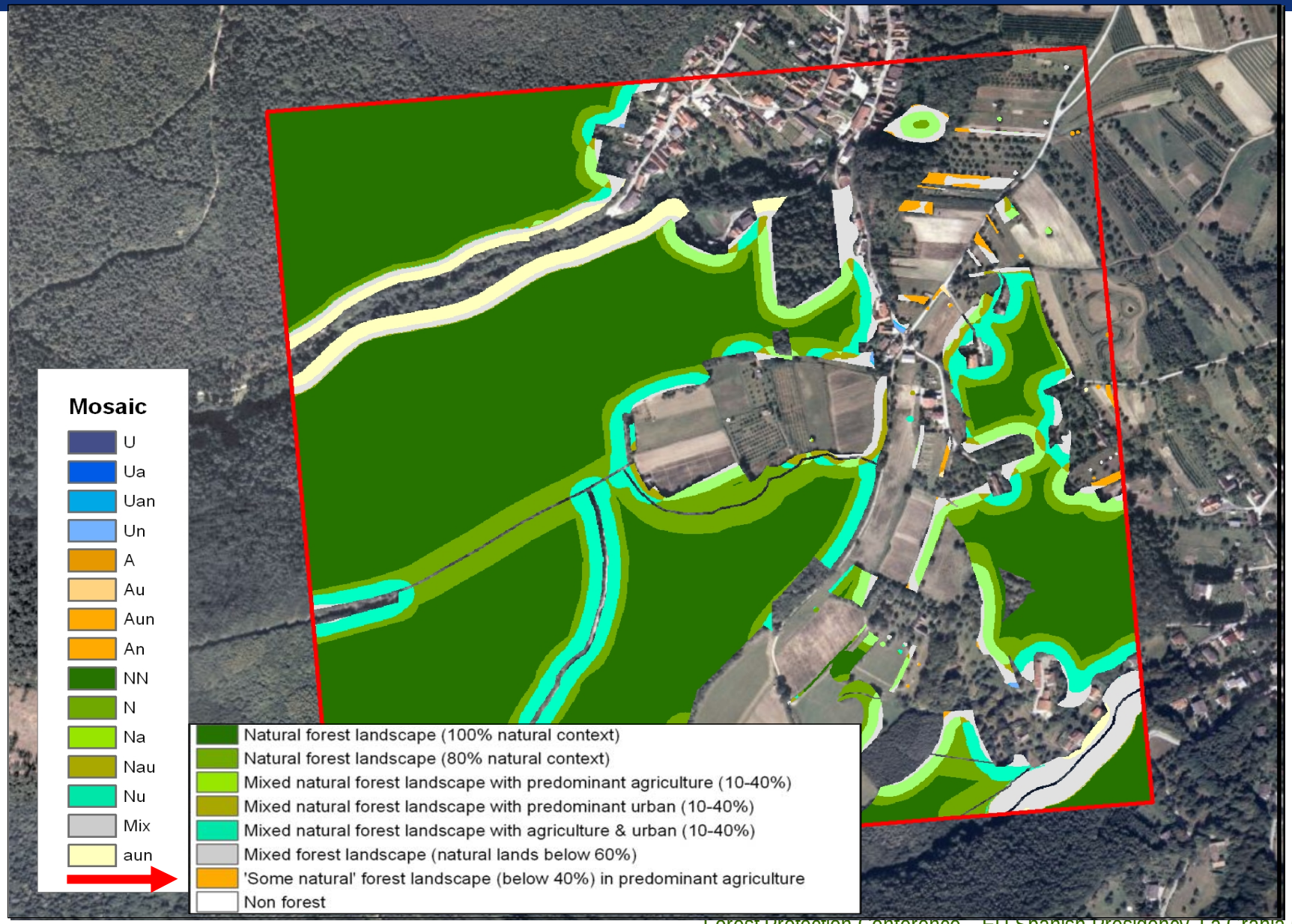
Forest Connectivity:

Degree to which the landscape facilitates or impedes movement across forest habitat.

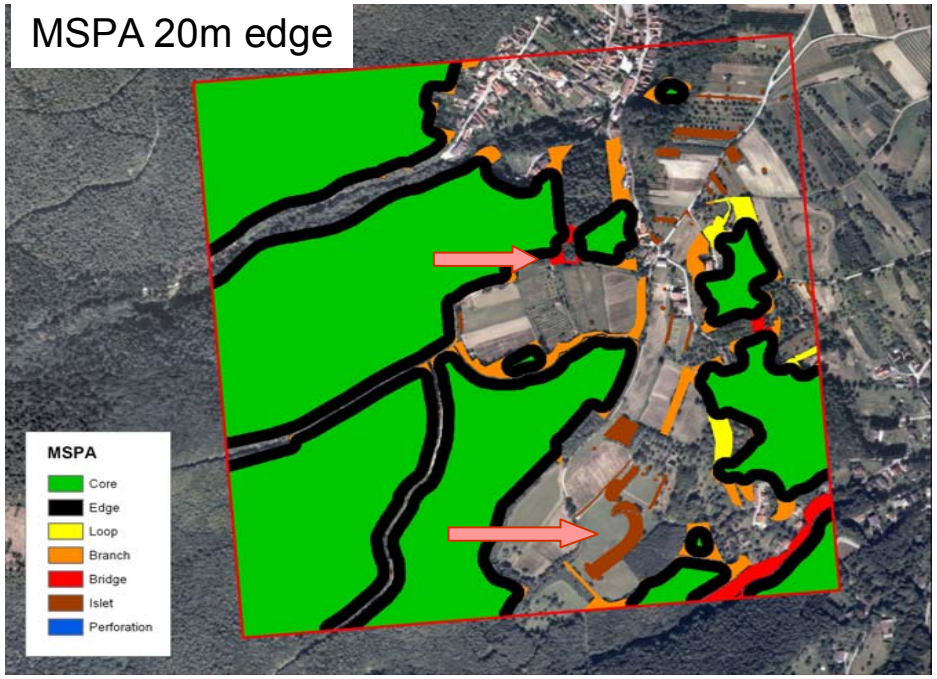
(1) - Spatial pattern mapping based on MSPA (MSPA: Morphological Spatial Pattern Analysis)

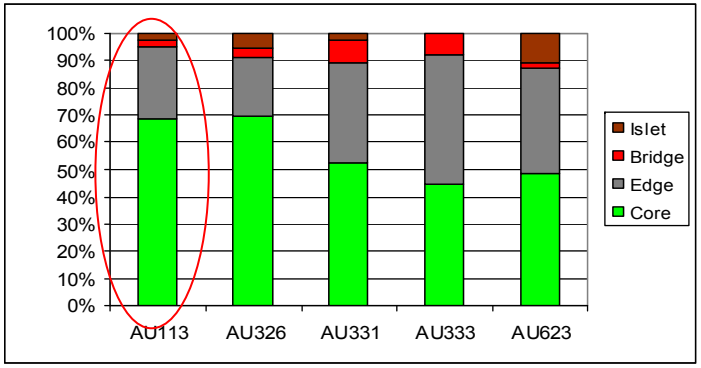
- Landscape pattern mapping based on LMI (LMI: Landscape Mosaic Index)

(2) - Fragmentation (loss of forest area and connectivity) (modified CONECOFOR)


Mosaic
U
Ua
Uan
Un
A
Au
Aun
An
NN
N
Na
Nau
Nu
Mix
aun
Natural forest landscape (100% natural context)
Natural forest landscape (80% natural context)
Mixed natural forest landscape with predominant agriculture (10-40%)
Mixed natural forest landscape with predominant urban (10-40%)
Mixed natural forest landscape with agriculture & urban (10-40%)
Mixed forest landscape (natural lands below 60%)
'Some natural' forest landscape (below 40%) in predominant agriculture
Non forest

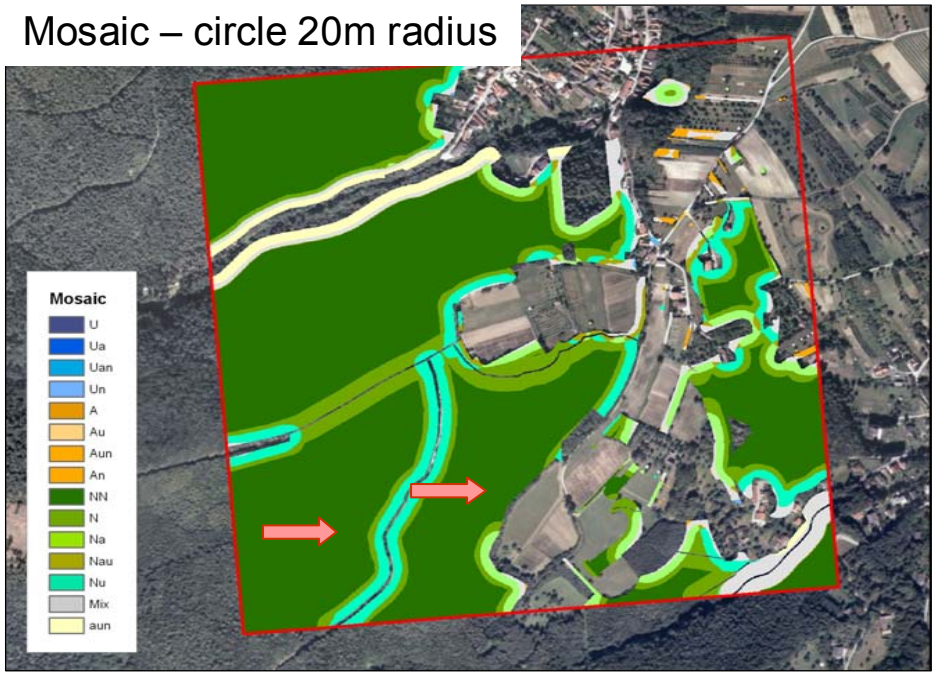
MSPA 20m edge

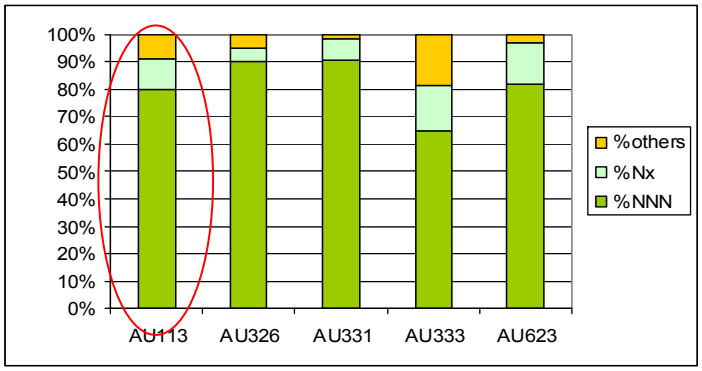




Forest spatial pattern (morphology)

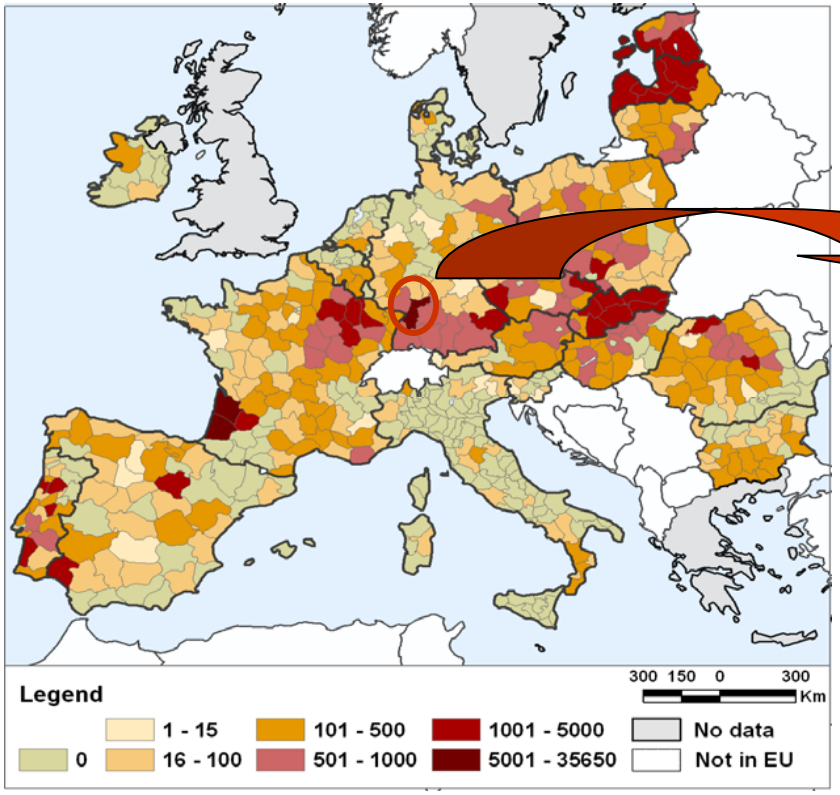
Mosaic – circle 20m radius





Forest landscape pattern (neighborhood)

Change in core forest areas : new perforation

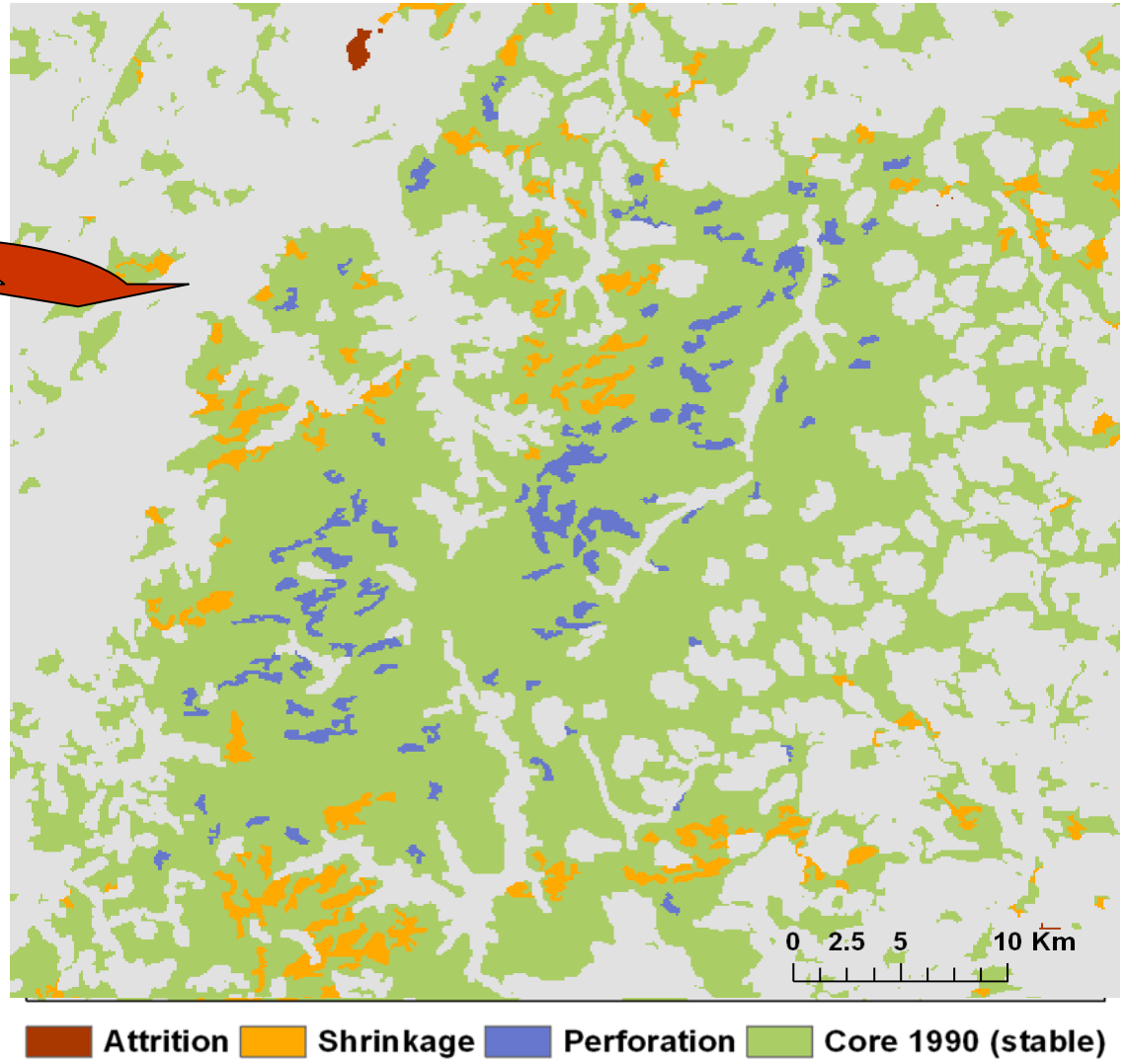


New Perforation (ha) per provinces

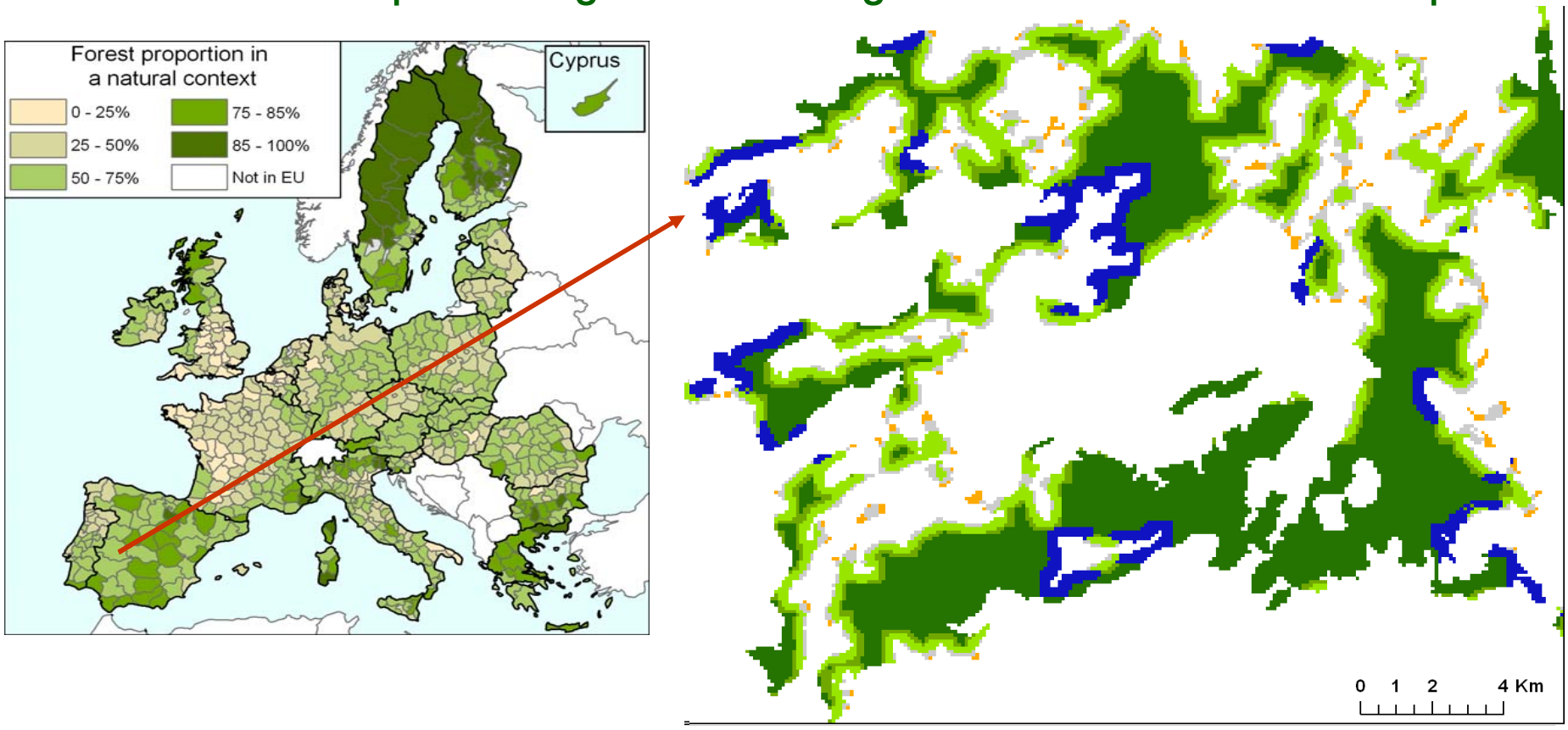
Germany: DE12

New perforation=5532 ha

2.4% core area in 1990

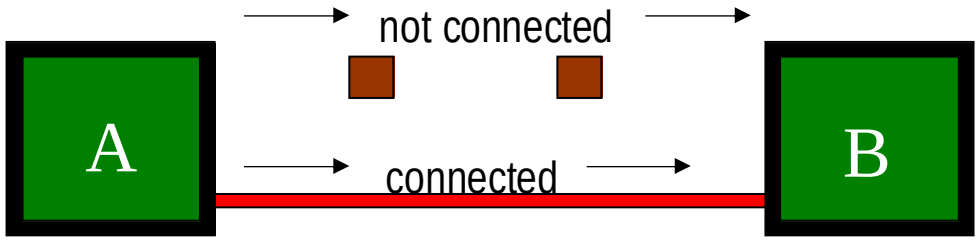


Natural forest landscape turning into mixed agric./artificial forest landscape



- Loss of forest in natural context
- New forest edge types due to less permeable matrix

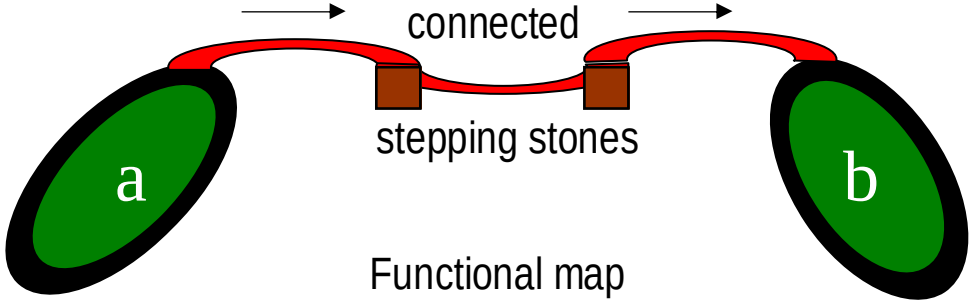
Structural view of the landscape : land cover/habitat map



Structural/physical link

Connectivity analysis with neutral matrix

Functional view of the landscape : land cover/habitat + species

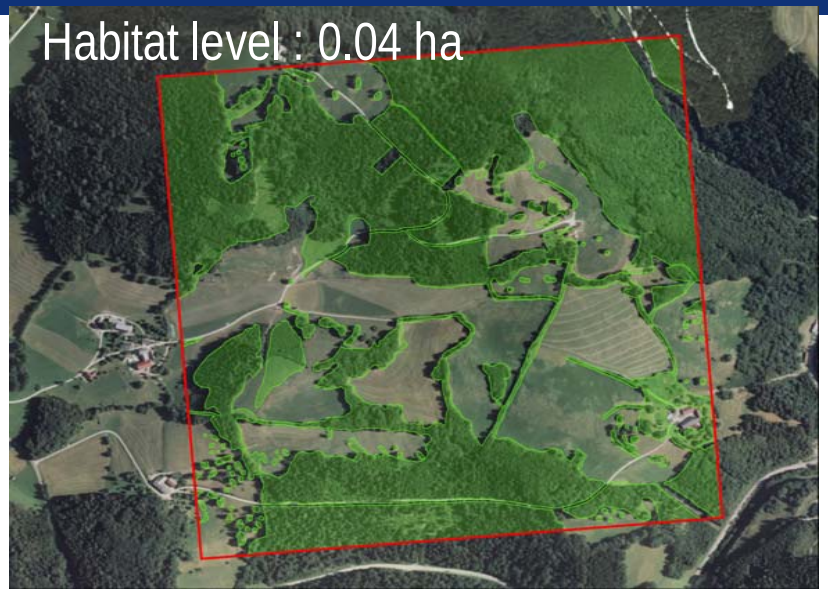


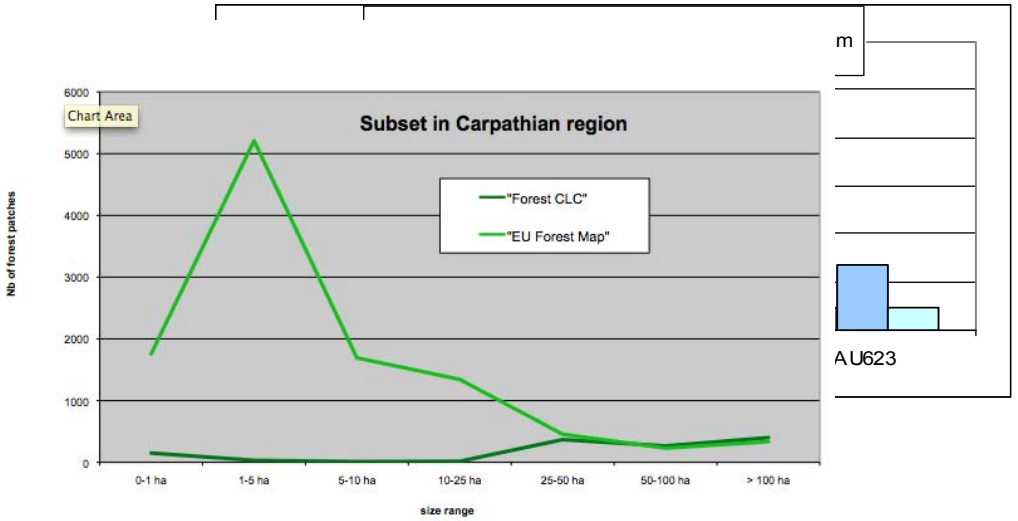
Functional map

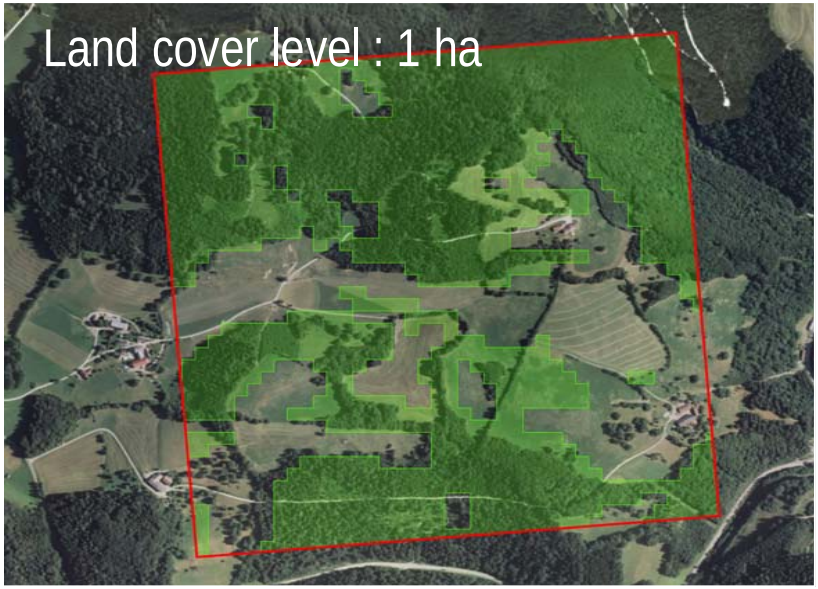
Connectivity analysis with matrix

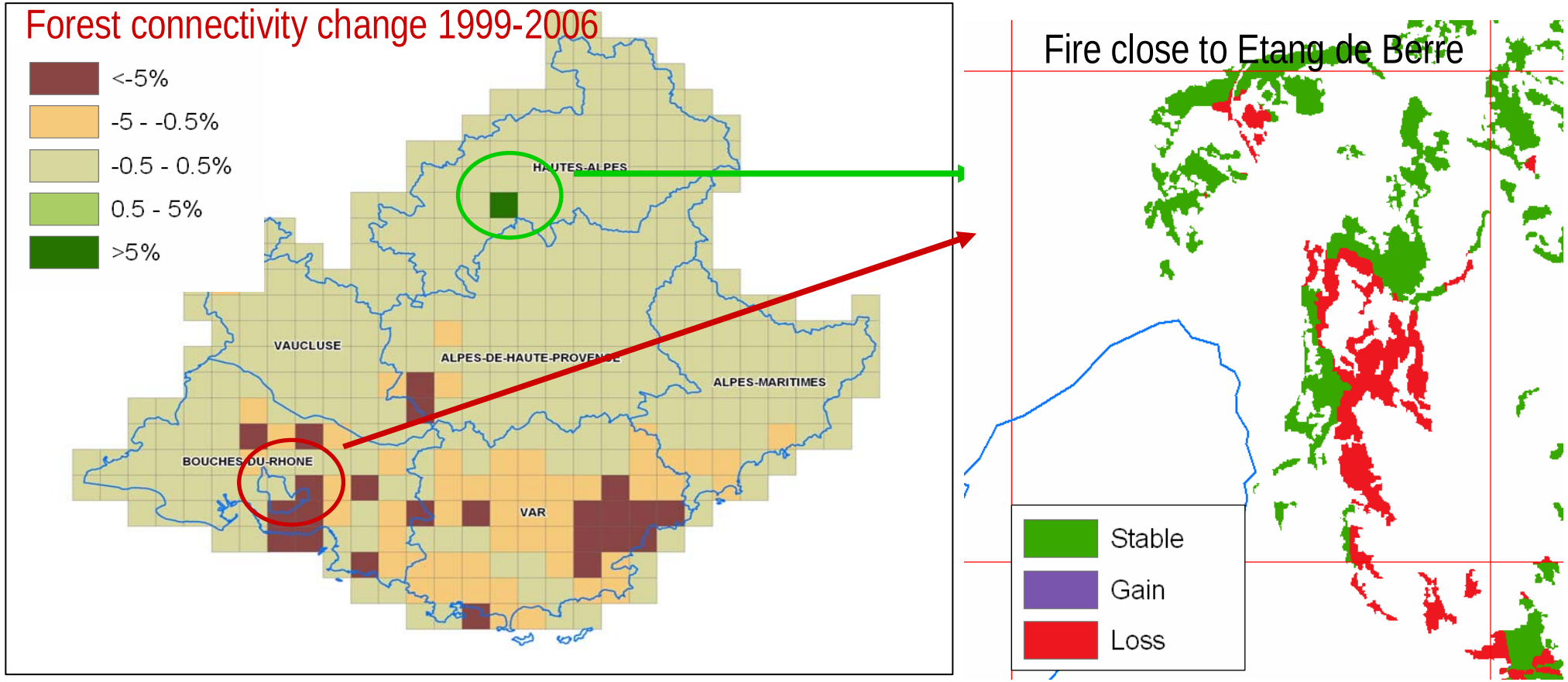
Assessment of forest spatial pattern

The issue of scale

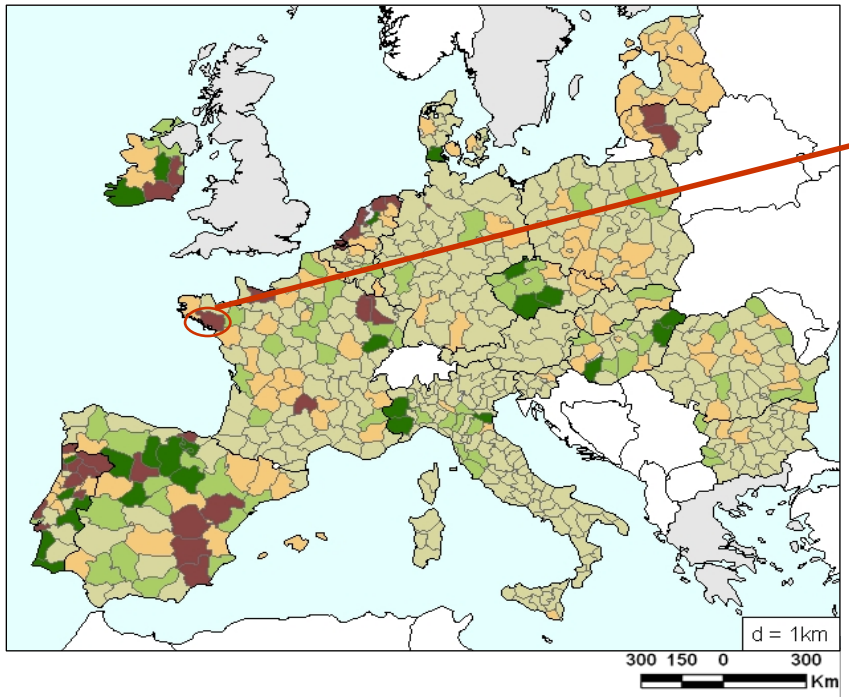








Forest connectivity change observed at 1ha MMU aggregated per grid (FP7 Project - EBONE)

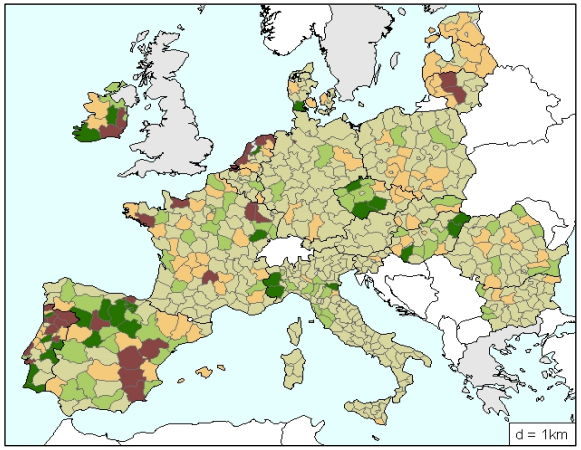


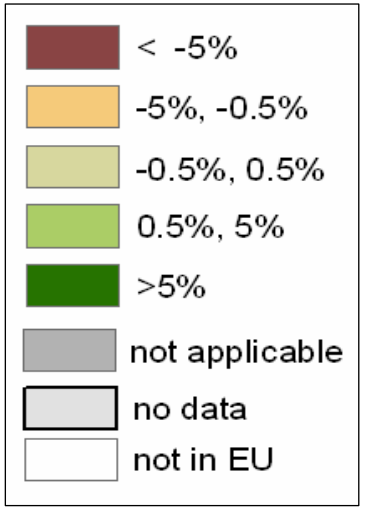
2000

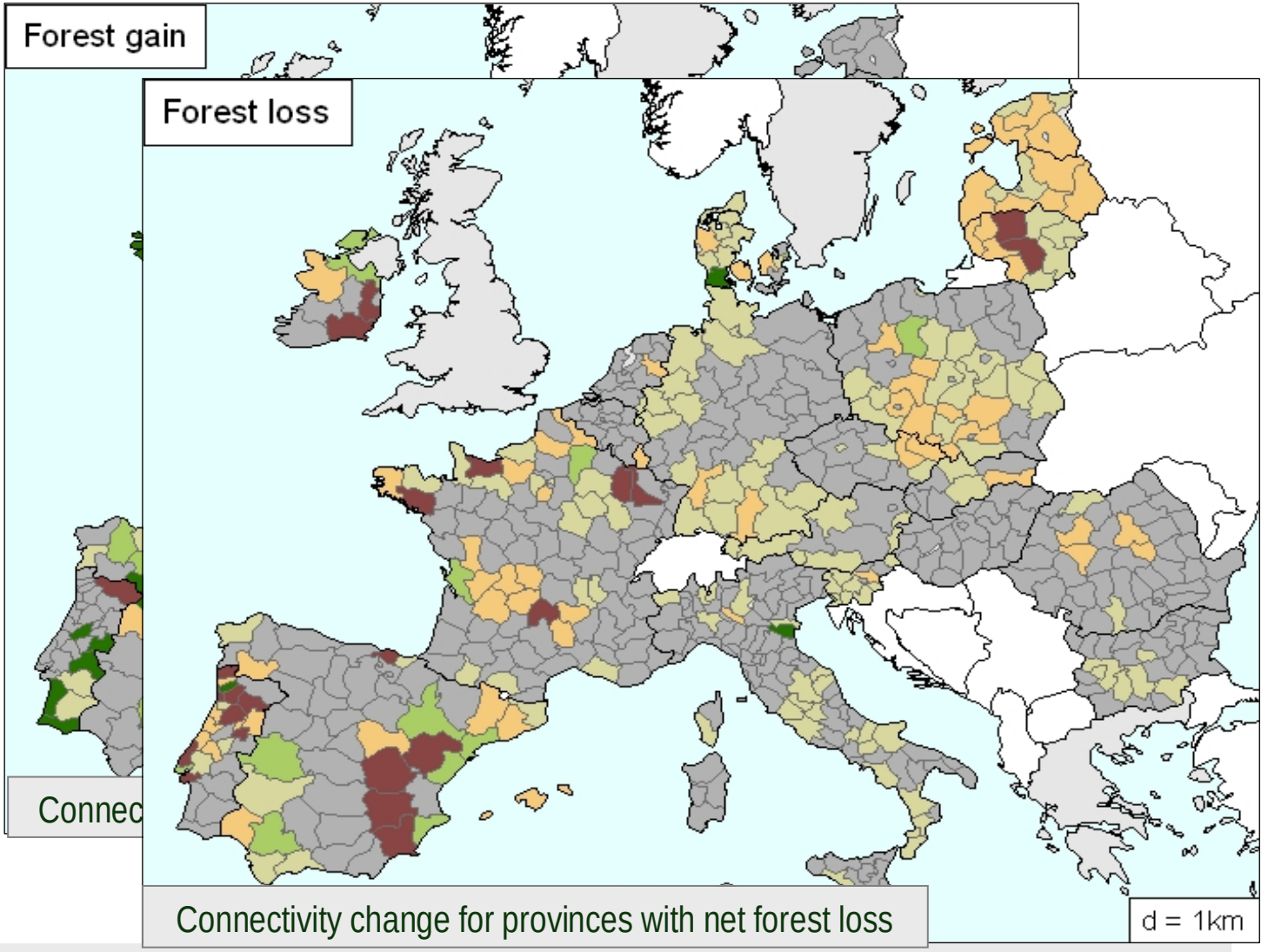
< -5%
-5%, -0.5%
-0.5%, 0.5%
0.5%, 5%
>5%

Change in forest connectivity in the 1990-2000 period is observed at 25ha MMU for forest-dwelling species with an average dispersing capability of 1km

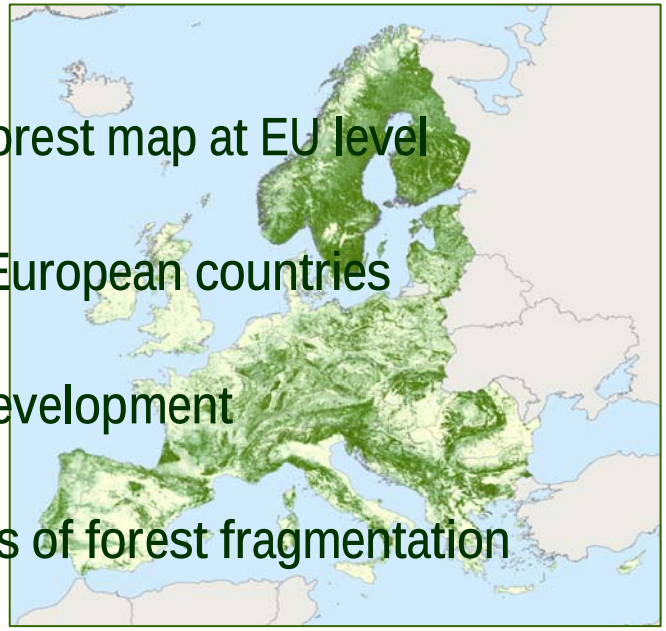
Aggregation per province - change in habitat availability and intra and inter-patch connectivity.







Results for forest dwelling species with low dispersal capabilities (1 km avg dispersal distance)



- Analysis of forest area dynamics requires a harmonized forest map at EU level
- The EU forest map must be derived in collaboration with European countries
- Accuracy assessment and validation is a key step in its development
- The European Forest Map can be the basis for the analysis of forest fragmentation
- Increase in forest area ≠ decrease in fragmentation
- Increase in forest area ≠ increase in connectivity
- Essential to take into account the issue of scale in the analysis

Gracias por su atención

References:

JRC FOREST Action: http://forest.jrc.ec.europa.eu/publications

European Forest Data Centre: http://efdac.jrc.ec.europa.eu