

# Forest connectivity and fragmentation.

An overview on the resources available (EU)  
What is the role of the grid?

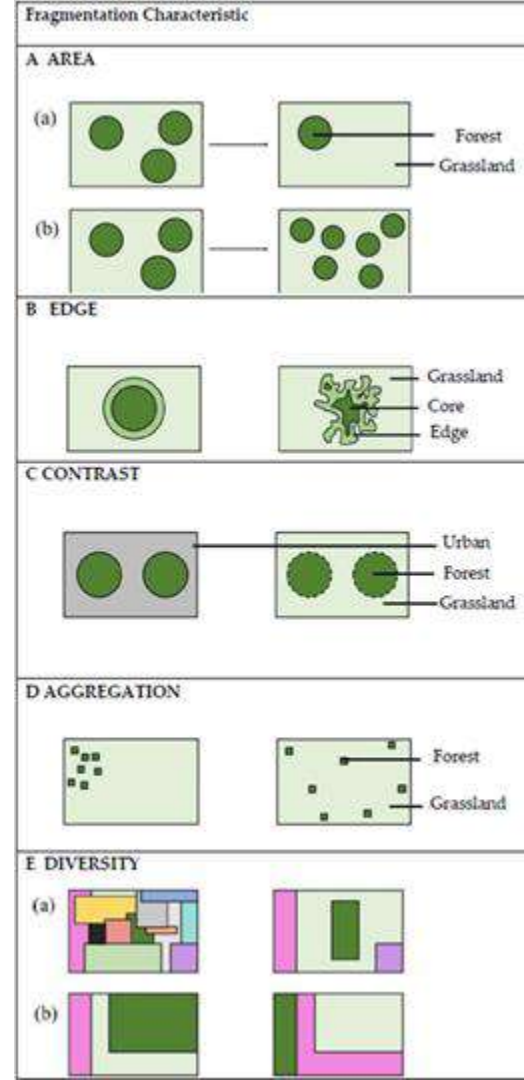
**Ecofirst** ([www.ecofirst.eu](http://www.ecofirst.eu))

Jean-François Godeau ([jf.godeau@ecofirst.eu](mailto:jf.godeau@ecofirst.eu))

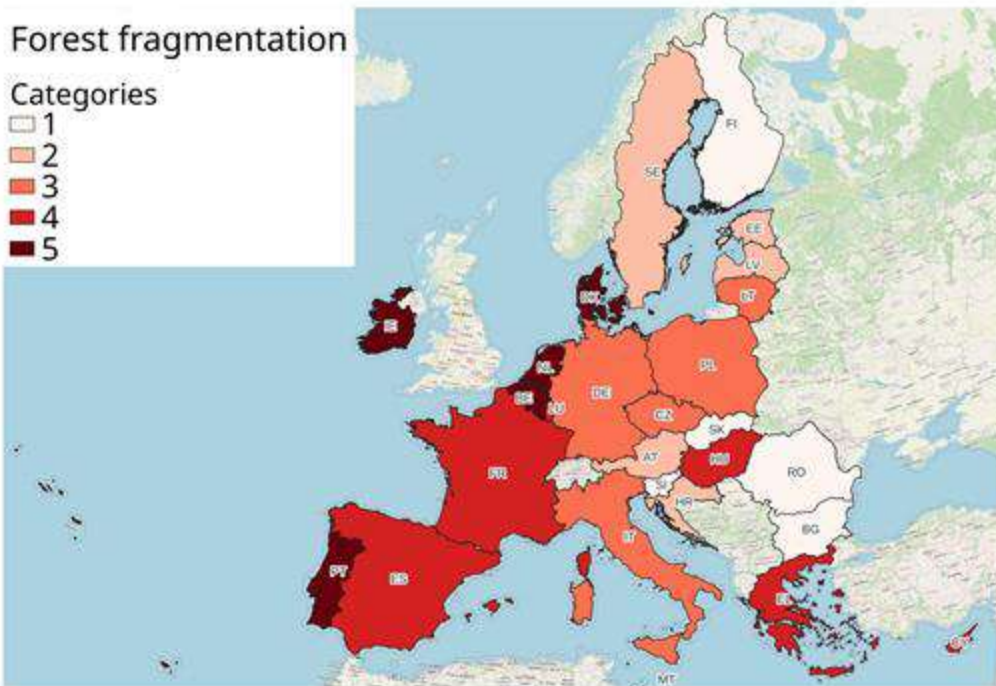
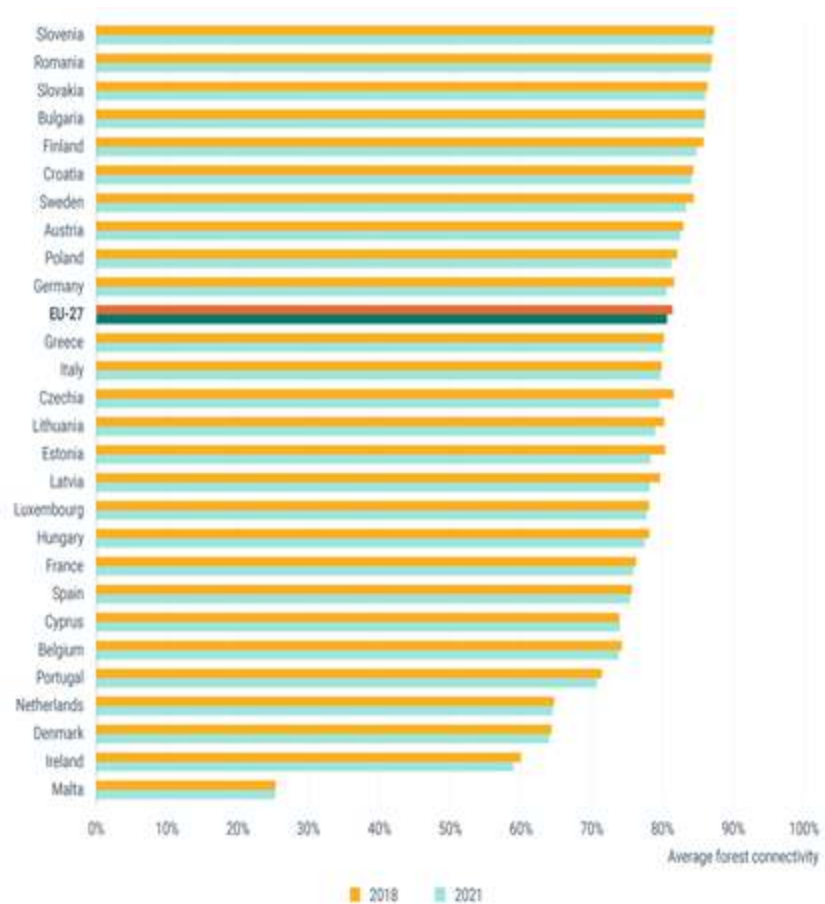
RGI workshop: session #1 - Porto 22/11/2024

## Forest fragmentation >< Forest connectivity

- Meaning is strongly dependant on end-user priorities
- High connectivity is ‘good’ for certain bird or butterflies species but ‘bad’ with regard to invasive species proliferation of wildfires
- Effect of fragmentation depends on the type of organisms and the features we focus on:
  - Area
  - Edge
  - Contrast
  - Aggregation
  - Diversity



## Connectivity in the EU: 0.8% decrease from 2018 to 2021



# Joint Research Centre Technical report EUROSTAT - Regional Yearbook 2022: forest connectivity

Datasets, method, algorithms, analysis tools



JRC TECHNICAL REPORT

EUROSTAT – Regional Yearbook 2022:  
Forest Connectivity

Algorithm Technical Basis  
Document (ATB0)

Inge P. Cavallar

2022



CLC-wide forest connectivity

estat.pro

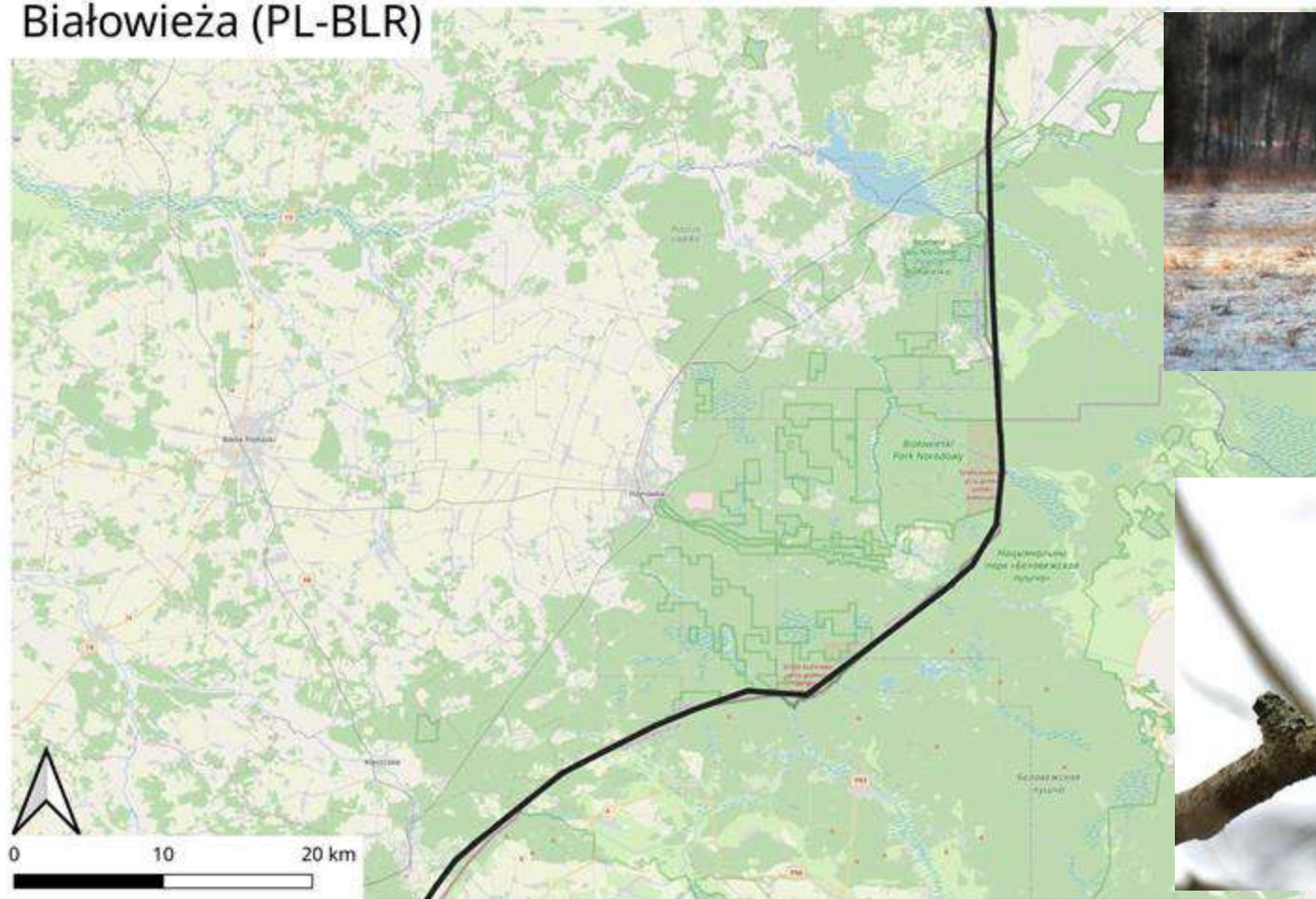
Reporting levels



SORT	NUTS_CODE	NUTS_NAME	AREA	FAREA	PERC_FAREA	AT_CONS	FARE	FA/CHY	TRANSITIONAL	DOMINANT	INTERIOR
[*]	[*]	[*]	[*]	[*]	[*]	[*]	[*]	[*]	[*]	[*]	[*]
1	AL	SPHIPERIA	2,879,863	1,005,548	35.40	67.58	0.36	32.64	21.74	47.29	18.57
2	AT	OSTERREICH	8,377,950	3,709,762	44.28	69.04	0.27	30.43	21.61	46.11	23.40
3	BE	BEUGIQUIC-BELGIE	3,058,638	626,177	20.47	60.73	1.51	23.91	23.38	32.73	19.55



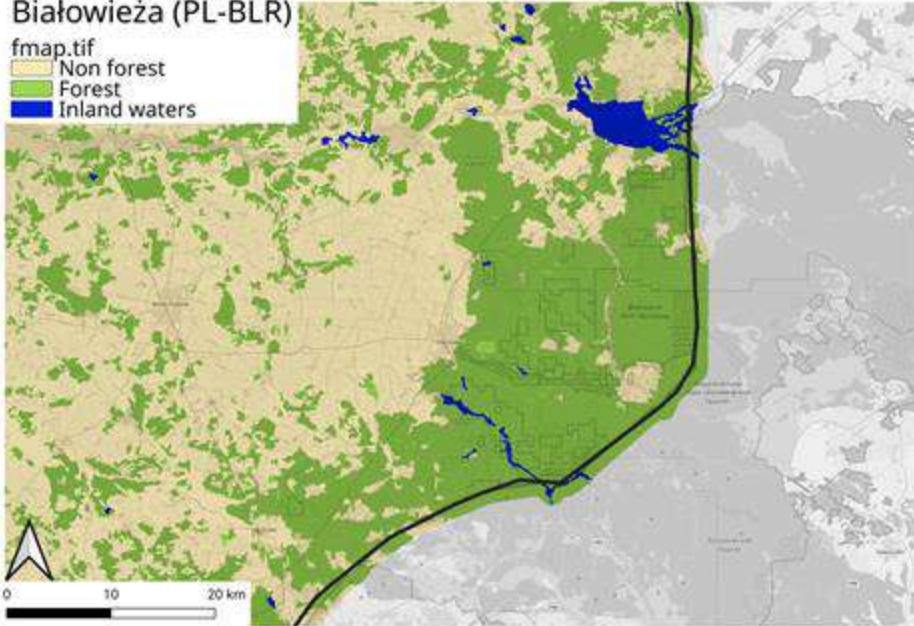
# Białowieża (PL-BLR)



## Forest mask

Białowieża (PL-BLR)

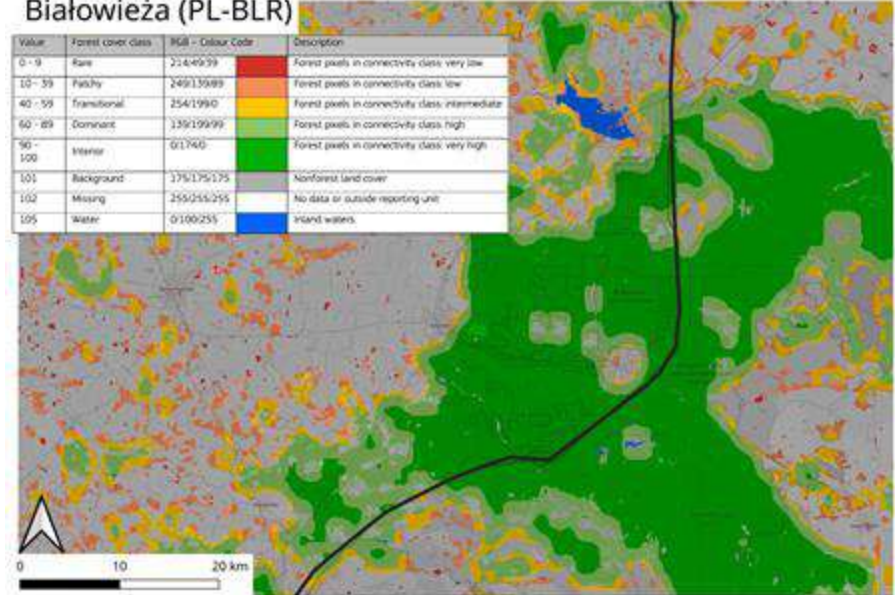
fmap.tif  
Non forest  
Forest  
Inland waters



## Forest connectivity

Białowieża (PL-BLR)

Value	Forest cover class	RGB - Colour Code	Description
0 - 9	Rare	214/49/39	Forest pixels in connectivity class: very low
10 - 39	Faithy	249/139/89	Forest pixels in connectivity class: low
40 - 59	Transitional	254/199/0	Forest pixels in connectivity class: intermediate
60 - 89	Dominant	139/199/99	Forest pixels in connectivity class: high
90 - 100	Intense	0/174/0	Forest pixels in connectivity class: very high
101	Background	175/175/175	Non-forest land cover
102	Missing	255/255/255	No data or outside reporting unit
105	Water	0/100/255	Inland waters





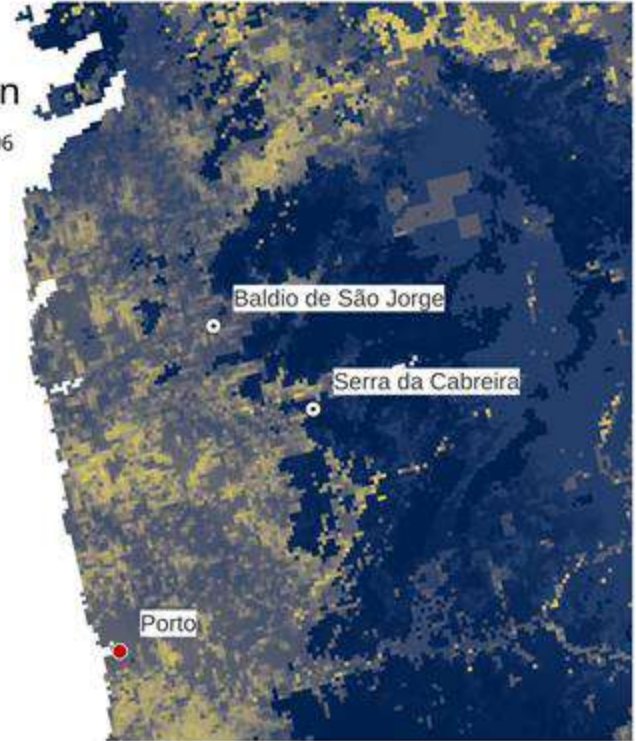
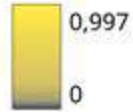
### Forest mask

fmap.tif  
Non forest  
Forest  
Inland waters



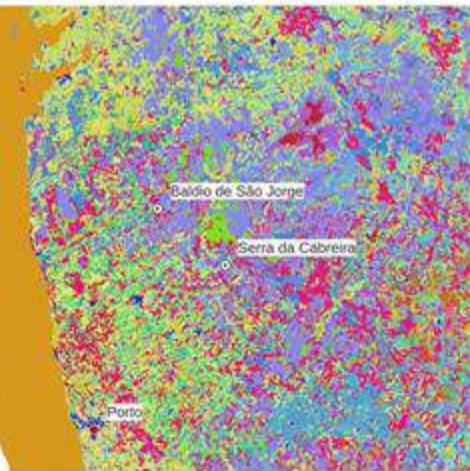
### Forest species composition

eea\_r\_3035\_1\_km\_forest-assemblage-sps\_2006  
Band 1 (Gray)



### Corine Land cover

Layer:  
U2018\_CLC2012\_V2020\_20u1.tif



“A forest != A forest”

# Joint Research Centre Science for policy report Mapping and assessment of Ecosystems and their Services: an EU ecosystem assessment (report + annexes + datasets)



Publicly available  
layers on forest  
ecosystems!



Indicator – Pressures and condition	Method of trend calculation	Recoding rules	Spatial resolution of the indicator
Tree cover loss	TS-MK	Upward significant: 1 Degradation Downward significant: 2 Improvement Not significant: 3 No change	10 km
Effective rainfall	TS-MK	Upward significant -> 4 Unresolved Downward significant -> 1 Degradation Not significant -> 3 No change	-50 km
Mean annual temperature	TS-MK	Upward significant -> 1 Degradation Downward significant -> 4 Unresolved Not significant -> 3 No change	-10 km
Extreme drought events	TS-MK	0 = no significant change -> 3 No change 1 = decreasing drought (negative slope) -> 2 Improvement 2 = increasing drought (positive slope) -> 1 Degradation	-25 km
Productivity under drought	See Ivits et al. (2016)	1 (Degradation) -> 1 Degradation 2 (No sig) -> 3 No change 3 (Sig positive) -> 3 No change	1 km
Soil Moisture (Soil water deficit)	TS-MK	> 0 -> 1 Degradation 0 -> No change < 0 -> Improvement	5 km
Acidification	5% rule	<= -5 -> 2 Improvement >= 5 -> 1 Degradation -5 to 5 -> 3 No change	-10 km
Eutrophication	5% rule	<= -5 -> 2 Improvement >= 5 -> 1 Degradation -5 to 5 -> 3 No change	-10 km
Tropospheric ozone (AO740)	TS-MK	Upward significant: 1 Degradation Downward significant: 2 Improvement Not significant: 3 No change	7 km x 9 km
Forest fragmentation (AV-FAD)	5% rule	0b - outside EU-28 -> 0 Background 1b - degradation -> 1 Degradation 2b - improvement -> 2 Improvement 3b - stable -> 3 No change 4b - grey: not forest at both or either times -> 4 Unresolved	1 km
Forest cover change	5% rule	Stable -> 3 No change Improvement -> 2 Improvement Degradation -> 1 Degradation	1 km
Dry matter productivity	TS-MK	Upward significant -> 2 Improvement Downward significant -> 1 Degradation Not significant -> 3 No change	1 km
Evapotranspiration	TS-MK	Upward significant -> 1 Degradation Downward significant -> 1 Degradation Not significant -> 3 No change	-25 km
Landscape mosaic (dominant natural)	5% rule	0b - outside EU-28 -> 0 Background 1b - degradation -> 1 Degradation	1 km

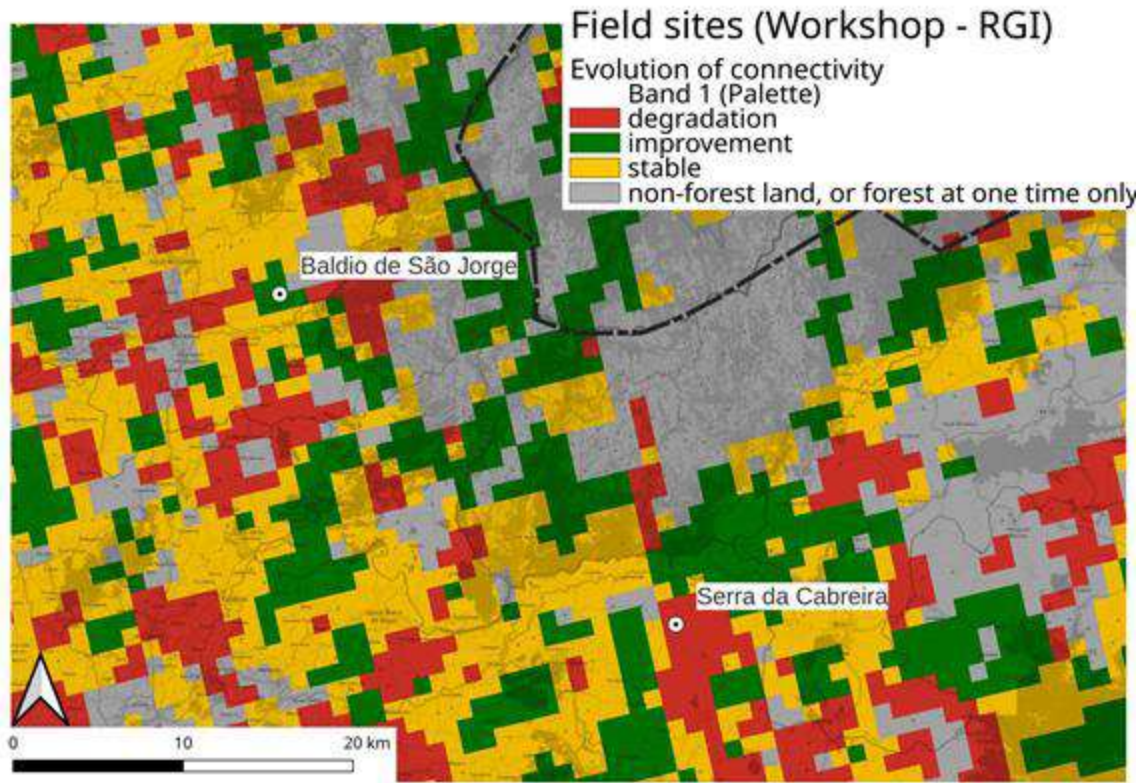






Field sites (Workshop - RGI)

Value	Forest cover class	RGI - Data Code	Description
0-9	None	25446533	Forest pixels in symbology class zero low
10-30	Partial	24913689	Forest pixels in symbology class low
40-50	Transition	25413690	Forest pixels in symbology class intermediate
60-80	Dominant	13913699	Forest pixels in symbology class high
80-100	Intact	311740	Forest pixels in symbology class very high
255	Background	13613673	Nonforest land cover
256	Missing	20021024	No data or outside reporting unit
257	Water	9100236	Inland waters



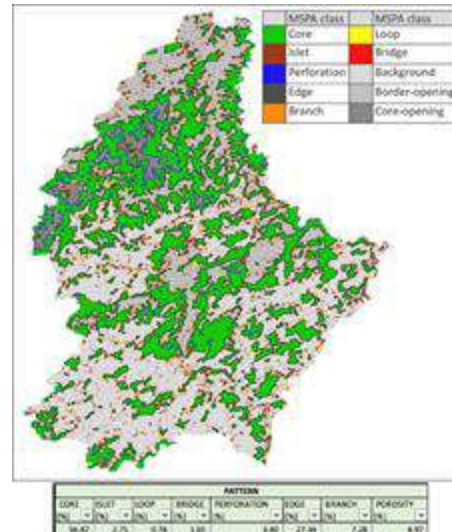
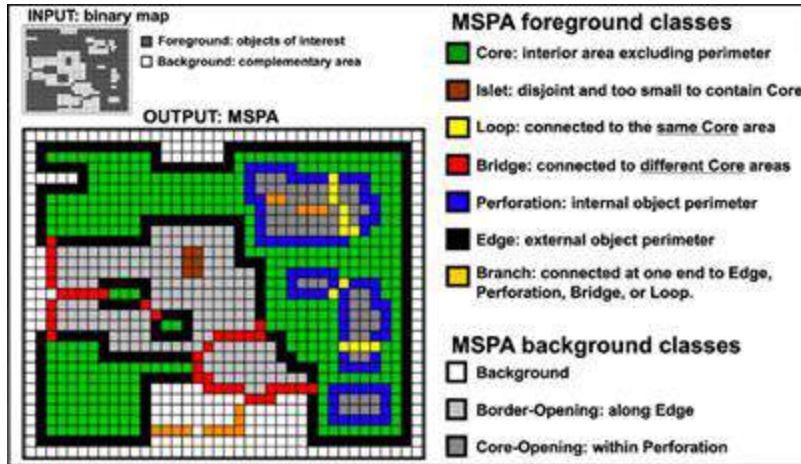
# Global analysis of forest attribute layers for the EU Observatory on deforestation and forest degradation

<https://publications.jrc.ec.europa.eu/repository/handle/JRC130494>

+ Associated dataset

<https://data.jrc.ec.europa.eu/dataset/24278219-a84c-4a12-a8b9-a811c93006c3#dataaccess>

In addition to connectivity and fragmentation: Morphological Spatial **Pattern Analysis**





## The power lines right-of-ways:

- Necessity
- Cleared corridors in the forest
- Involve a long term planned management
- Management should be cost effective

= a barrier in the forest ?



= a meadow/shrub corridor ?





- Multi-species approach (France) on the impacts of powerline safety corridors on mammals:
  - Roe-deer
  - Fox
  - Hedgehog
  - Pine marten
  - Bank vole
- Population genetics
- Banded animals (GPS collars)
- Direct observations (bats)

PROGRAMME RTE – PNR08

2012-2015

Evaluation de l'impact du Réseau de Transport d'Électricité sur la connectivité du massif ardennais pour des mammifères sauvages.

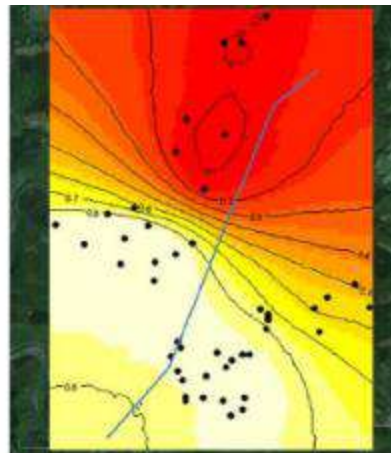
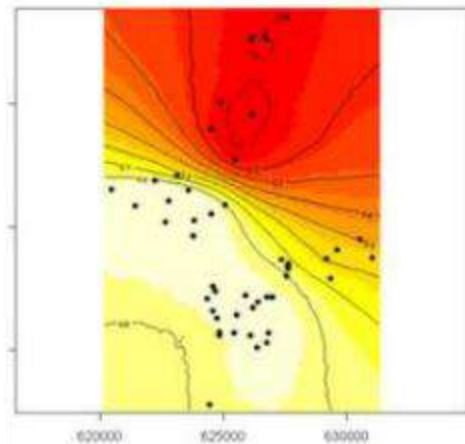
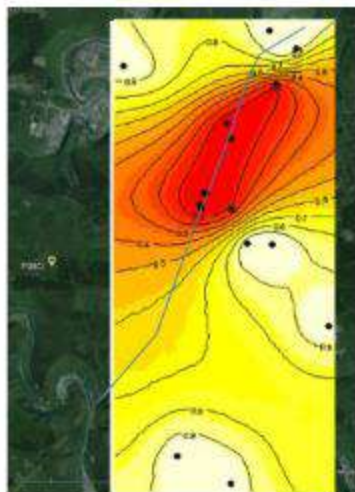
Responsable du programme

Rémi HELDER, Université de Reims, Centre de Recherche et de Formation en Eco-éthologie (CERFE), 5 rue de la Héronnière, 08240 Boul-t-aux-Bois

Membres de l'équipe

Clara Bardonnet, Carole Bodin, Pauline Hubert, Marina Mergéy, Thomas Quintaine



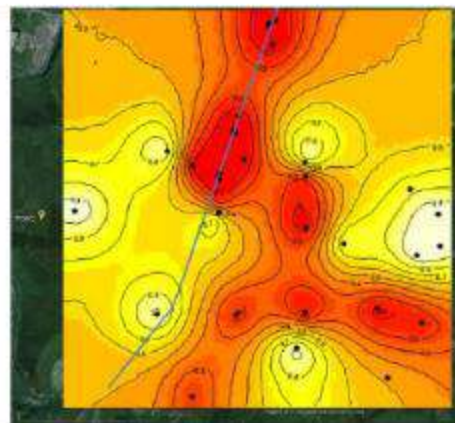
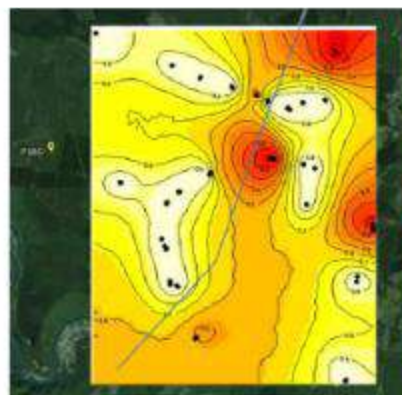
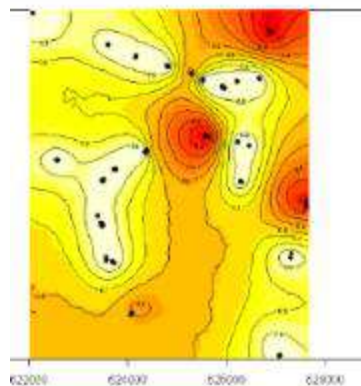


Fox ↑

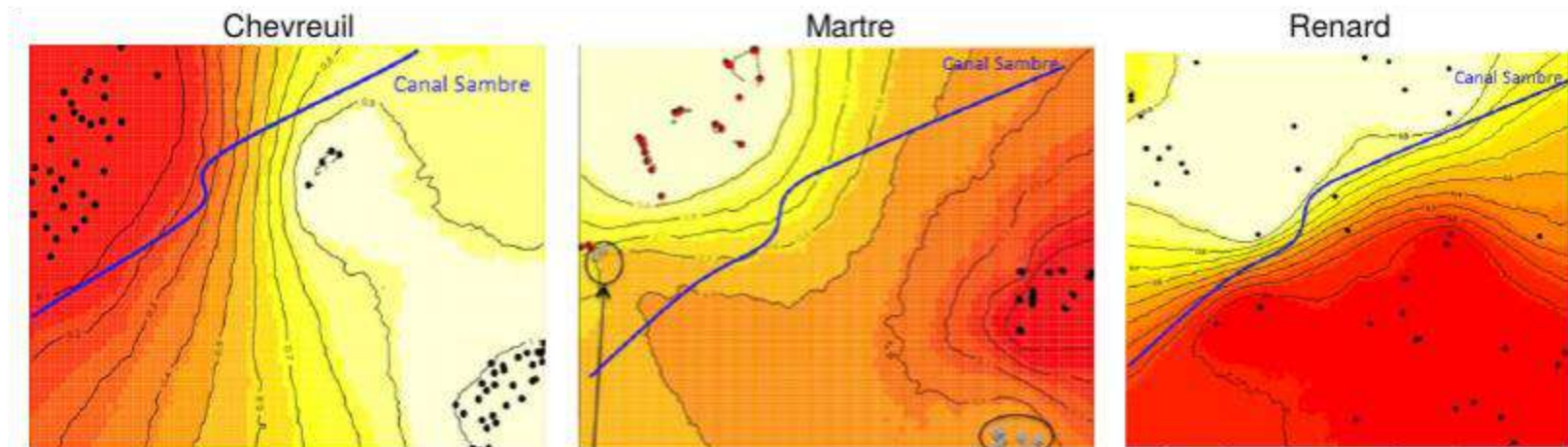
Bank vole ↓

Roe-Deer ↑

Pine marten ↓



No effects on genetic fluxes for these 4 species  
whereas a river induced a strong effect on 3 of them





# Conclusion

- Plenty of dataset at different scales (EU, National, Regional)  
=> select the appropriate one
- Glades, deadwood, edges, not productive species, vegetation layers are all component of forest ecosystems
- We can ... rather SHOULD transform the grid into integrated mosaic of habitats that host populations of species and increase the forest resilience