Connectivity: spatial and temporal scales issues in the context of land abandonment.

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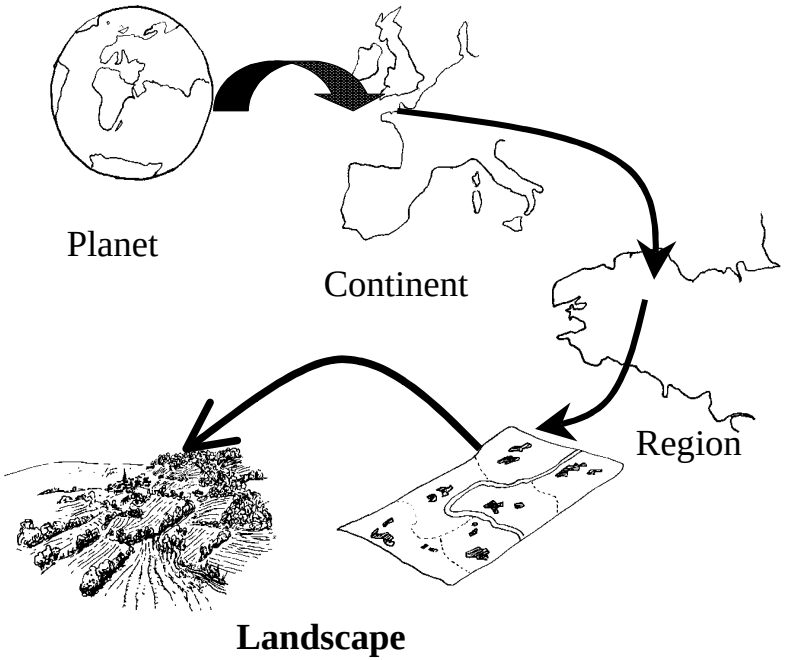
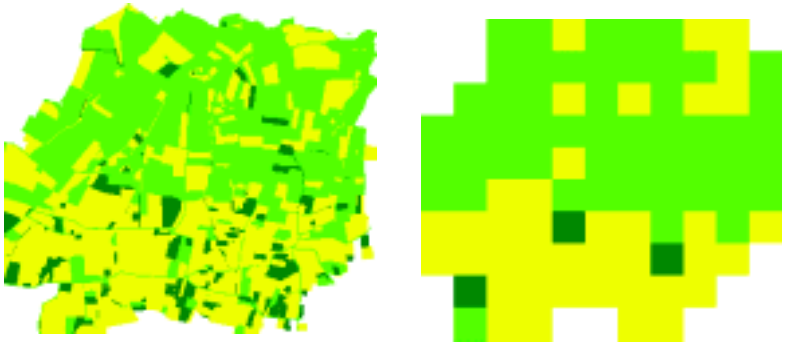
Scales

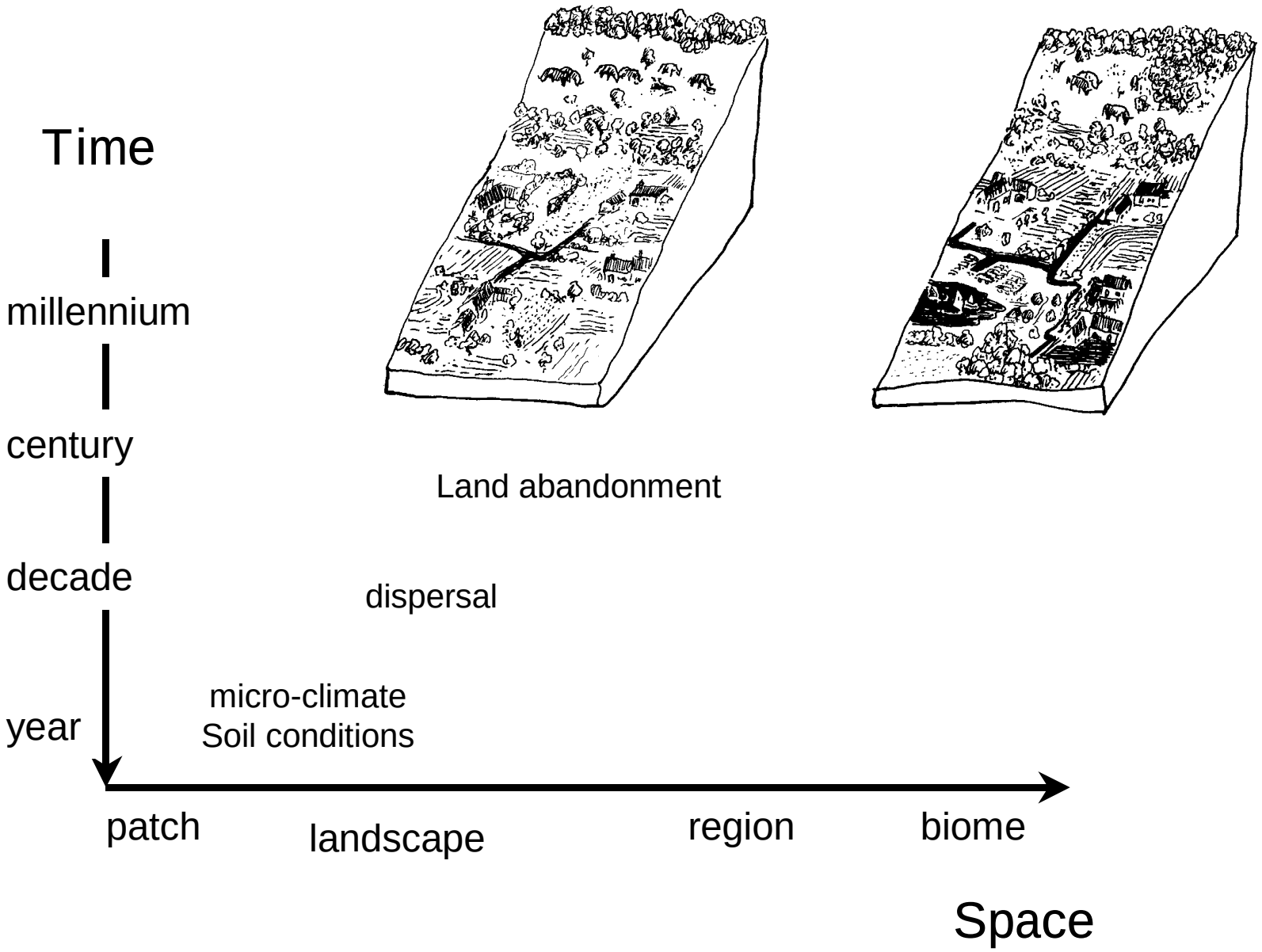




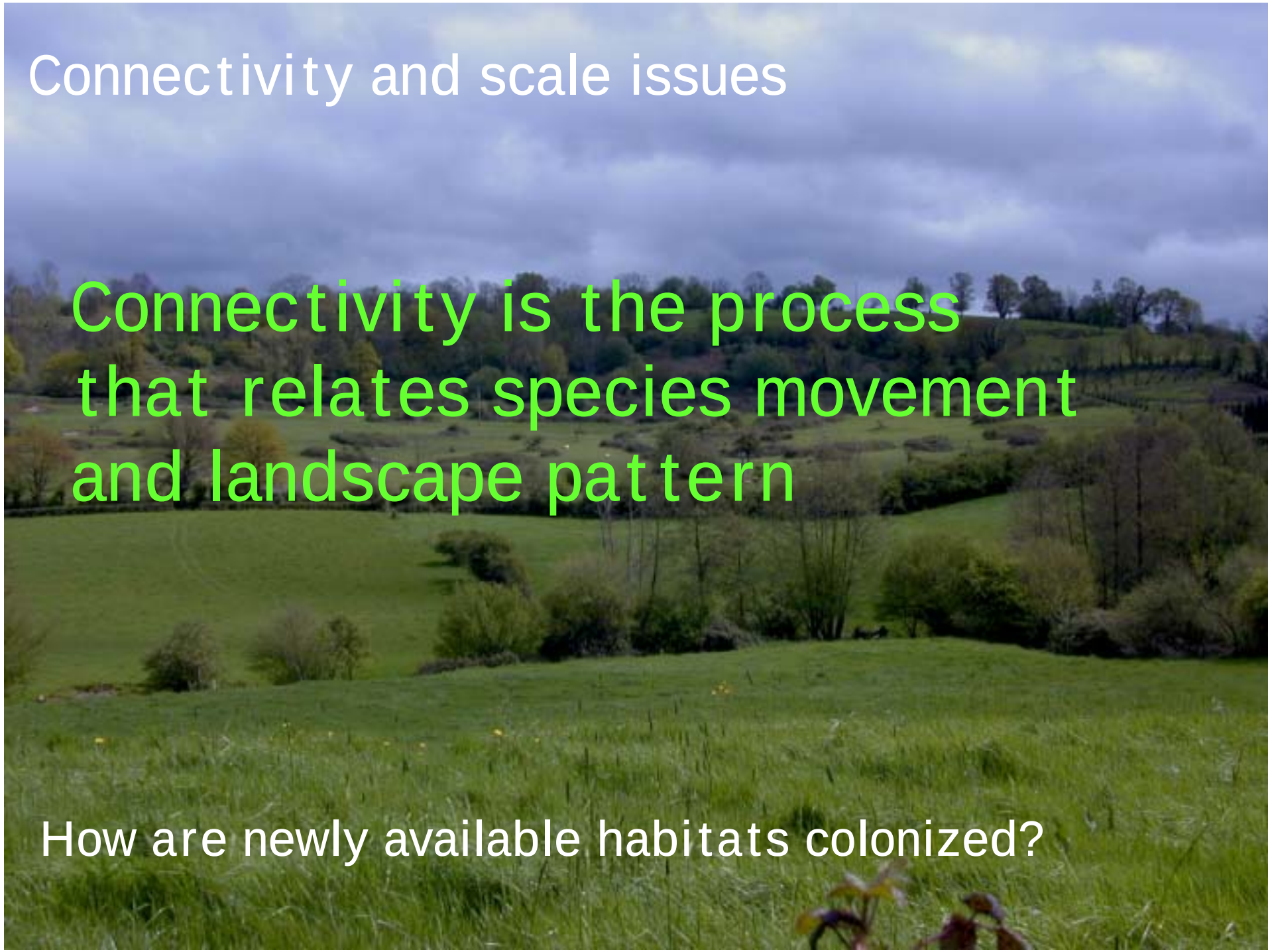
Resolution (grain)

Extent

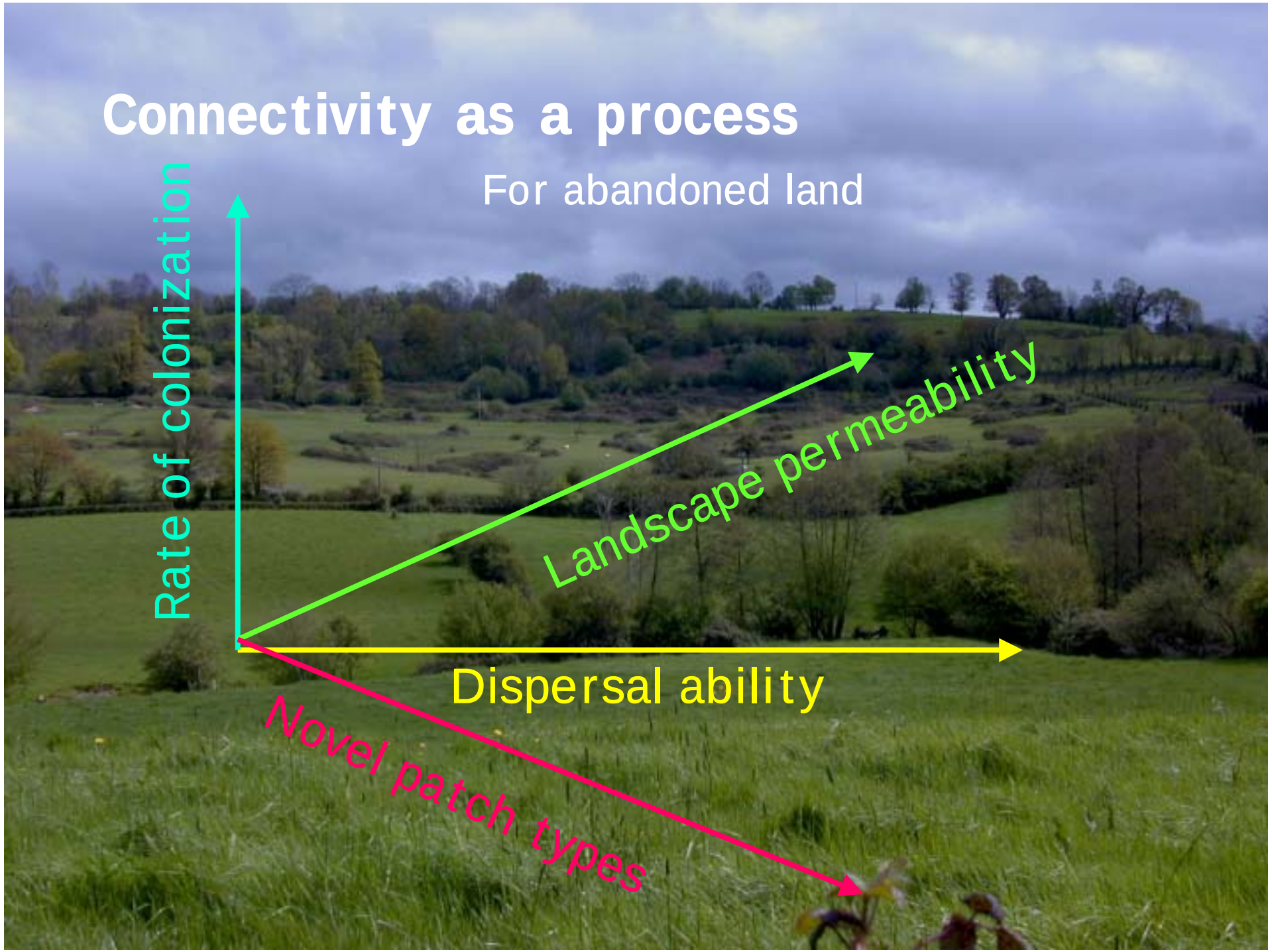
Ratio = (change) quantity 1/ (change) quantity 2



Burel & Baudry, 1999 - 2003

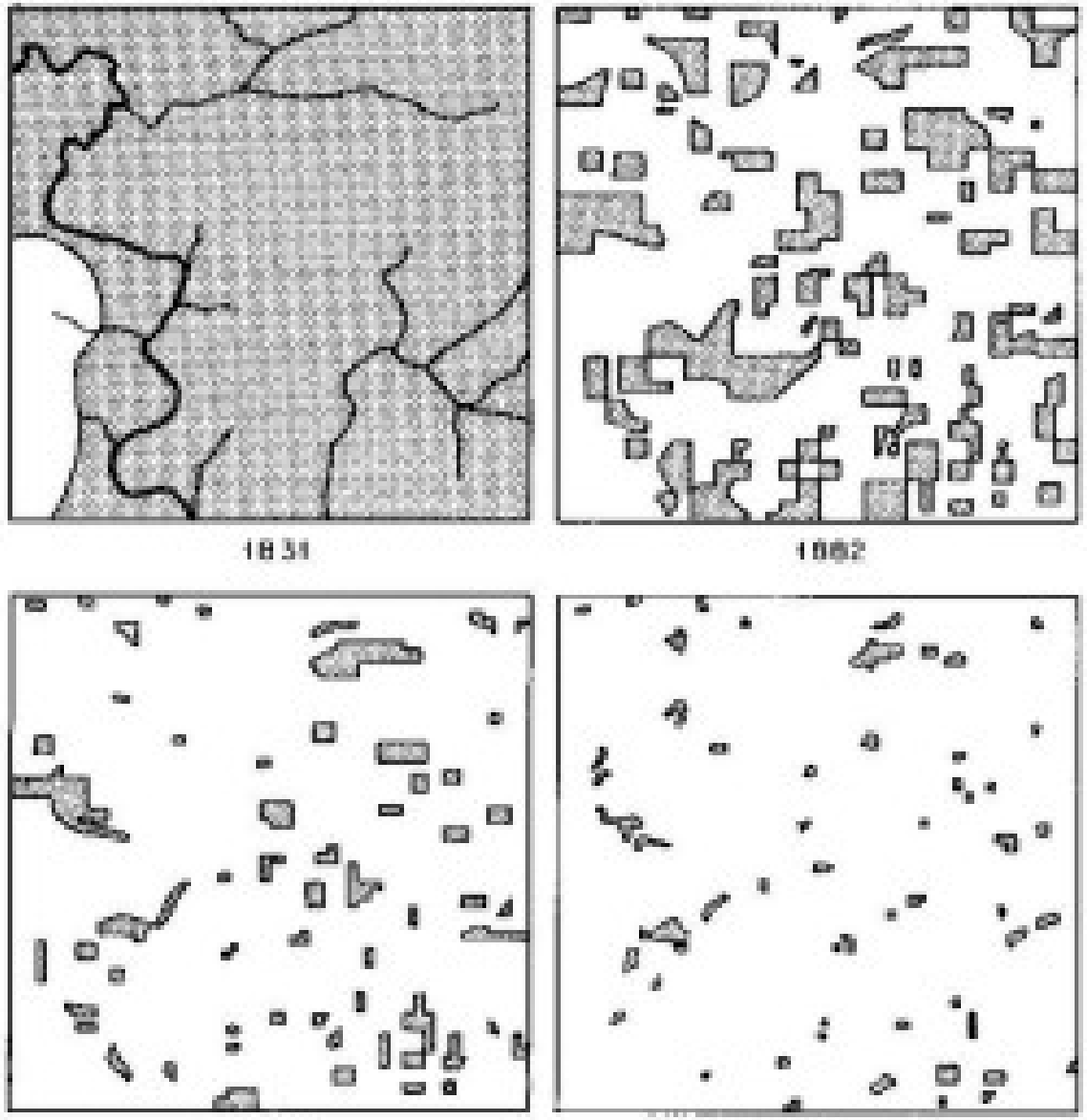

Connectivity and scale issues
Connectivity is the process that relates species movement and landscape pattern
How are newly available habitats colonized?


How flora & fauna can benefit from land abandonment ?


Connectivity as a process
For abandoned land
Rate of colonization
Landscape permeability
Dispersal ability
Novel patch types

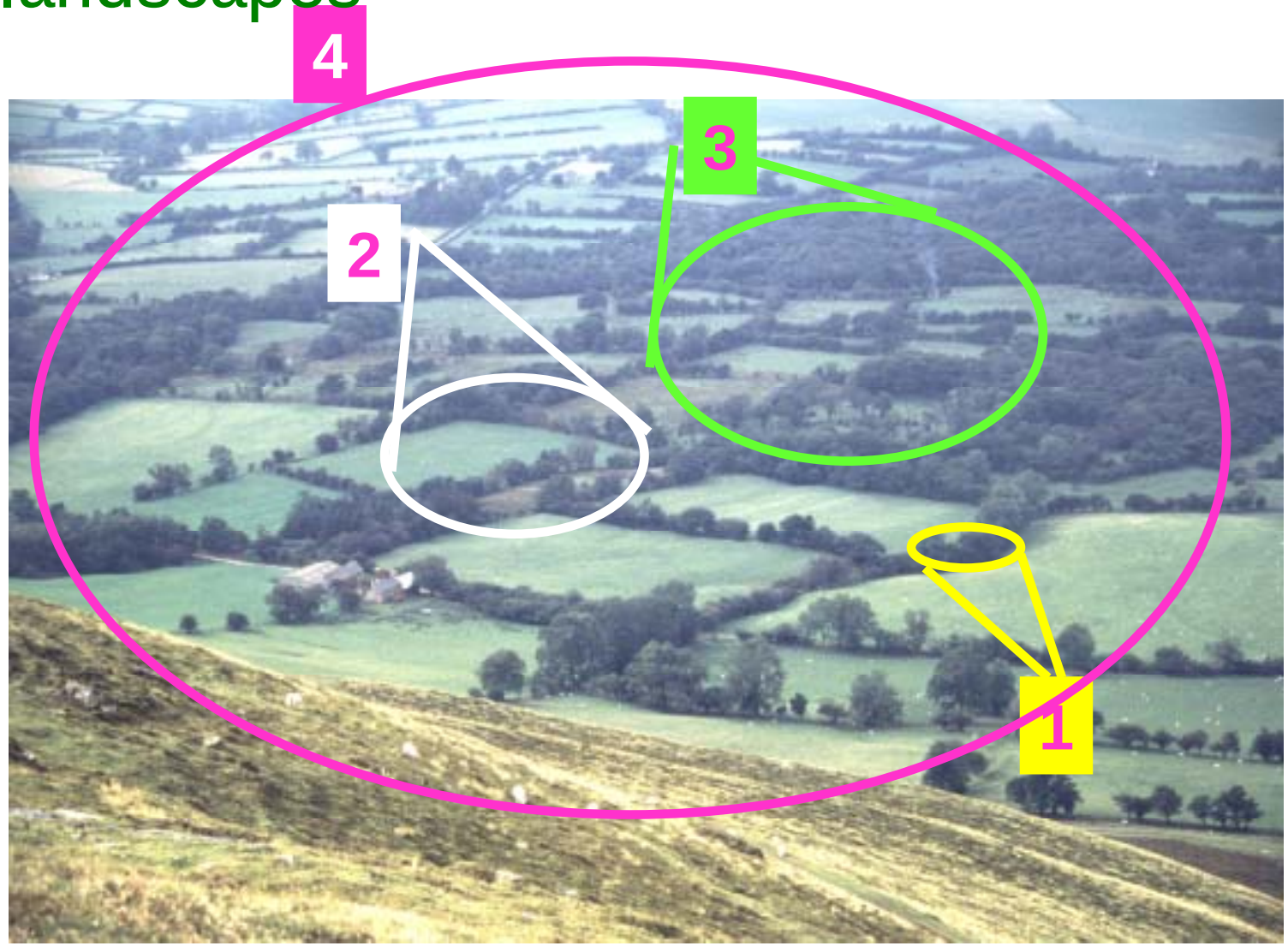

Scaling issues and species behavior
Scaling issues in mapping and analysis
Scaling issues in land abandonment as a process

Land abandonment is not the reversal of deforestation



Cadiz township, Green County, Wisconsin USA

Scaling issues and species behavior: the use of landscapes



Scaling issues and species behavior

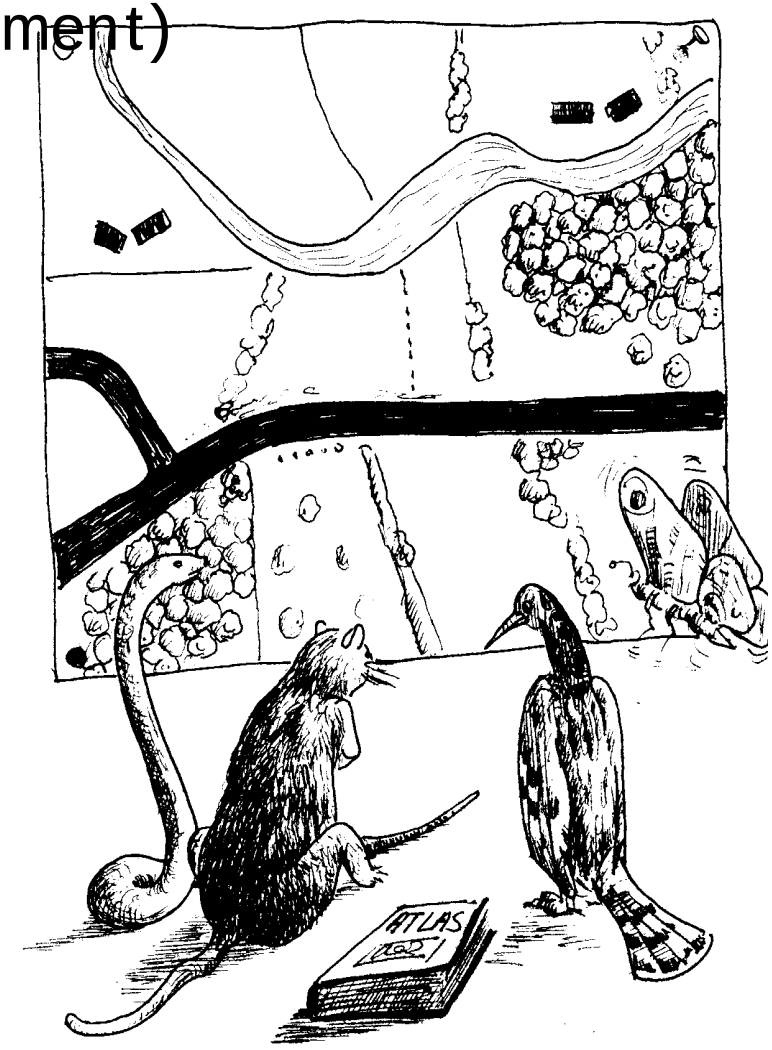
Habitat size (minimum area requirement)

Complementation among habitats

Types of movement: daily (feeding), Migration, colonization

Type of dispersal & landscape permeability

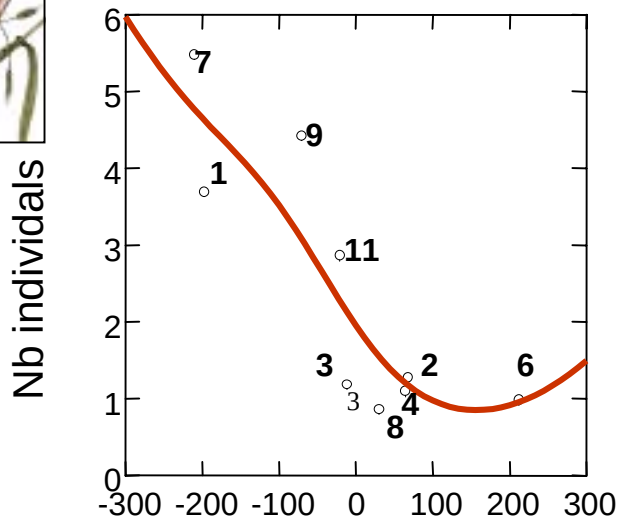
Best fit to landscape extent



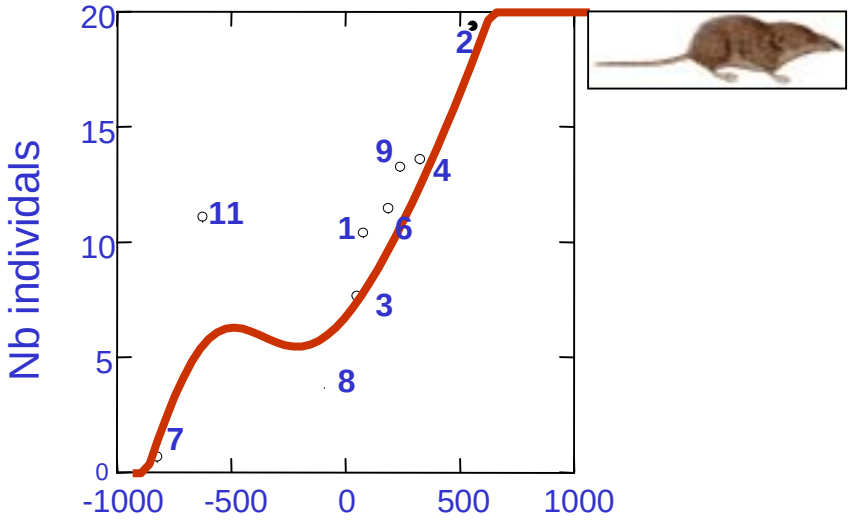
The scale response of organismes

Small mammals response per site.

Micromys minutus



Crocidura russula



Windows 50 X 50 meters

Windows 450 X 450 meters

Perm Grass / Wood

« other crops »

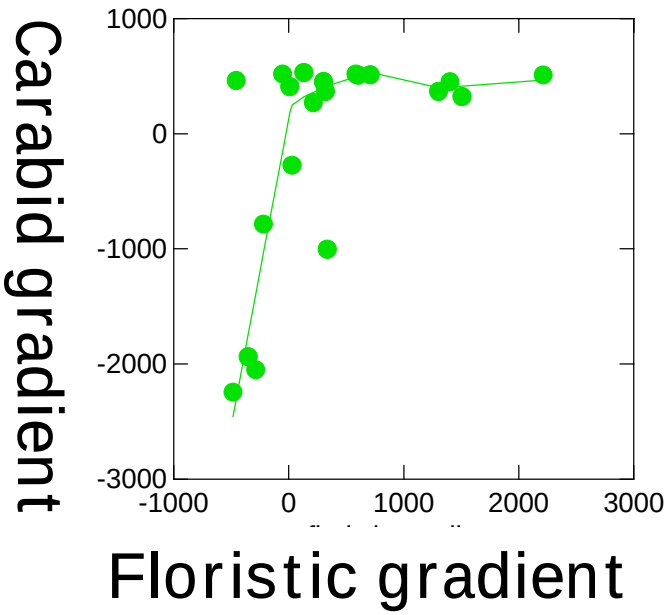
Perm Grass / Wood

« other crops »

Landscape gradient (1 km² sites)

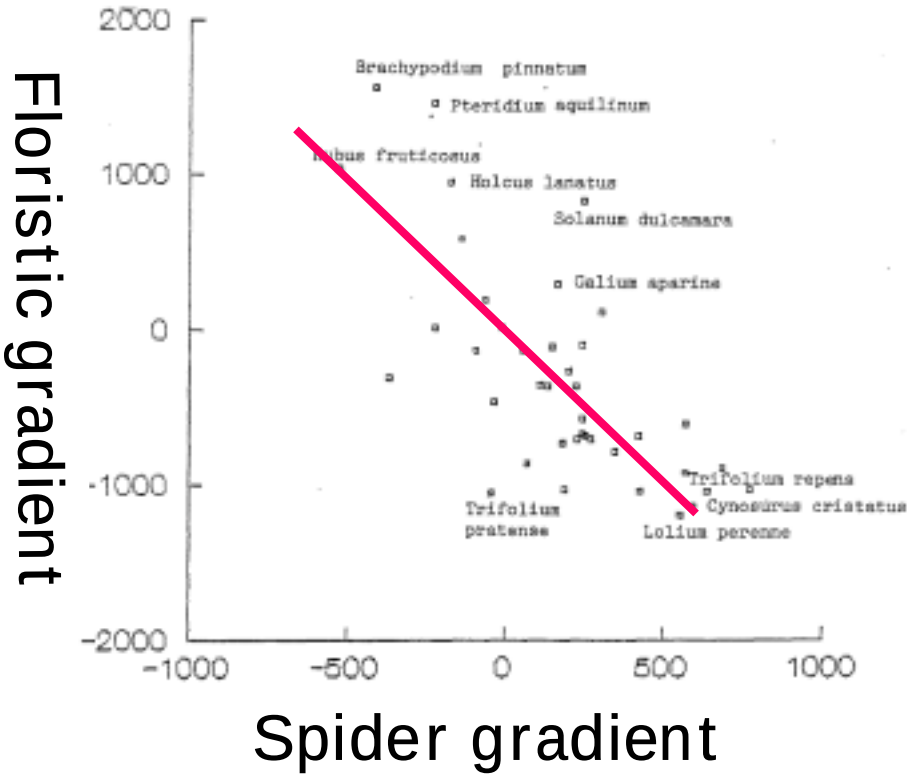
Rate of response to vegetation change

Non linear response of carabids

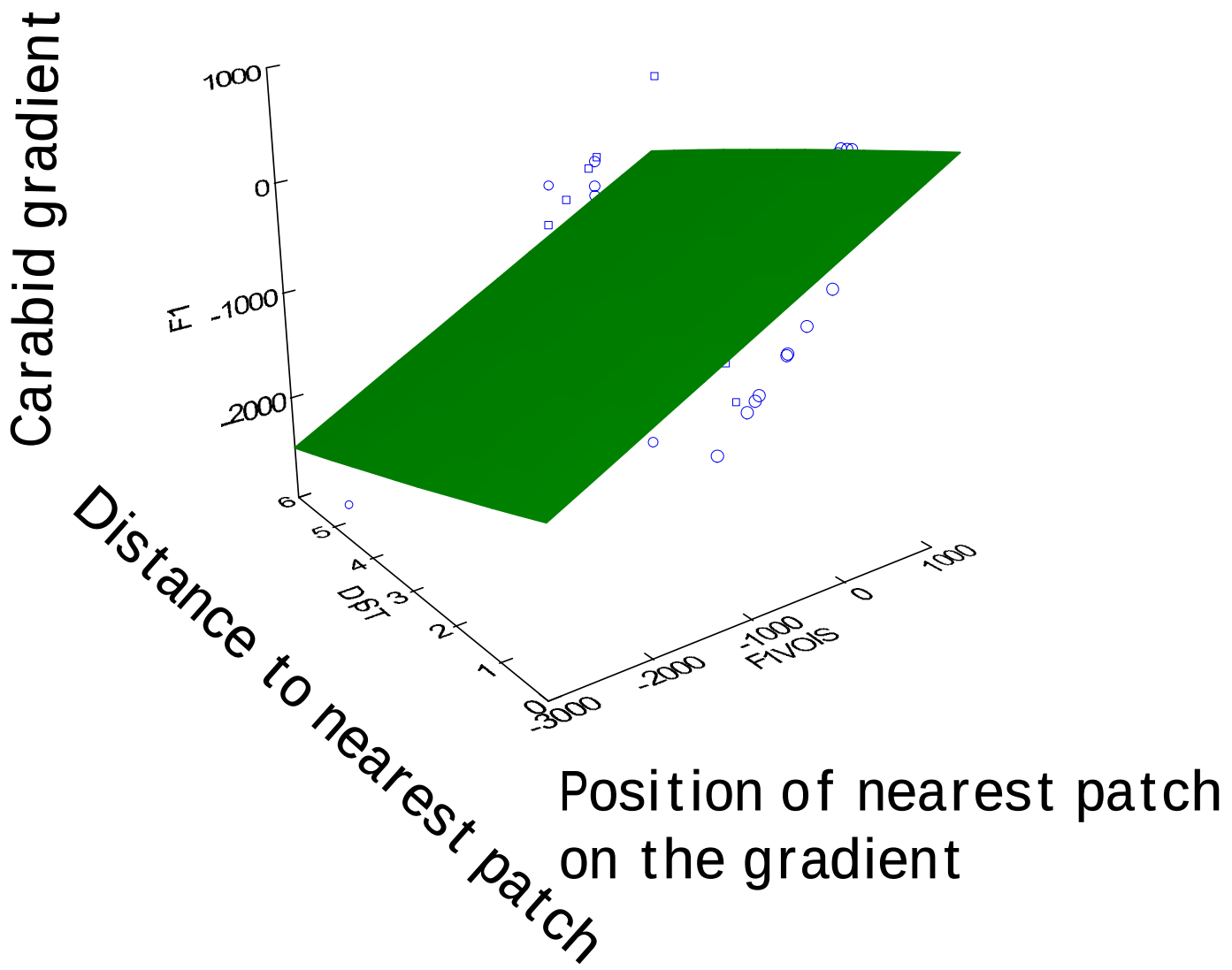


Burel & Baudry, 1994

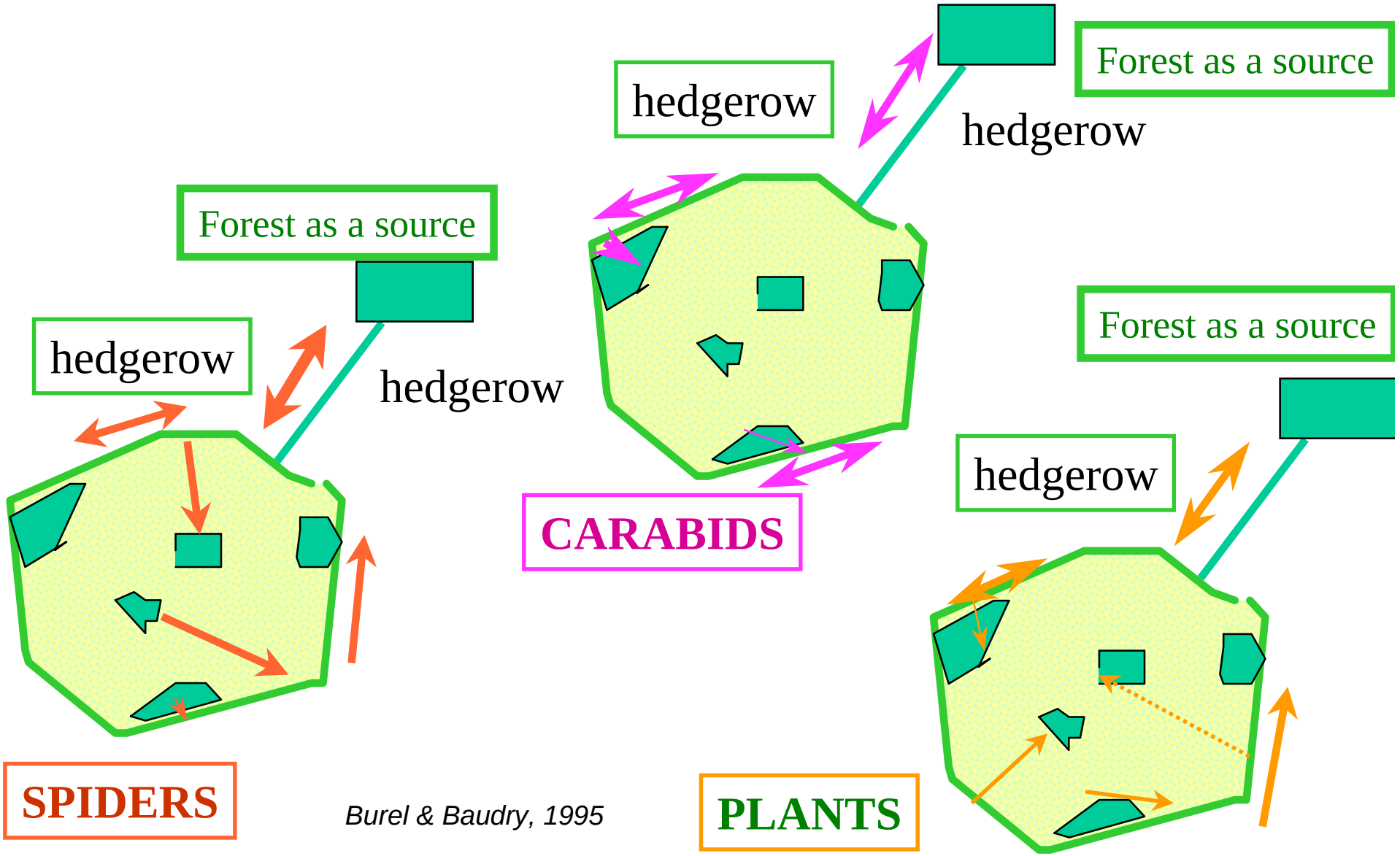
Linear response of spiders



Baudry & Asselin, 1991


Carabid gradient
Distance to nearest patch
Position of nearest patch on the gradient
F1
1000
0
-1000
-2000
DpT
6
5
4
3
2
1
0
FIVOIS
-3000
-2000
-1000
0
1000

Differences in colonization according to species

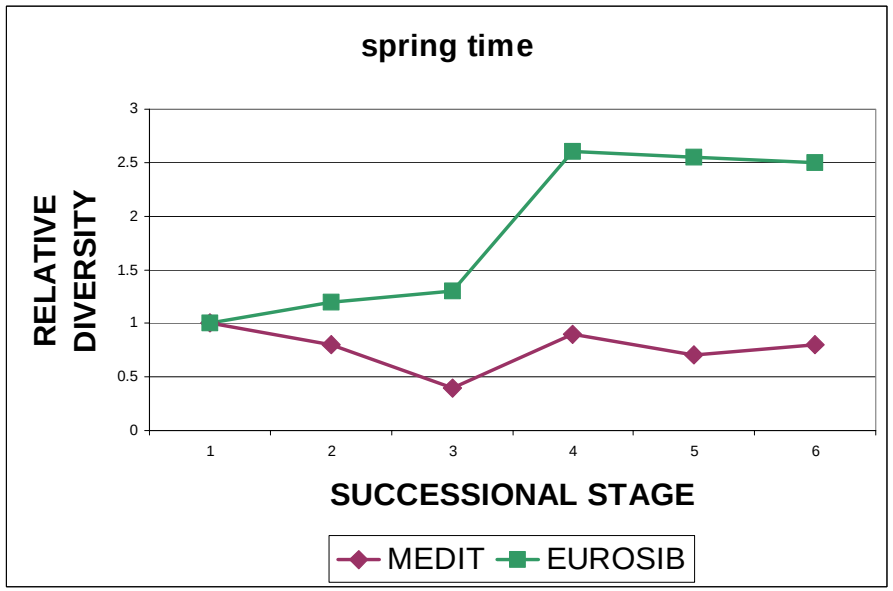


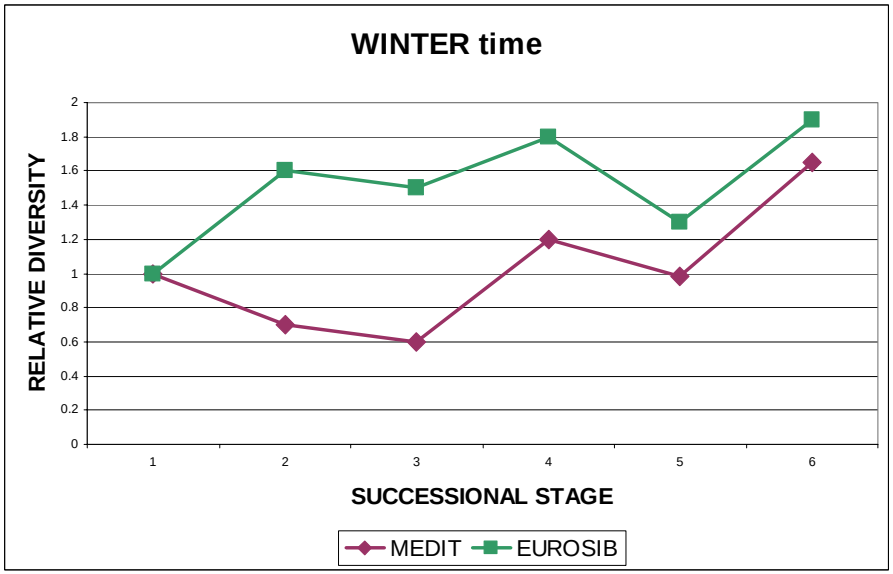
Burel & Baudry, 1995

Response to vegetation change

Importance of time grain of analysis (fine grain)

Birds in a mediterranean landscape

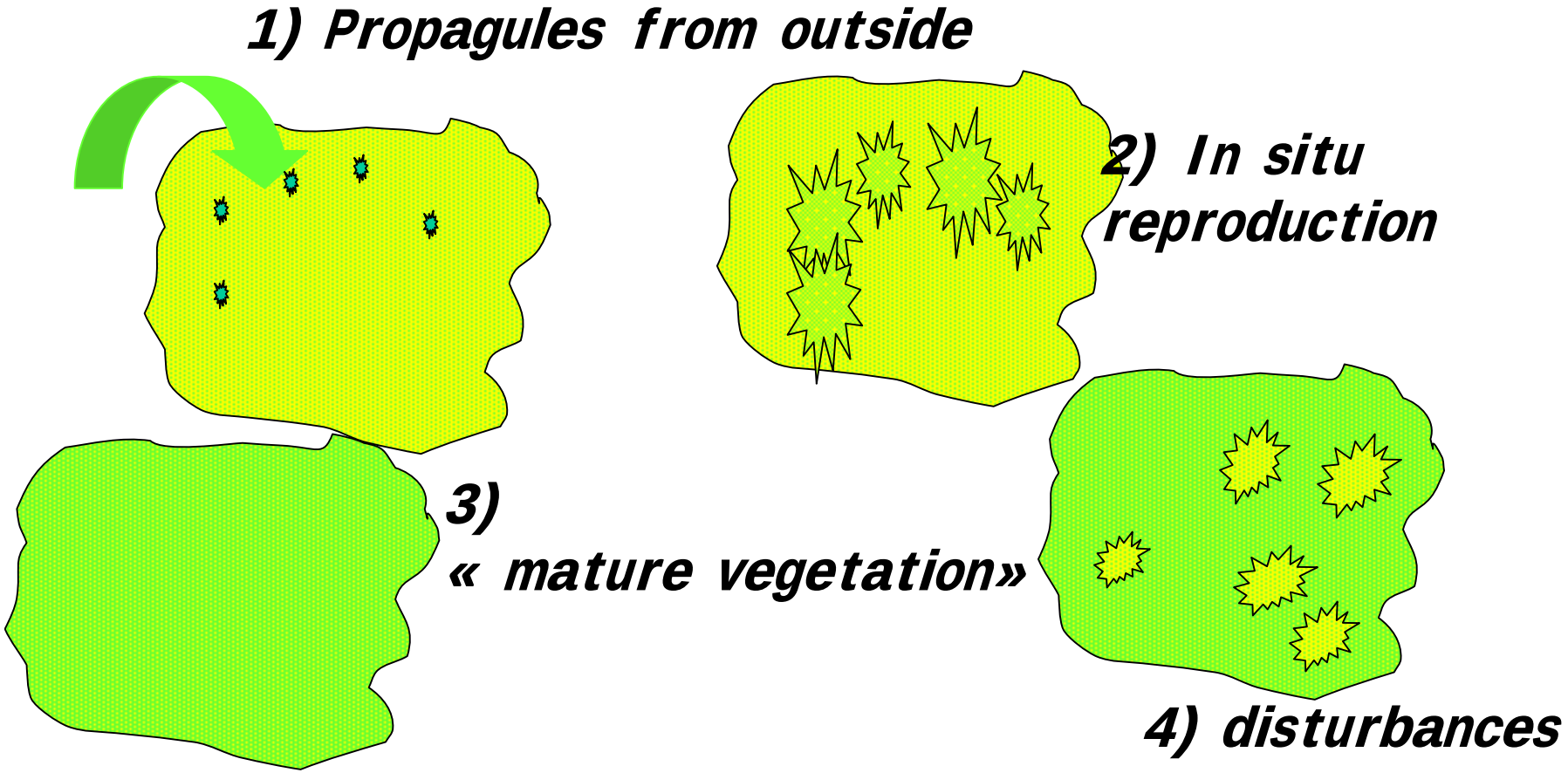




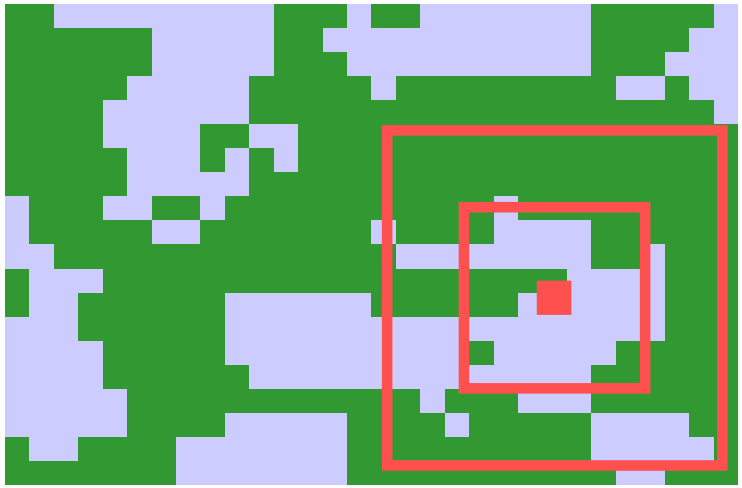
Suarez Seoane, Osborne & Baudry, 2002

Processes change over time :

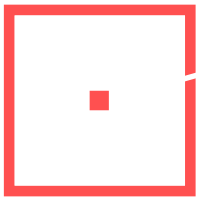
Importance of time grain of analysis (coarse grain)



Potential habitat

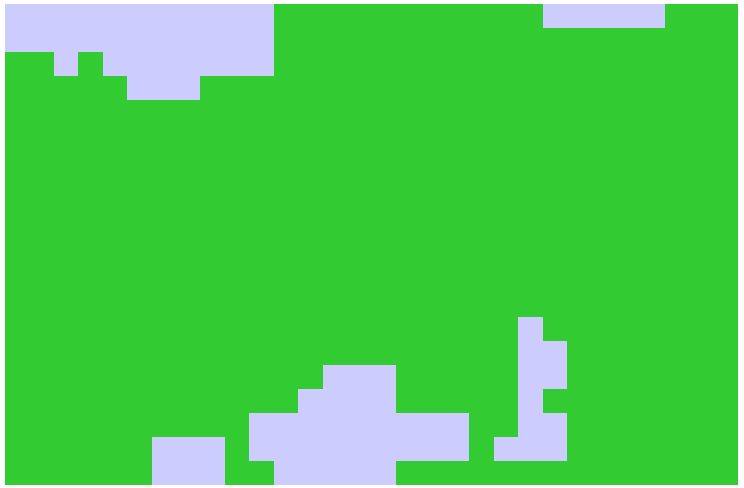


On the map



Central pixel

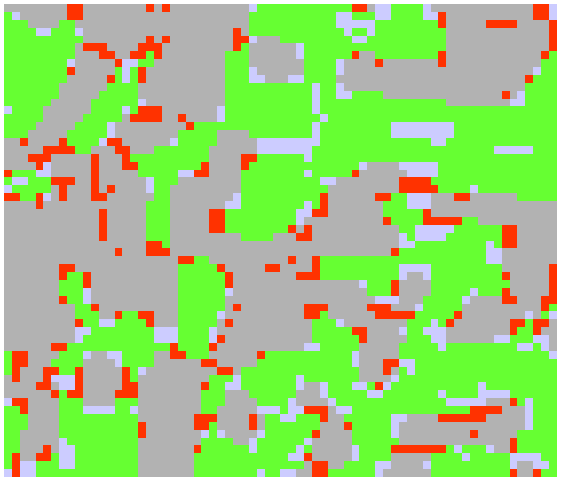
Window



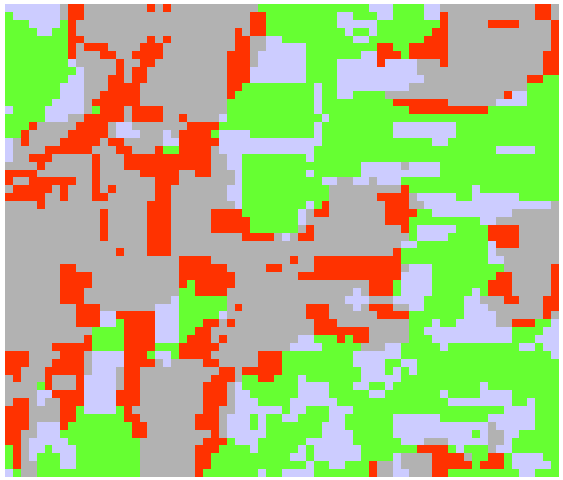
10 X 10 pixels windows with at least 50% habitat

Suitable patch type

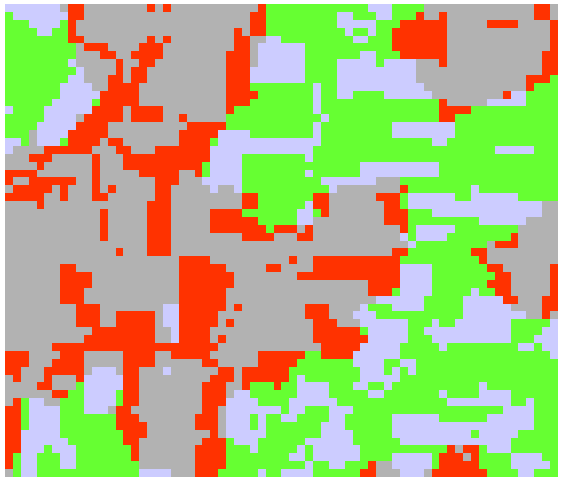
«Available habitat» for species with different grain and same requirement (50% wood): implications for connectivity



Fine grain (L = 5)



Medium grain (L = 10)



Coarse grain (L = 15)

Available for the species

Not available

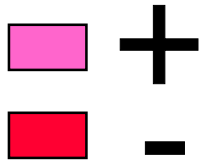
area included in home range

Decreasing connectivity

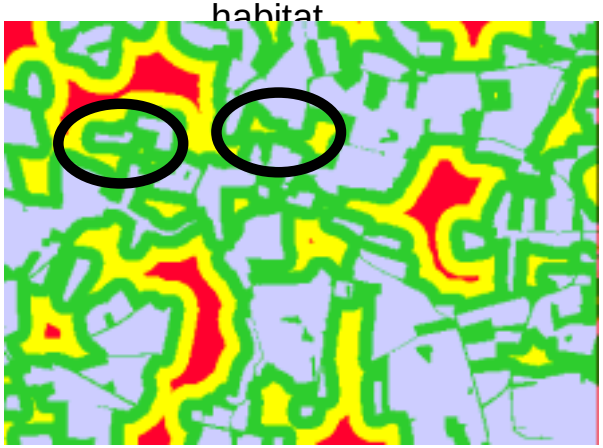
Integrating permeability

habitat

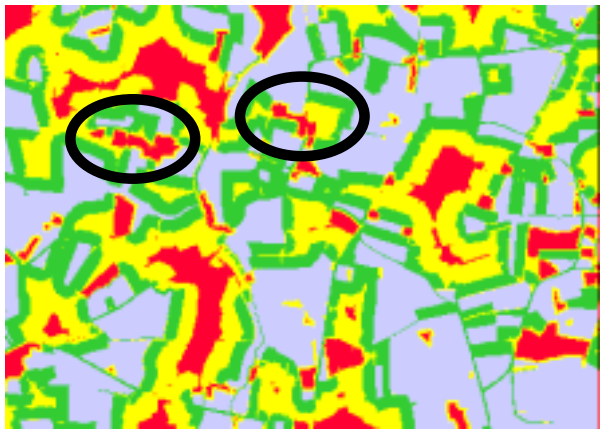
permeability



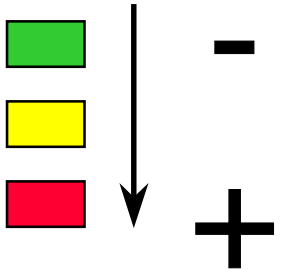
habitat



distance



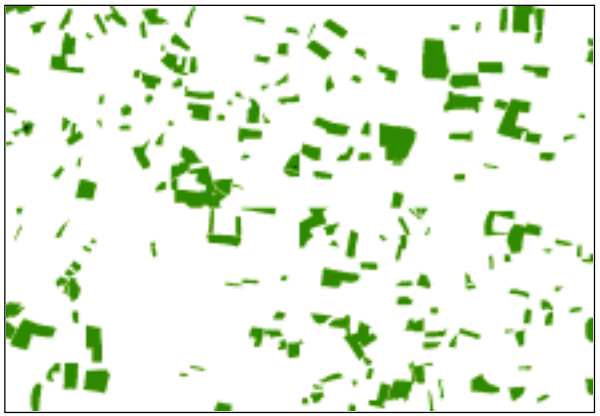
distance + permeability



habitat

Modeling to obtain populations and metapopulation

Landscape

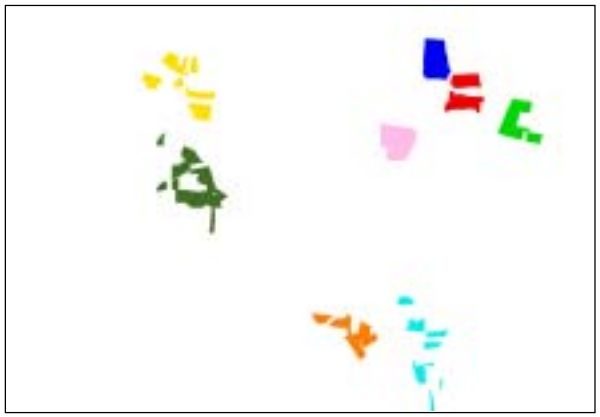


Habitat

Use of
minimum area for a
population

minimum cumulative
resistance

Landpop model



Populations

Metapopulations

G. Pain et al.

Grassland
Abandoned
Cropland
Built area
Networks

(a)

1 km.

Grassland :

Water :

Abandoned :

Types of patches needed

(b)

Habitat 1

habitat 2

1 km.

X

(c)

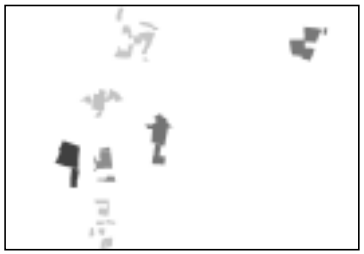
Grassland must be close to streams :

Habitat 1

Abandoned patches must be > 5 ha

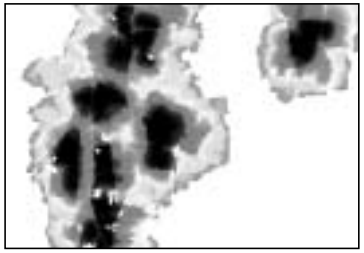
Habitat 2

Habitat 1 (a) Habitat 2



7 potential sub-populations (short term movement)

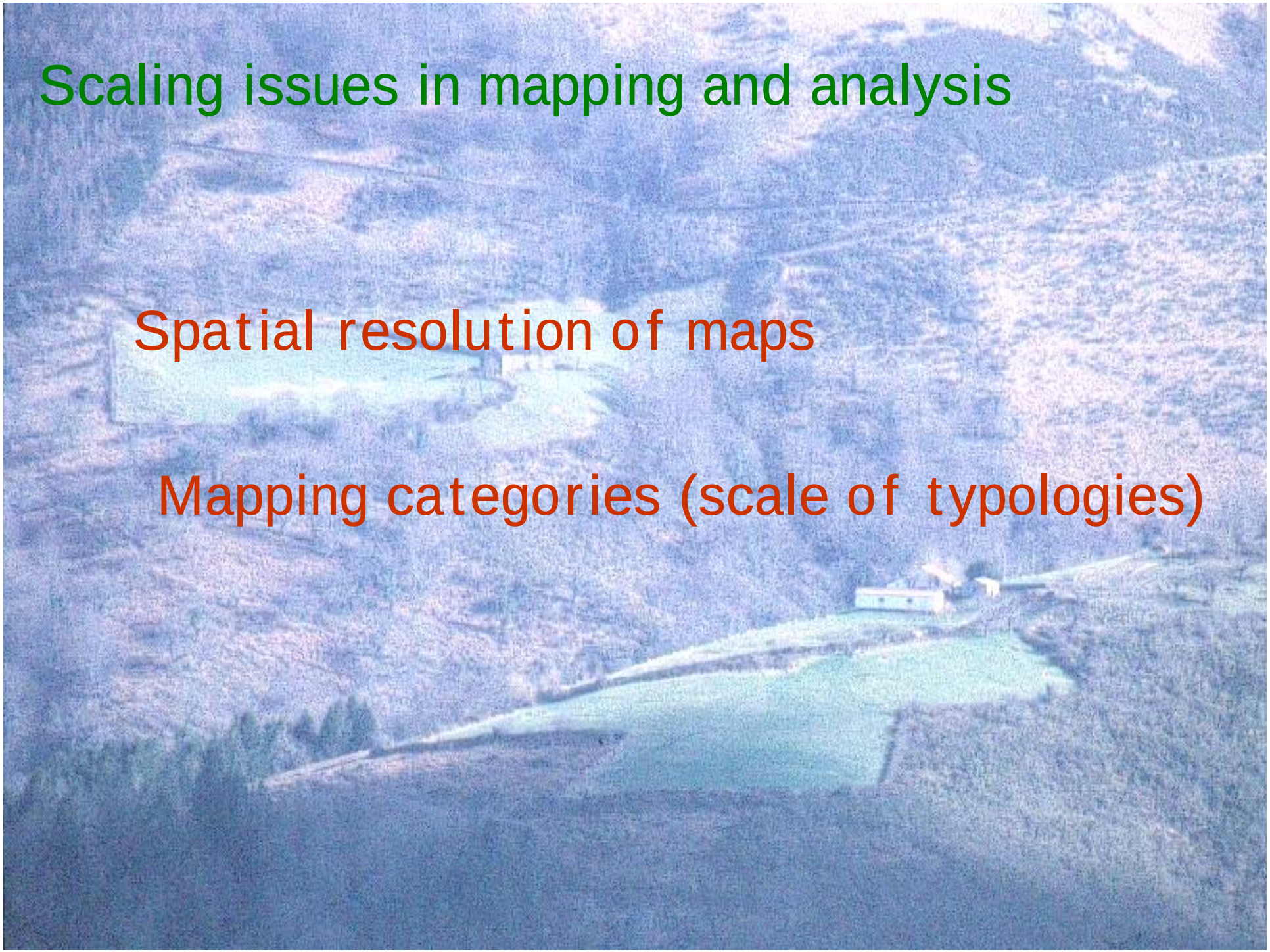
(b)



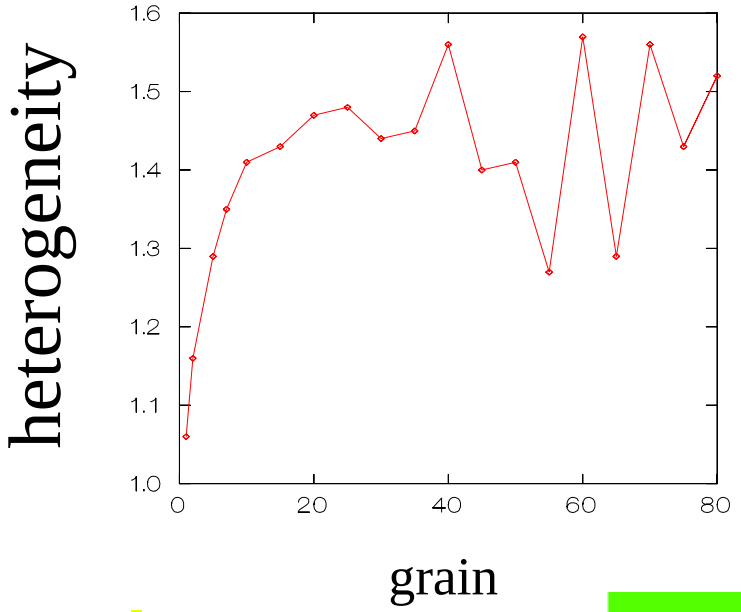
Landscape resistance to movement

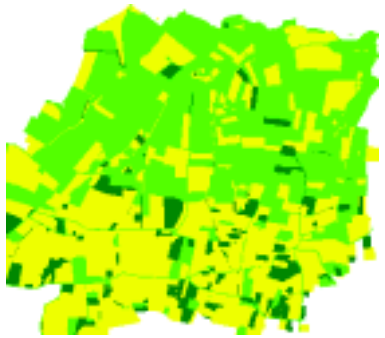
(c)

2 potential populations

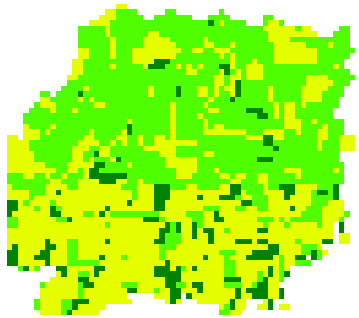

Scaling issues in mapping and analysis
Spatial resolution of maps
Mapping categories (scale of typologies)

Heterogeneity/ connectedness as a function of grain of analysis





02



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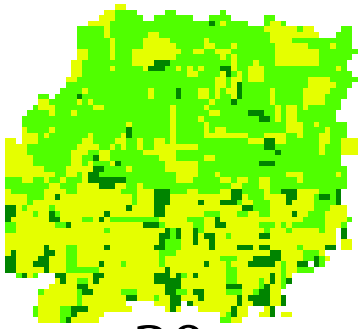

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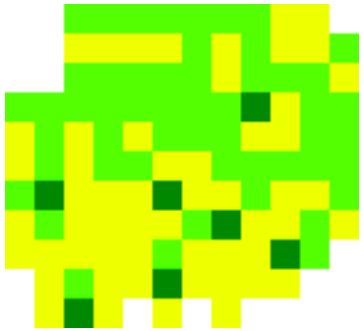
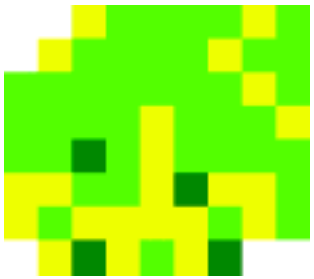


50

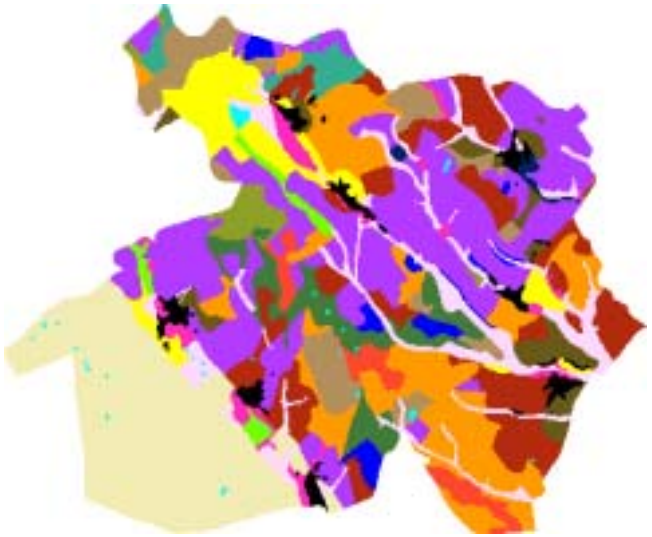
55

60



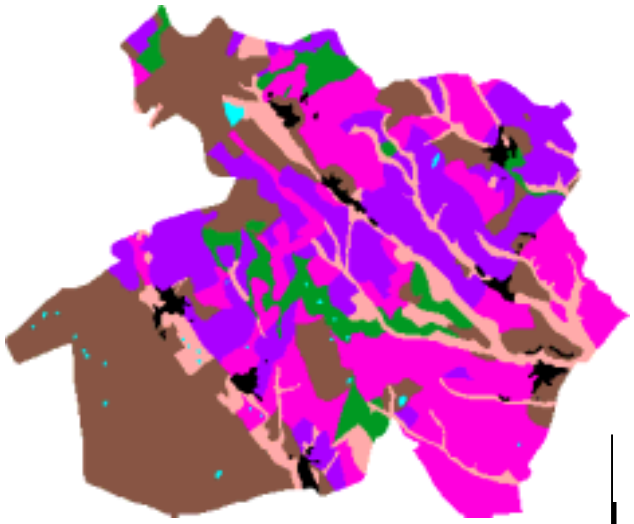
65

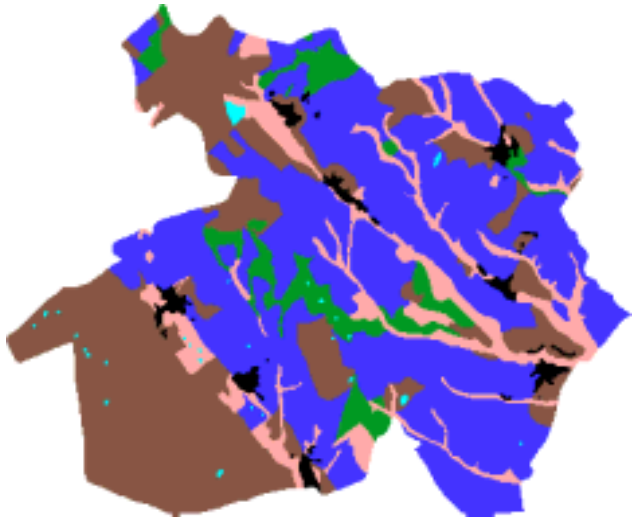
80



Typology A

1. Towns
2. Lakes
3. Non-irrigated crops (field size 0.2 ha)
4. Non-irrigated crops (0.4 ha)+woods
5. Non-irrigated crops (2.5 ha)
6. Irrigated crops (0.5 ha) by wells
7. Irrigated crops (4 ha) by channels
8. **Non-irrigated crops (0.2 ha)+abandoned fields**
9. **Non-irrigated crops (0.4 ha)+woods+ abandoned fields**
10. **Irrigated crops (0.5 ha)+ abandoned fields**
11. **Non-irrigated crops (2.5 ha)+ abandoned fiel**
12. **Abandoned fields**
13. «Bocage»
14. Valley bottom pastures
15. Pastures+scattered trees
16. *Quercus pyrenaica+Q. faginea*
17. *Quercus pyrenaica+Q. faginea +Q. rotundifolia*
18. *Pinus* sp.





N

8890.17 ha

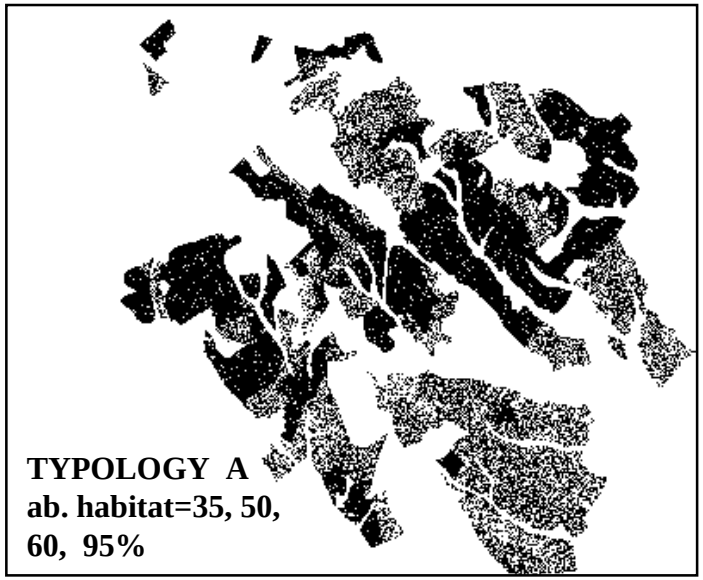
(Maps were drawn at scale 1: 25 000)

Typology C — Typology B

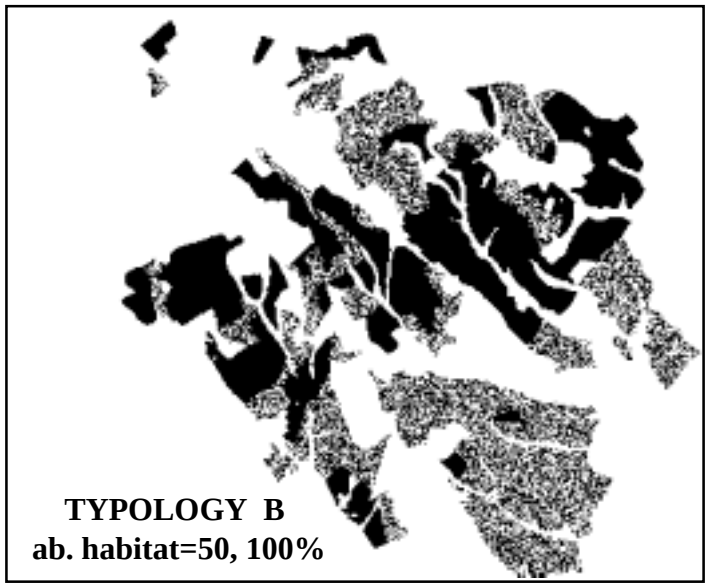
1. Towns
2. Lakes
3. Crops
4. Pastures
5. Forests
6. **Abandoned fields**
7. **Mosaic crops + abandoned fields**
8. **Abandoned fields**

Different mapping units

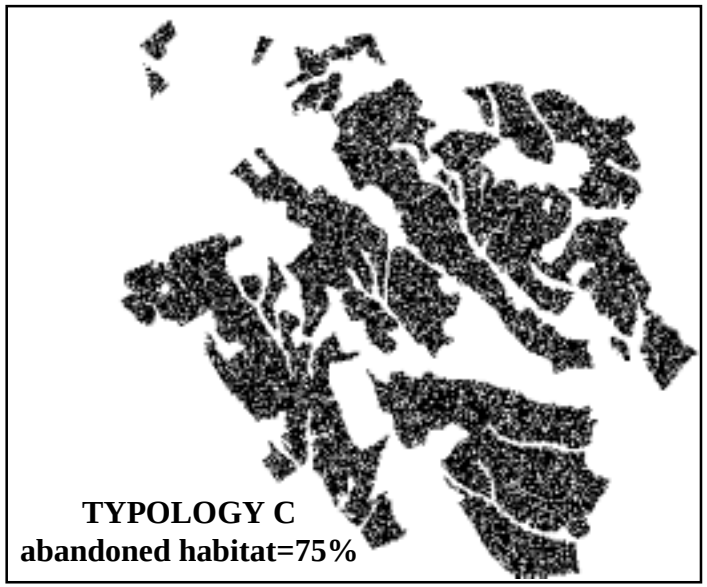
Transformation into density of abandoned land



TYPOLOGY A
ab. habitat=35, 50, 60, 95%



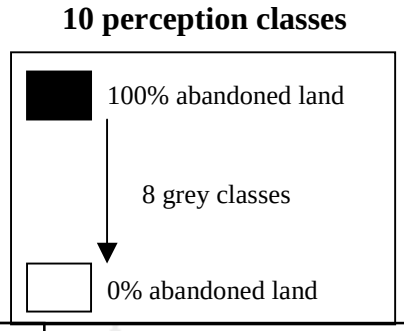
TYPOLOGY B
ab. habitat=50, 100%



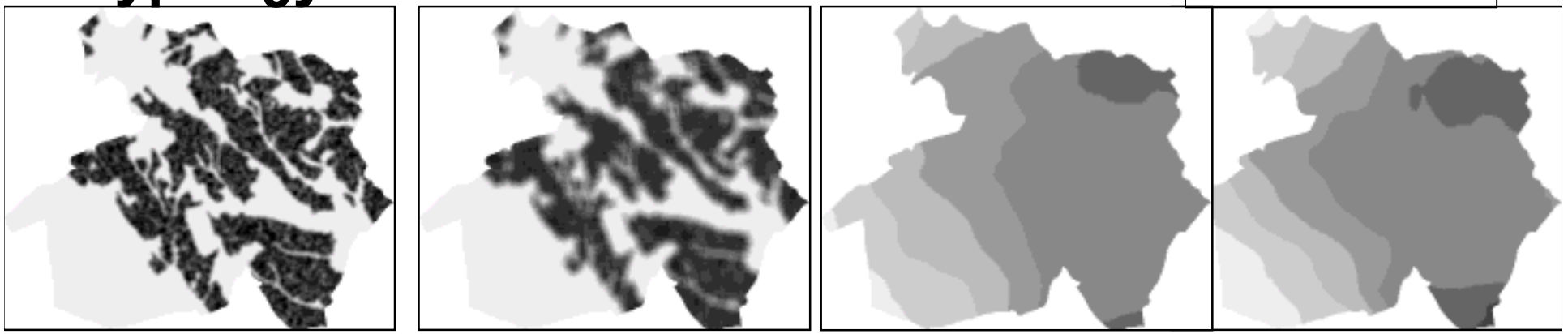
TYPOLOGY C
abandoned habitat=75%

Suarez Seoane & Baudry, 2002

Species grain (resolution of analysis) and perception of available habitat

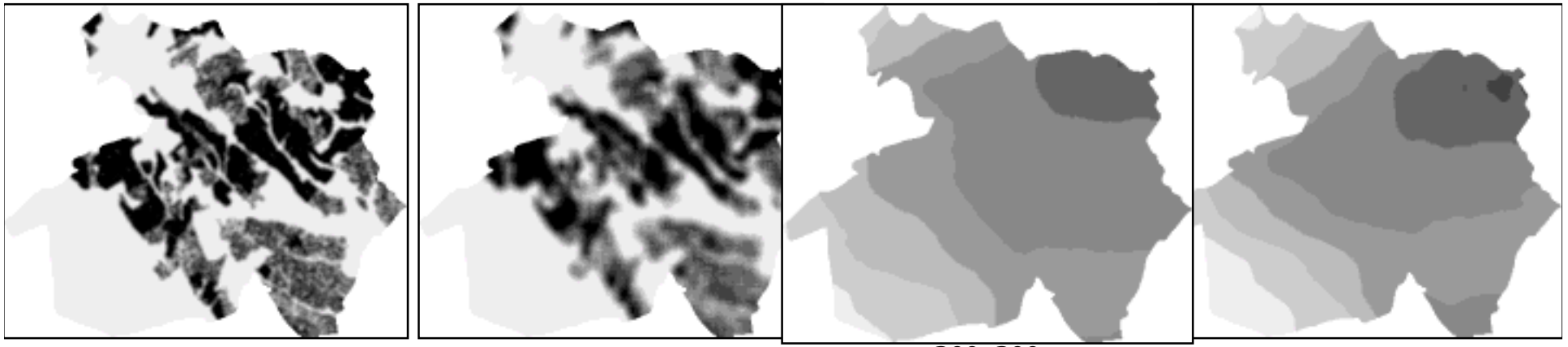


Typology A



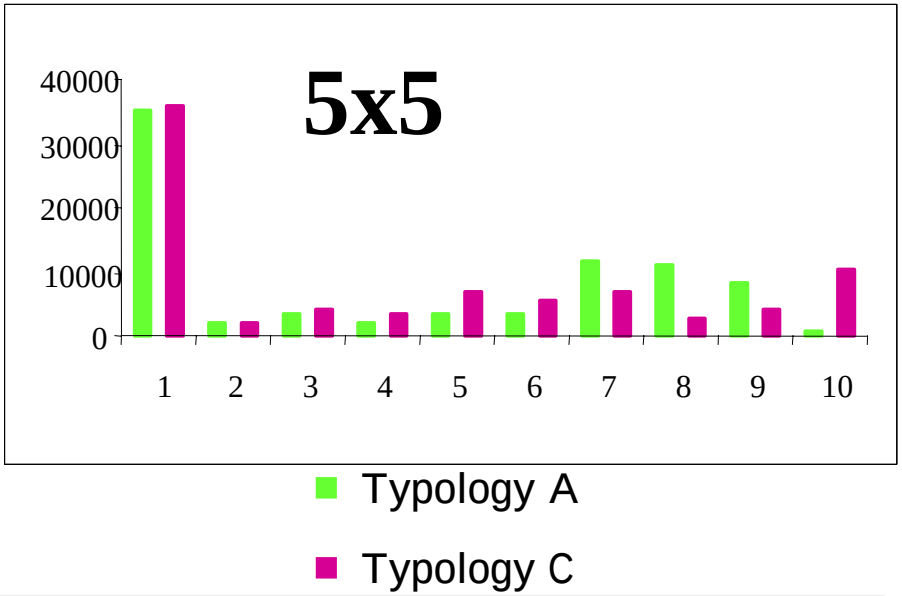
5x5 10x10 200x200 150x150

Typology C

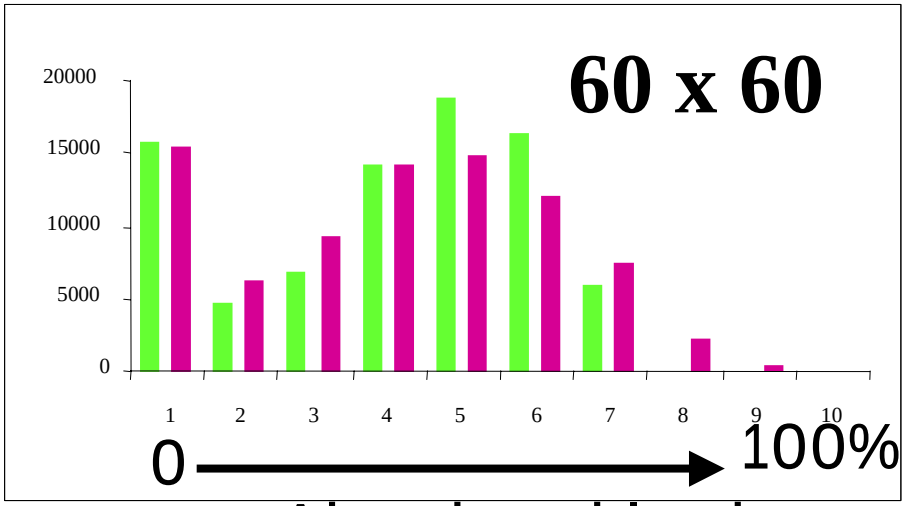


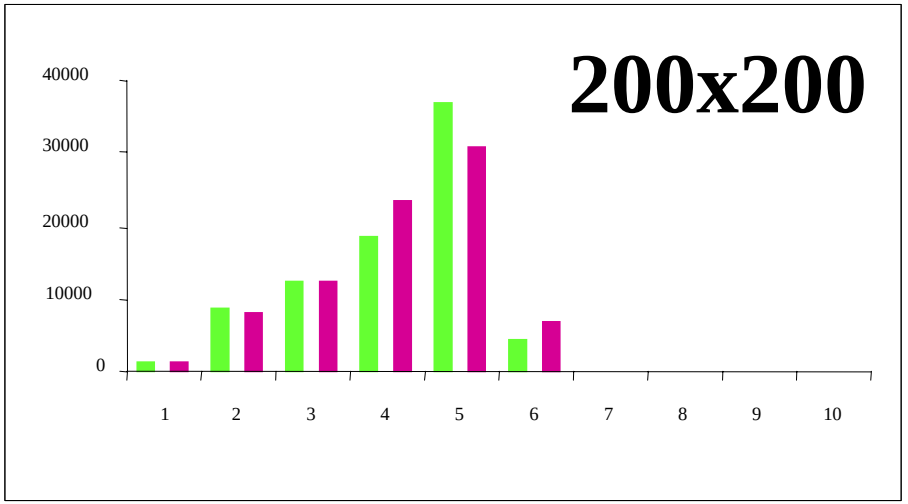
5x5 10x10 200x200 150x150

Combined effects of mapping typologies and amount of perceived available habitat at different scales



Differences are larger for fine grain species

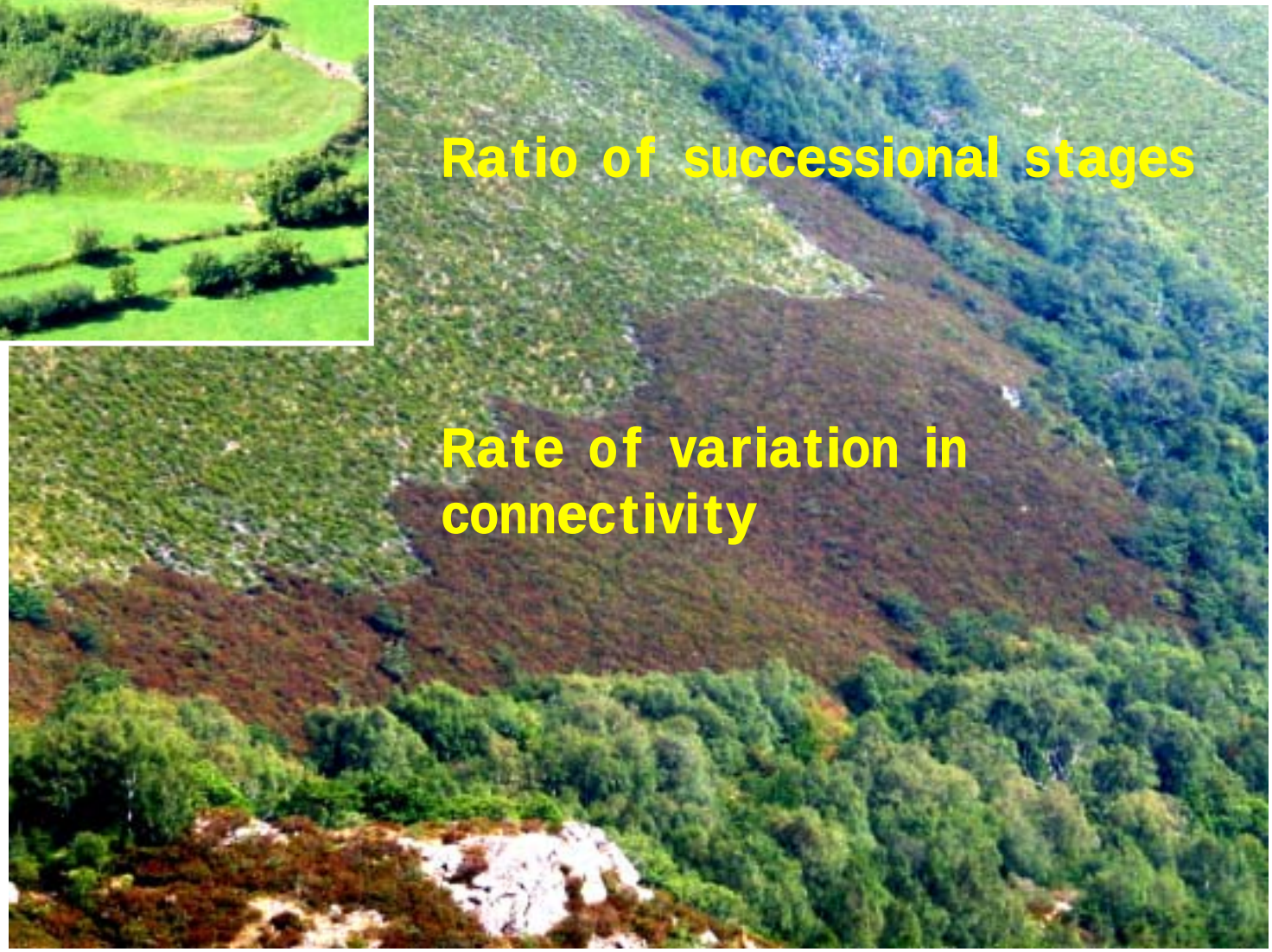




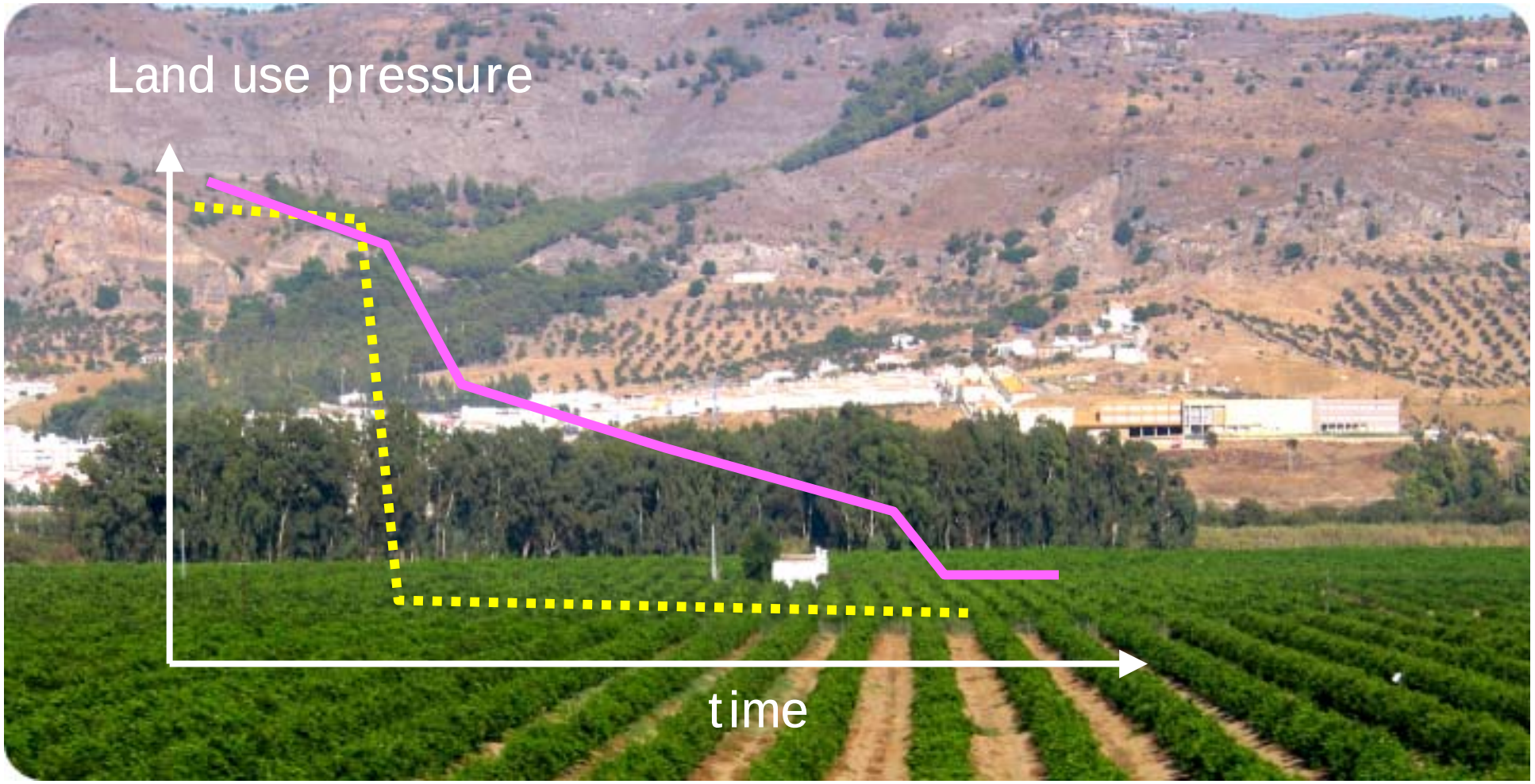
Suarez Seoane & Baudry, 2002


Scaling issues in land abandonment
as a process

Rate of change (*soil conditions, land cover*)

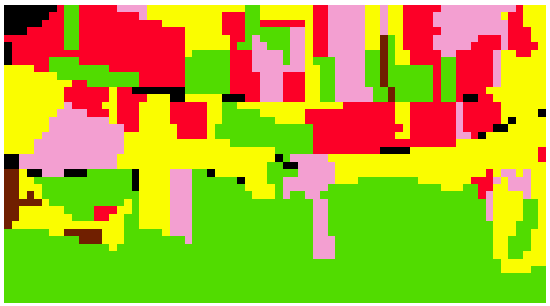

Ratio of successional stages
Rate of variation in connectivity

Rate of between patch differenciation



Maubec (Provence, France): land cover changes

1890

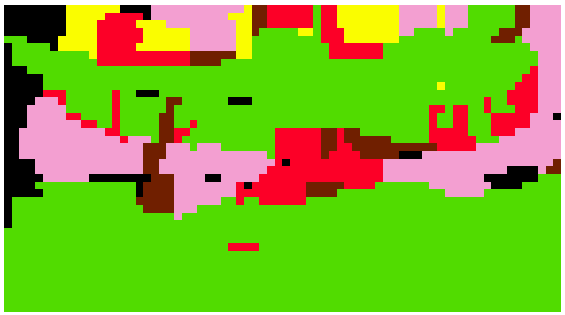


1910

1930

1950

1970



1990

wood

vineyard

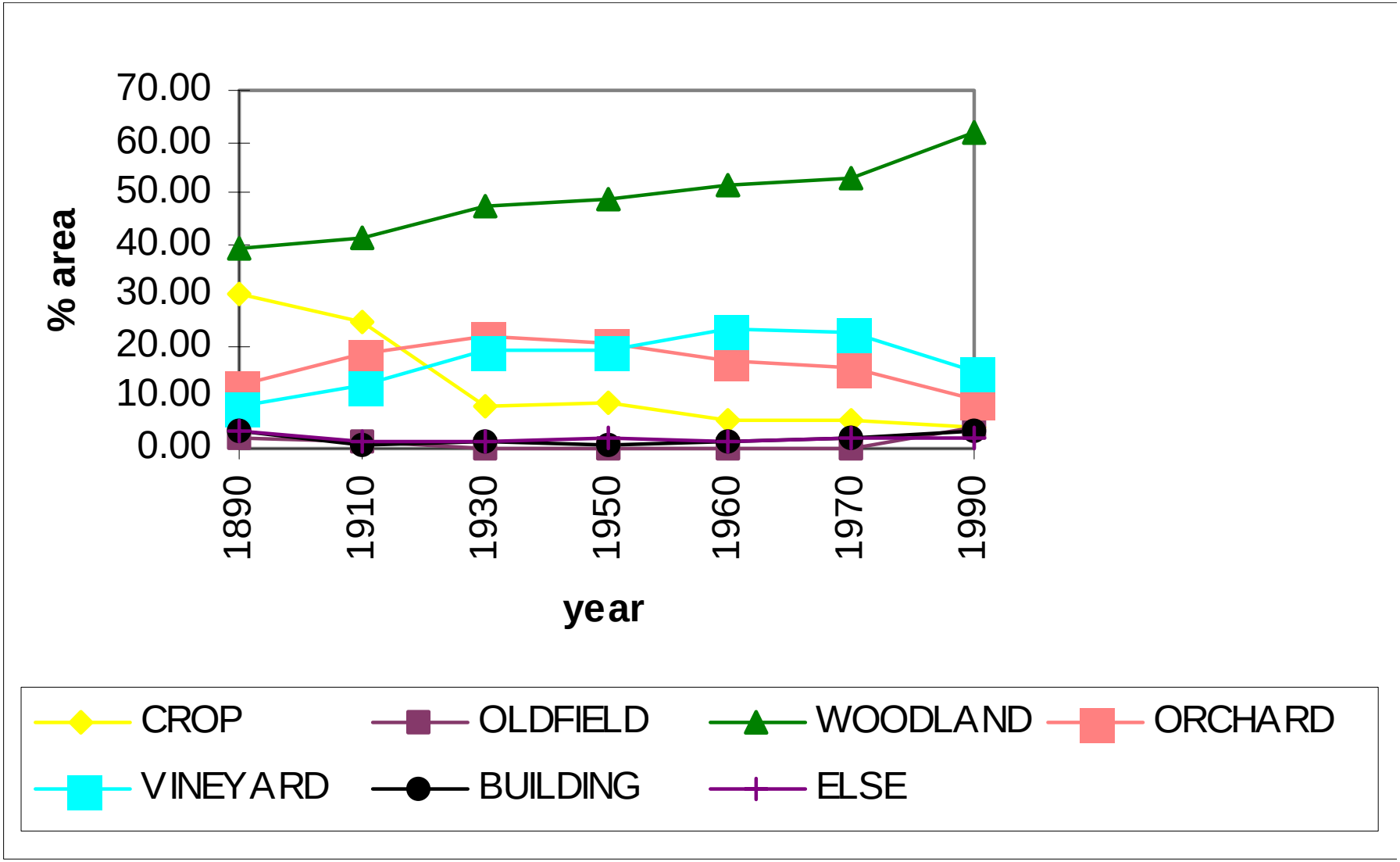
old field

crop

olive grove

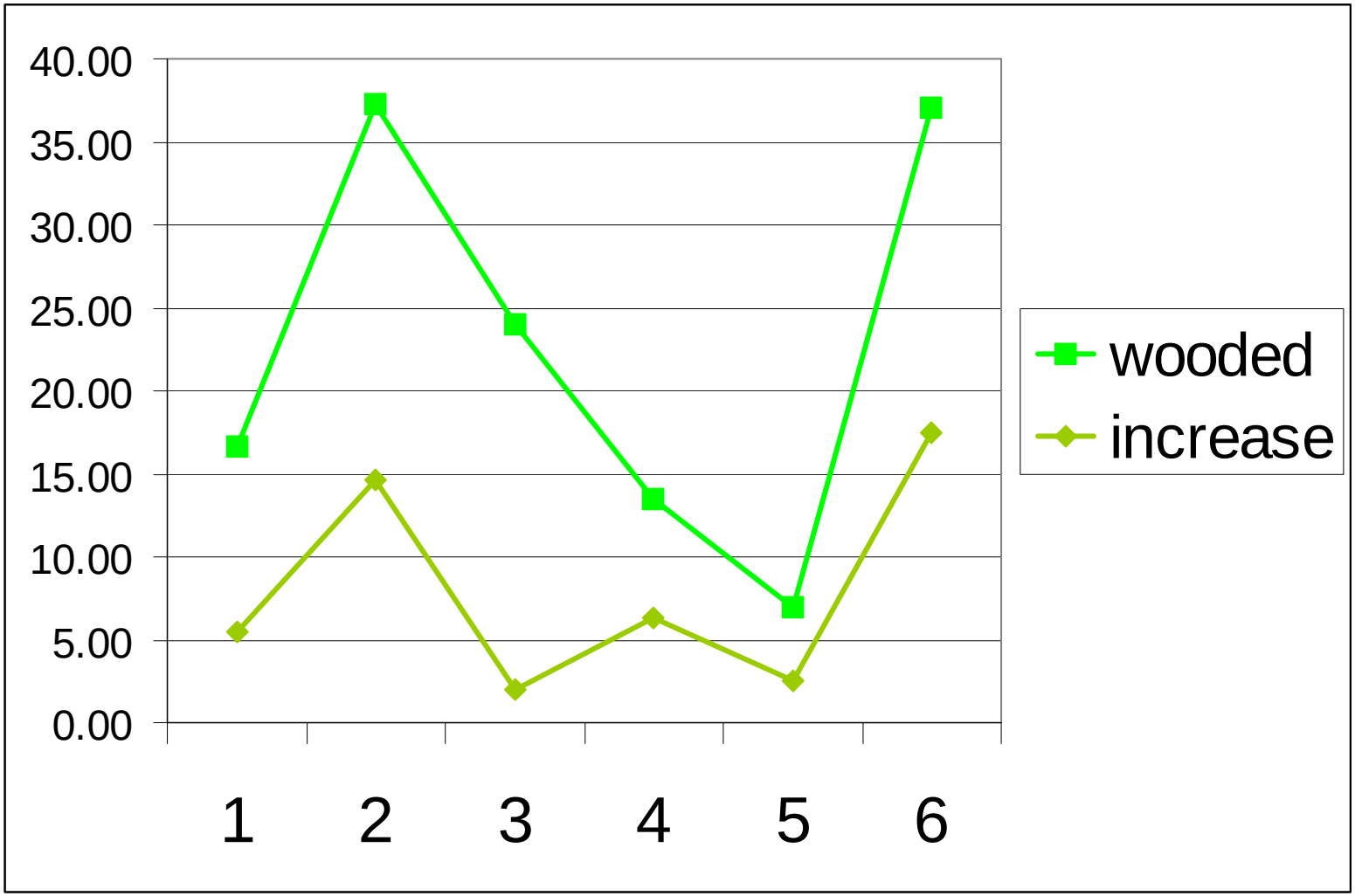
Baudry & Tatoni, 19

Maubec (Provence, France): land cover changes

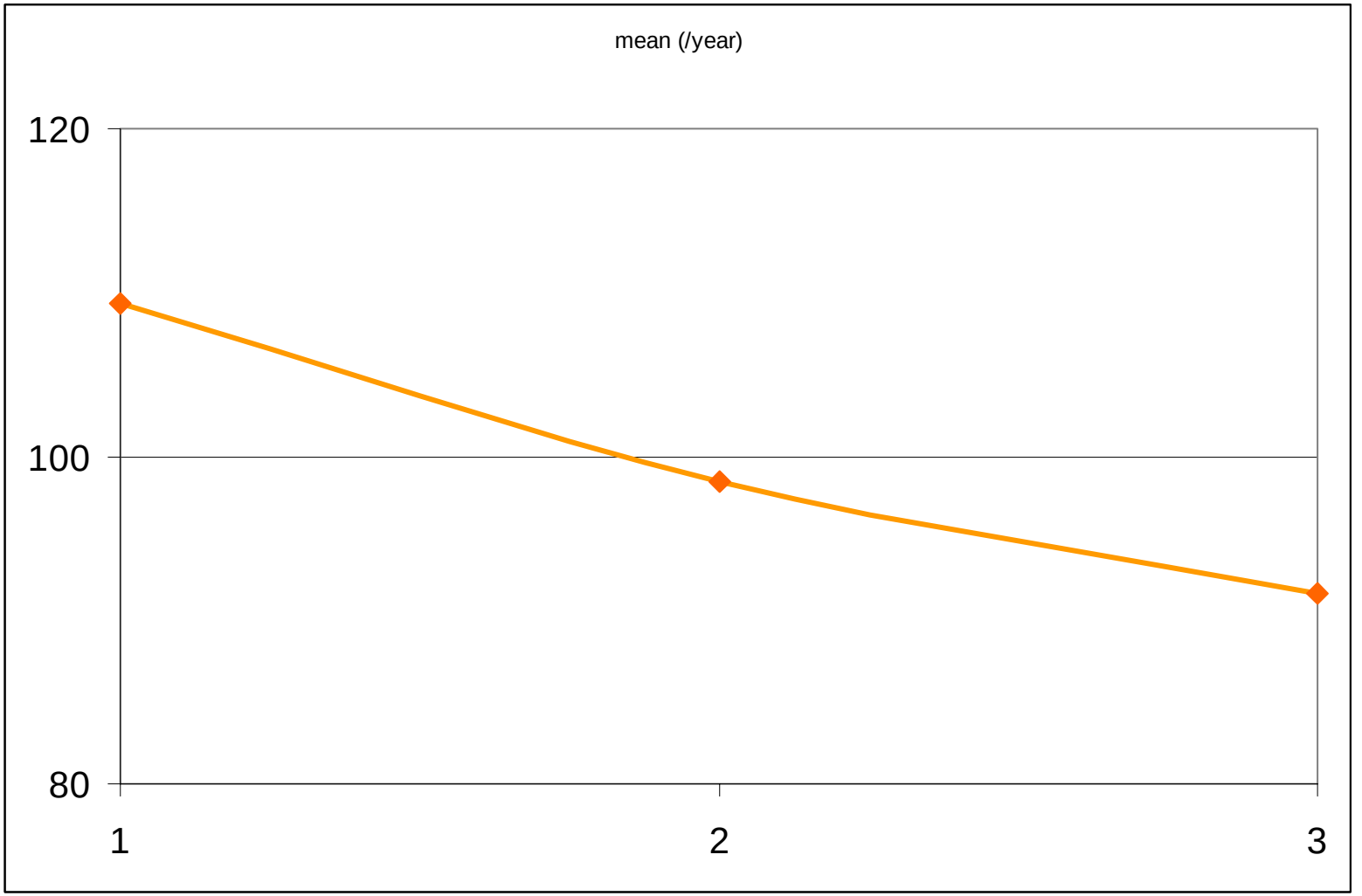


Two processes: abandonment / clearance

A shifting mosaic



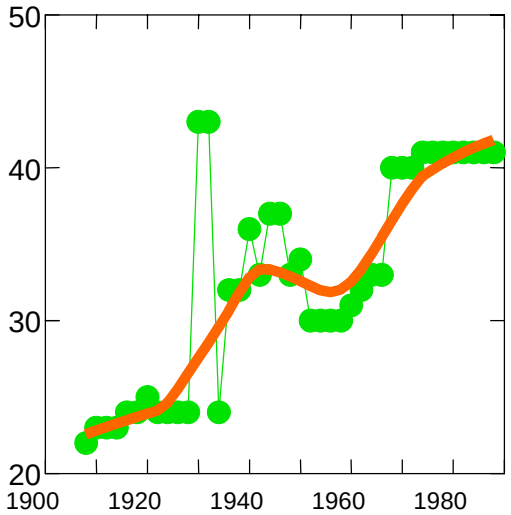
Mean increase of wood per annum according to the number of periods considered



The scale dependance (in time and space) observed for all types of land use change

The lozère ² département in France

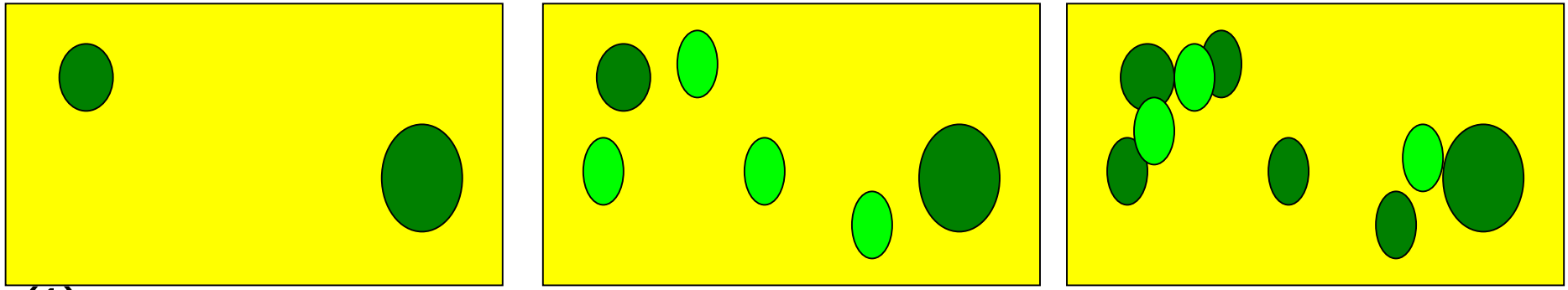
% wood abandoned



Fluctuations in land abandonment in Lozère (France)

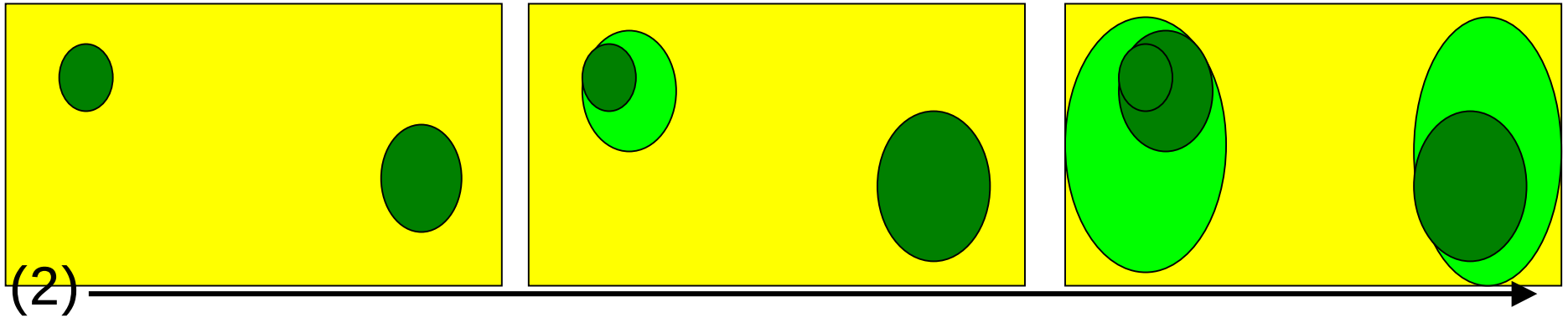
Two patterns of abandonments /

Two types of landscape change



(1)

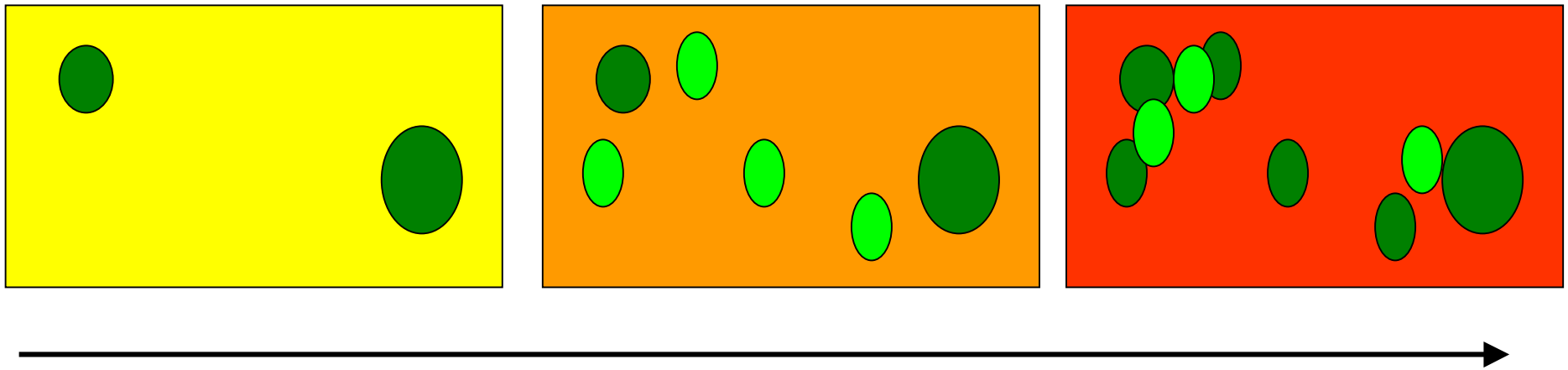
Fine scale process of abandonment (individual patches, e.g. individual land users acting independently)



(2)

Coarse scale process of abandonment (diffusion, e.g. on a specific physical environment)

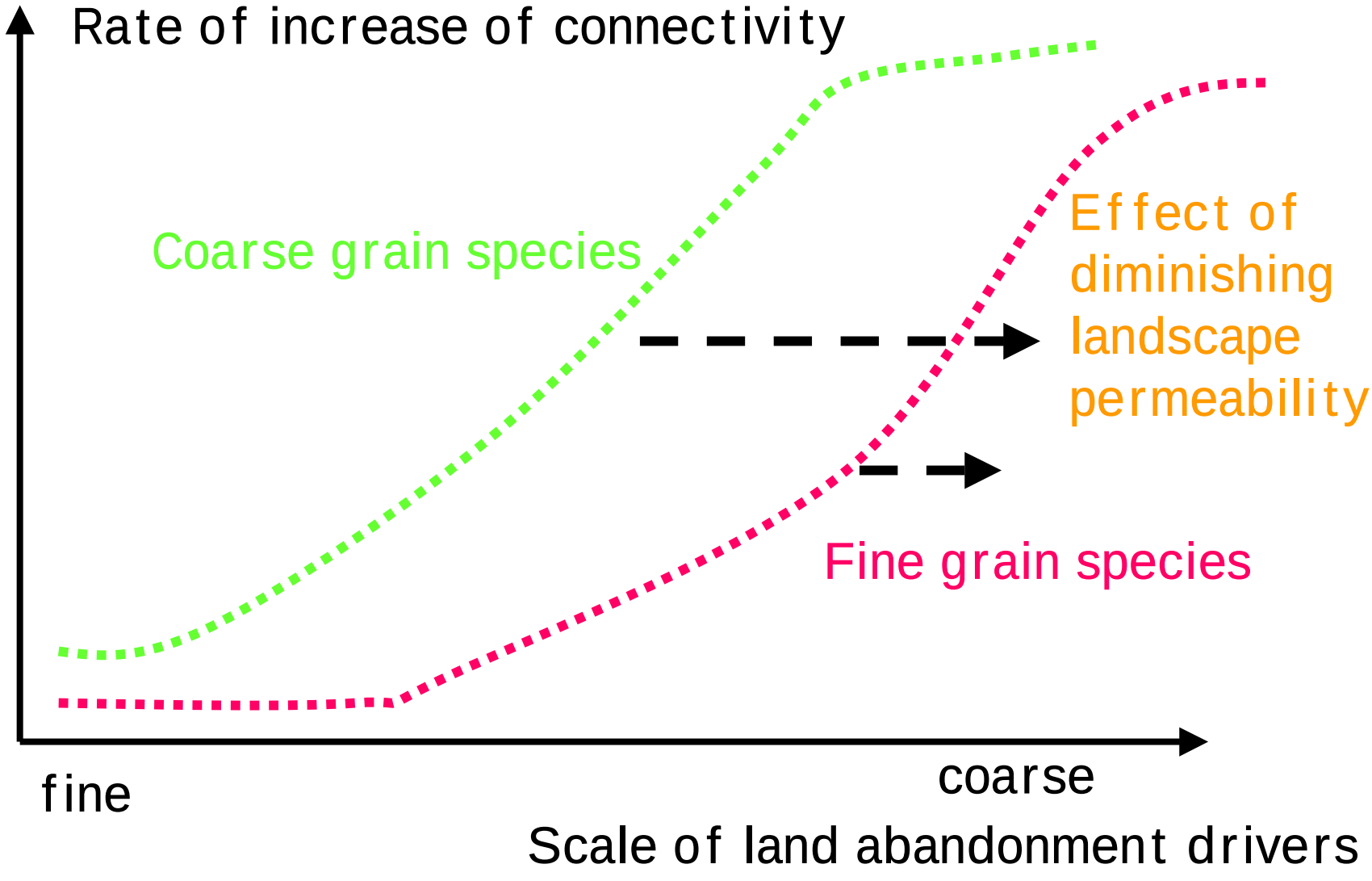
Contrasting land uses

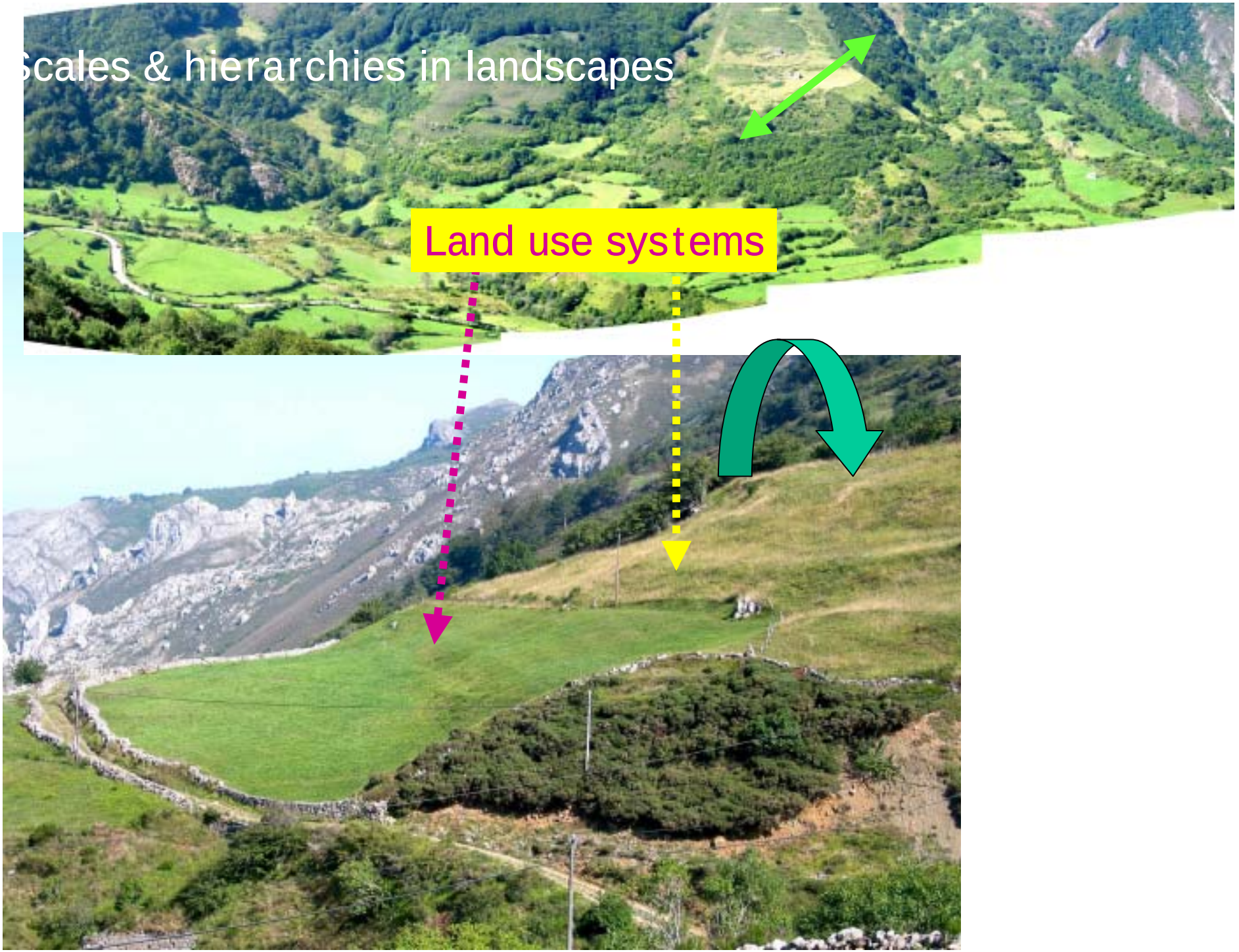


Increasing land abandonment,
Decreasing distance among patches of spontaneous vegetation
Decreasing permeability of farmland

Which effects on connectivity / flora/ Fauna ?

Hypothetical patterns linking social and ecological processes via landscape changes




Scales & hierarchies in landscapes
Land use systems

Next part: processes for remaining farmland


Thank you

References

Acess to those references is provided on our web site / pblications

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