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# A socio-ecological framework for the analysis of forest edges dynamics and their consequences on ecosystems services in temperate landscapes.

**Marc Deconchat**, Audrey Alignier, Annie Ouin, Emilie Andrieu, Antoine Brin, Luc Barbaro, Hervé Jactel



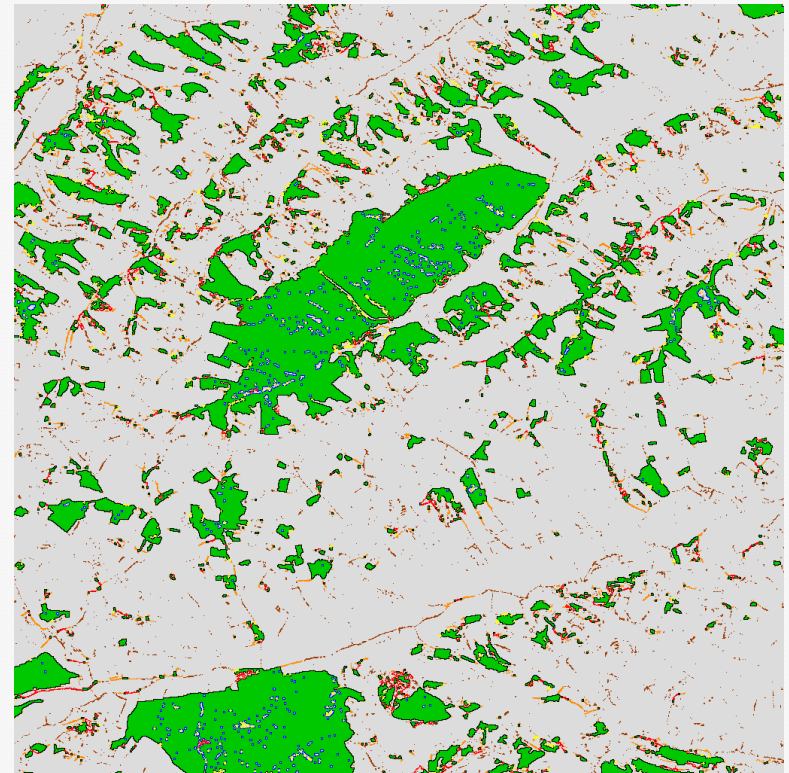
IALE2015, Portland, OR

UMR1201 Dynafor INRA/INP ENSAT/ INP EIPurpan  
Dynamiques et écologie des paysages agriforestiers  
[dynafor.toulouse.inra.fr](http://dynafor.toulouse.inra.fr)

# Forest edges: many facets of a very common landscape component

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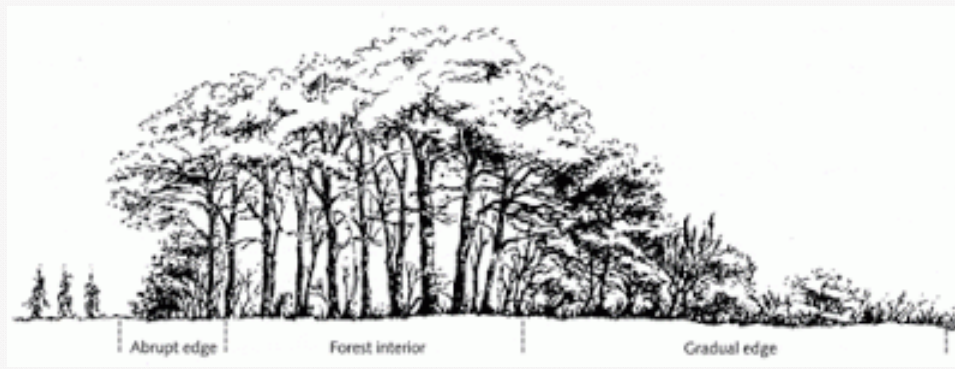
- Forest edges are very common in many temperate landscapes
- « Edge effect »: what does it mean?
- Forester/farmer interactions ?



# 2 adjacent vegetation structures

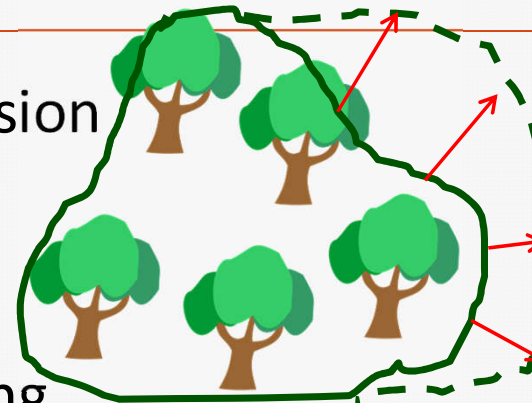
...different patterns

- Forest / non-forest discontinuity
- Different types of forests
- Many possible non-forest habitats
  - Water bodies
  - Human infrastructures
  - **Pastures**
  - **Crops**



# Dynamics

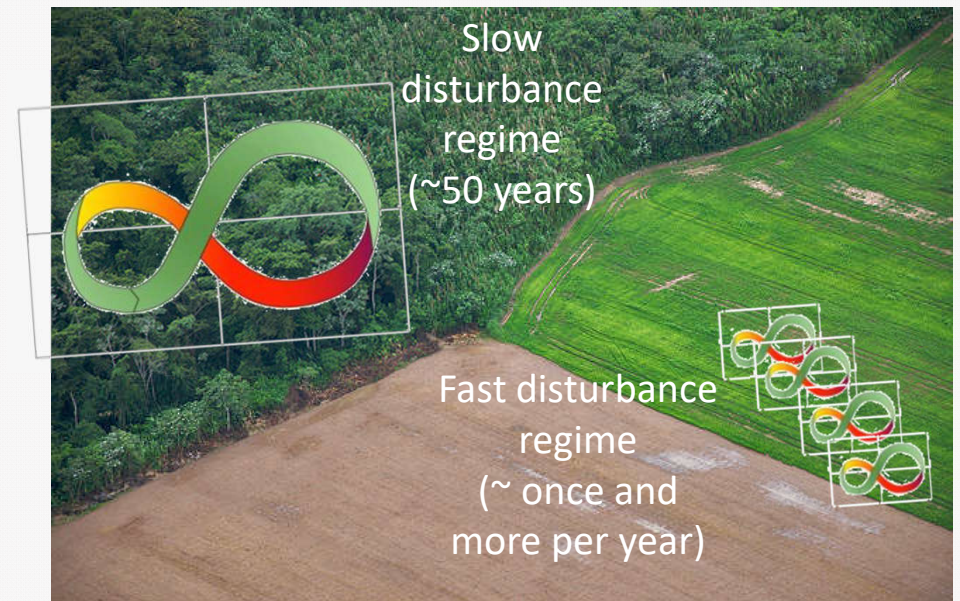
- Natural dynamic of forest is expansion
- Old edges can disappear into the forest behind new edge
- Or, new edge can appear by clearing part of the forest
- Edges have an age
- Private ownership of land induces stability of edges



*Andrieu et al., 2011*

# 2 rates of disturbance

- Forest edges has to be reset regularly
- Disturbance of vegetation limits tree expansion
- Higher rate of disturbance in non-forest habitat than in forest



## 2 interacting managers



- Forester / farmer with their own objectives
- Edges are a consequence of their practices



- Farming is the main origin of forest edges in temperate landscapes



*Sourdril et al, 2012; Du Bus et al., 2006; Andrieu et al., 2011*

# An object of a management

- Edges are consequence of management
- But they are also managed themselves
  - To control tree dynamics
  - To exploit their resources
- Generally managed by/for farmers
- Importance of secondary features associated to forest edges: ditches, paths, stone walls, fences

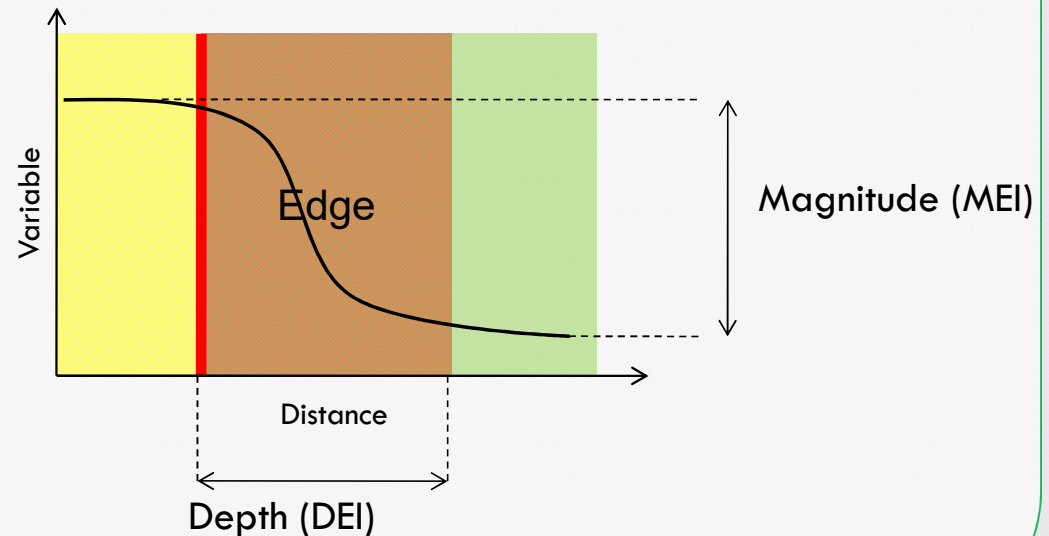


*Du Bus et al., 2006; Ouin et al., 2015*



# Physical and biological gradients

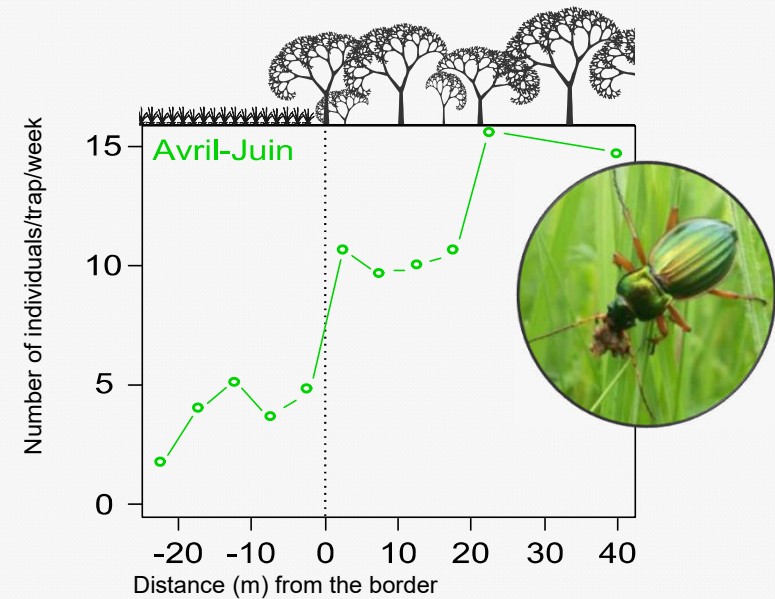
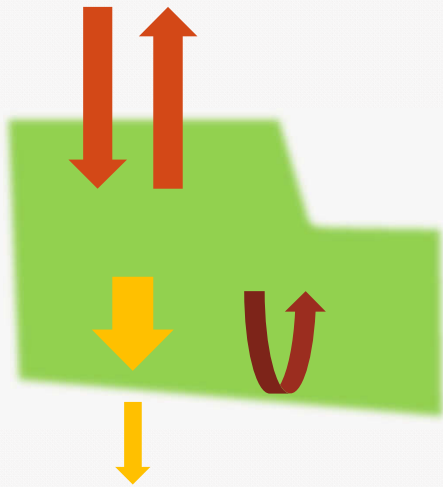
- Combination of several physical, chemical and biological gradients
- Edge = zone of gradient
- Measures of edge effect
- What is a “strong edge effect”?
  - Short depth + high magnitude
- or
  - Long depth + low magnitude



*Alignier & Deconchat, 2011, 2013*

# Interfaces between habitats

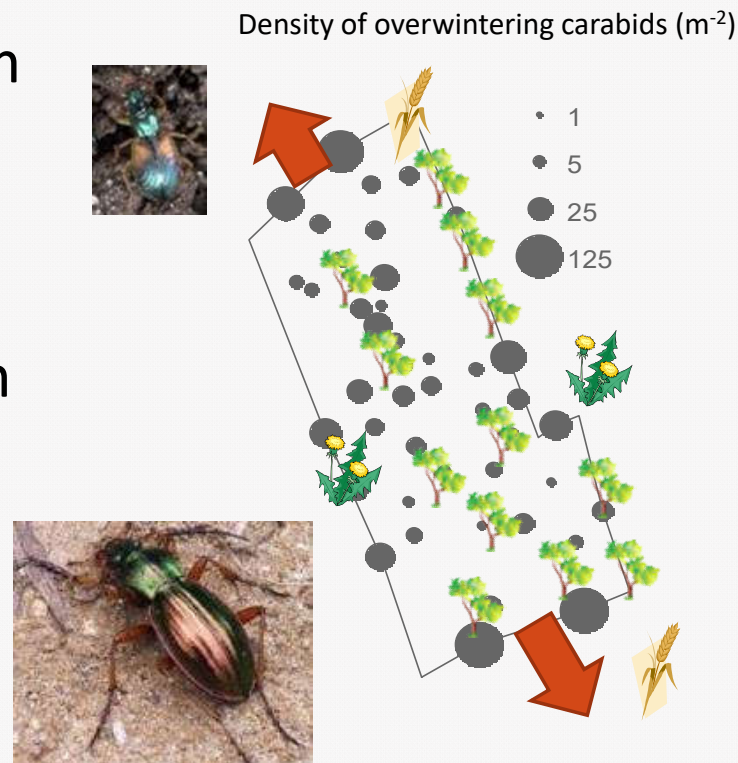
- Edges influence fluxes of matter, energy, information
- Edges as filters
- Consequences for the adjacent habitats



Roume et al., 2011a

# Forest edges: key role in ecosystem services

- Some fluxes support ecosystem services (or dys-services)
- Modifications of edges may enhance or degrade ecosystem services

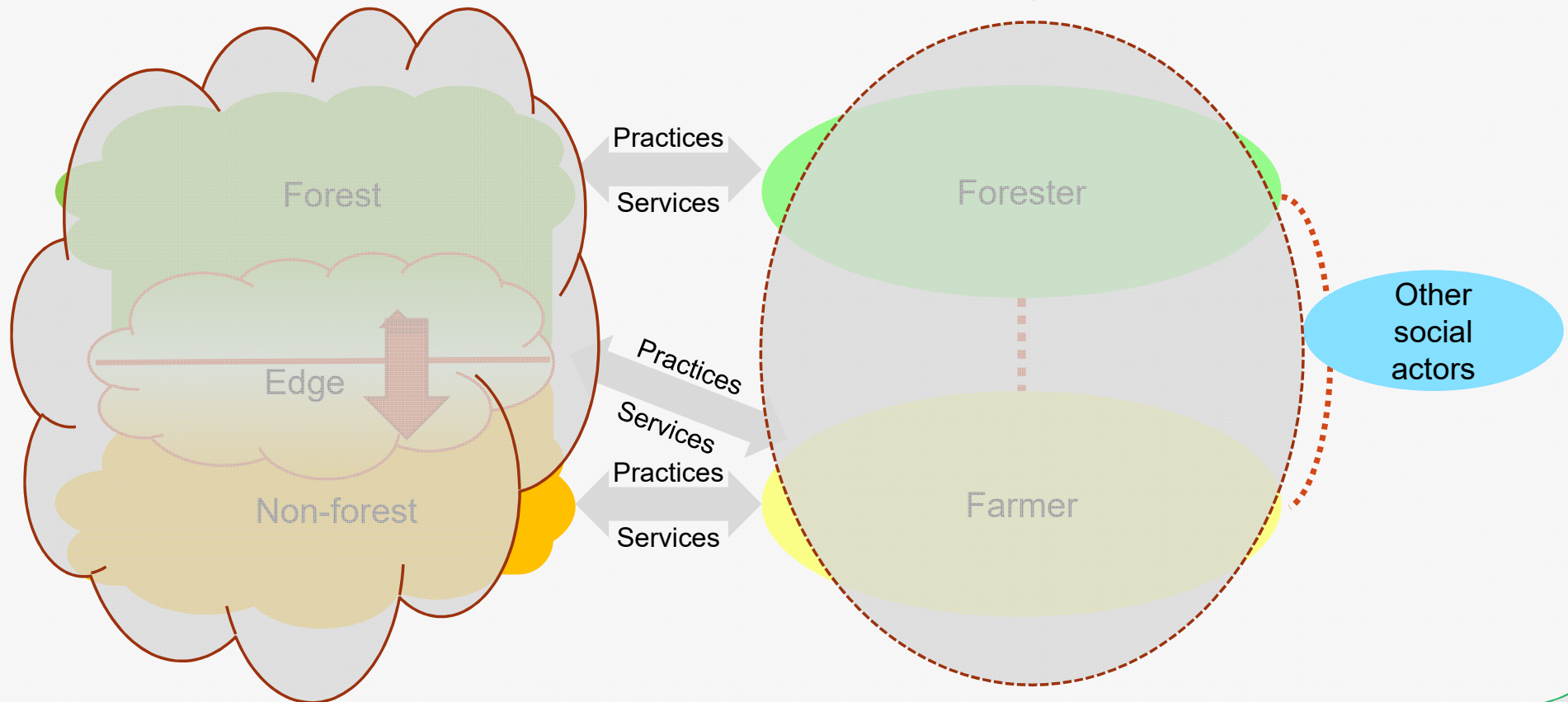


Arrignon et al., 2007; Roume et al, 2011b

# Forest edges as a spatially-defined socio-ecological system

Ecological systems

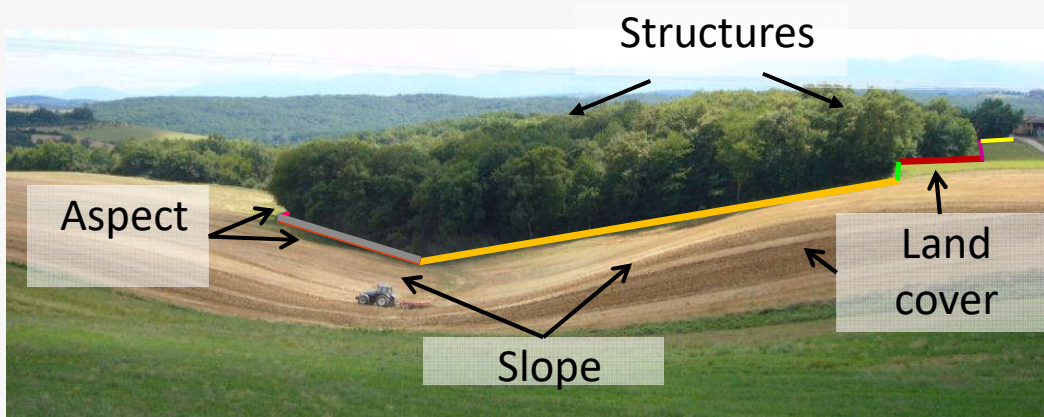
Social systems



# Discussions

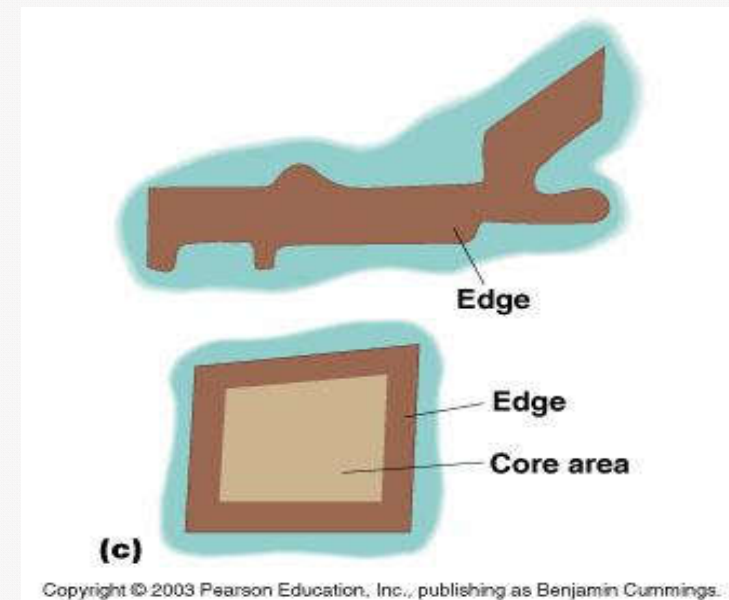
## FOREST EDGES ARE VERY DIVERSE

- Many factors influence edge characteristics
- What are the most important?
- Which one can we modify?



## EDGE EFFECT AT PATCH LEVEL

- Edge effects at fragment scale are not the same as local edge effect



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