



## Forest management cessation and biodiversity: a synthesis of a nationwide French project

Frédéric Gosselin, Yoan Paillet, Marion Gosselin, Laurent Larrieu, Anders Mårell, Vincent Boulanger, Nicolas Debaive, Frédéric Archaux, Christophe Bouget, Olivier Gilg, et al.

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# Forest management cessation and biodiversity: a synthesis of a nationwide French project

Gosselin, F. \*, Paillet, Y. \*, Gosselin, M. \*, Larrieu, L. ©, Mårell, A. \*, Boulanger, V. #, Debaive, N. @, Archaux, F. \*, Bouget, C. \*, Gilg, O. @, Drapier, N. #, Dauffy-Richard, E. \*



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# Forest reserves for biodiversity enhancement

Forest reserves left unmanaged as **a central strategy for biodiversity enhancement...**

... even though other management approaches can improve biodiversity promoted by unmanaged forests (extending rotations, deadwood...)...



# Forest reserves for biodiversity enhancement

Forest reserves left unmanaged as a central strategy for biodiversity enhancement...

***Land sparing***

... even though other management approaches can improve biodiversity promoted by unmanaged forests (extending rotations, deadwood...)

***Land sharing***

# State of knowledge

European meta-analysis (Paillet et al. 2010 *Conserv. Biol.*)

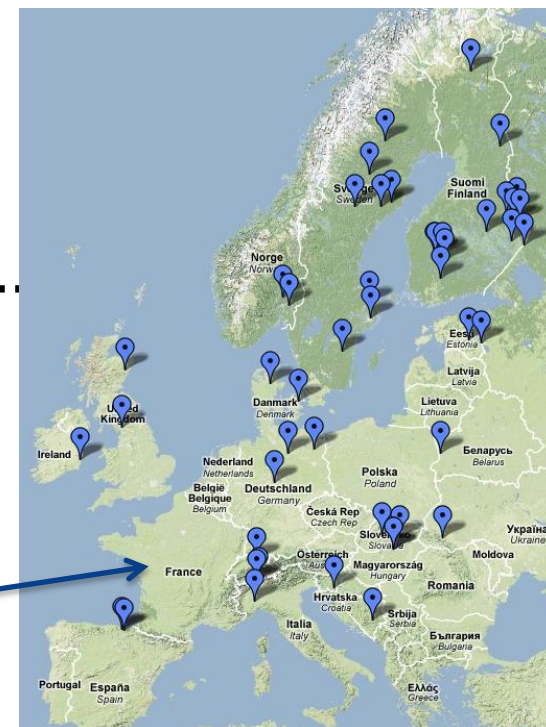
➤ **Positive effect of forest management cessation on local species richness**

➤ **... with strong « taxonomic » variations...**

- negative effect on vascular plants
- positive effect for taxa related to deadwood & MH

➤ **... but important knowledge gaps**

- *few temperate studies*
- *sampling often problematic (site type bias, pseudoreplication)*
- *explanatory factors often not incorporated*





# Instigation of the French **GNB** project

*Biodiversity in forest reserves vs managed forests*

## 1st Objective

*Quantify and better understand the relationship between biodiversity and management cessation esp. in France*

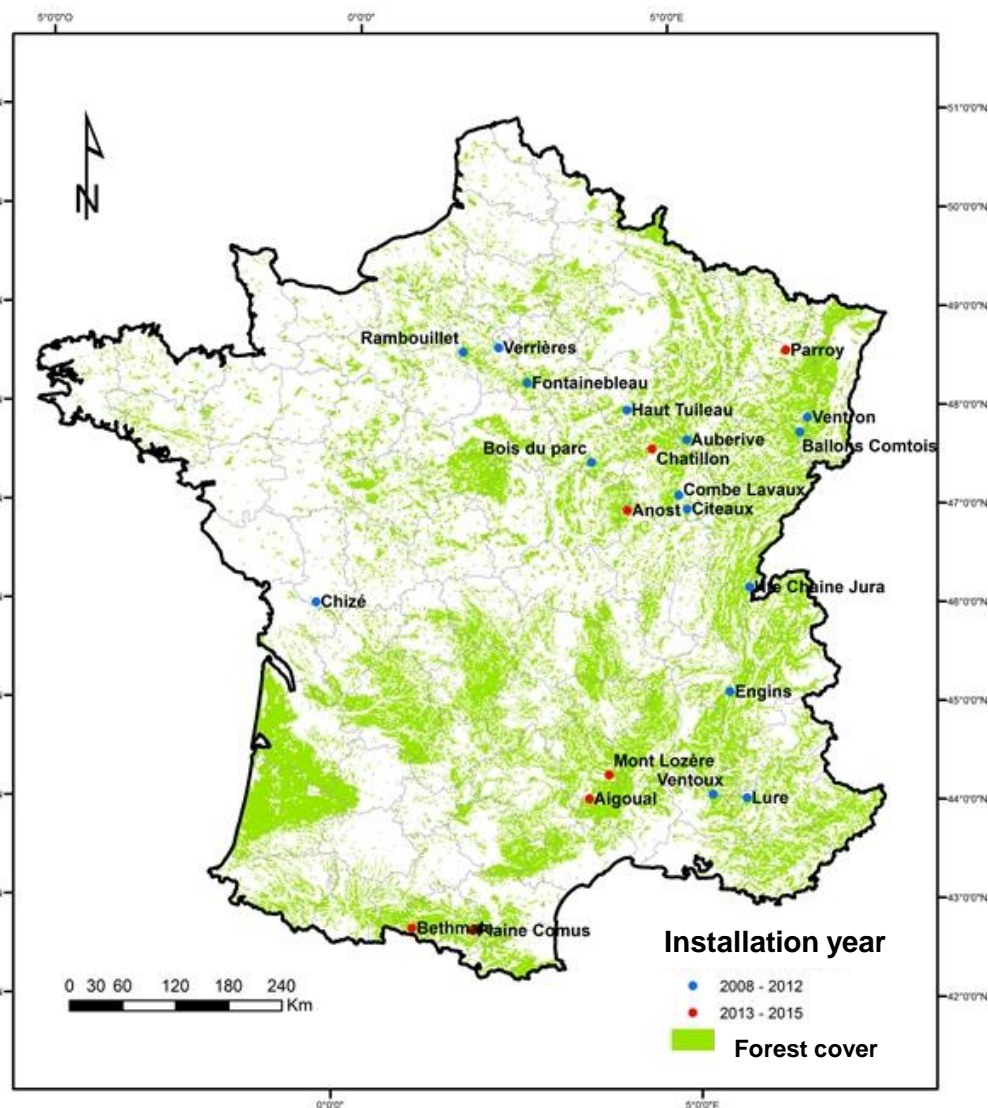
## 2<sup>nd</sup> Objective

*Test biodiversity indicators (SoEF, EEA...) on an extended gradient of forest management intensity*

## 3<sup>rd</sup> Objective

*Methodological developments (protocols, statistical tools...)*

# A multi-site research project



From 2008 to 2017: **282 stands studied once in 22 French forests**

Balance between **managed and unmanaged stands, in similar site types** (topography, soil)

**Time since last harvesting**

**MAN:  $9 \pm 12$  years**

**UNM:  $46 \pm 38$  years**



# Dendrometric characterization: combined fixed angle, surface & transect techniques...

Living wood  
DBH > 7.5cm  
(max: 2% or 3%)



Snags  
DBH > 7.5cm  
(max: R=20m)



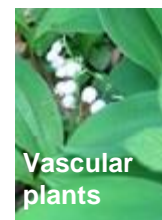
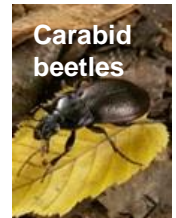
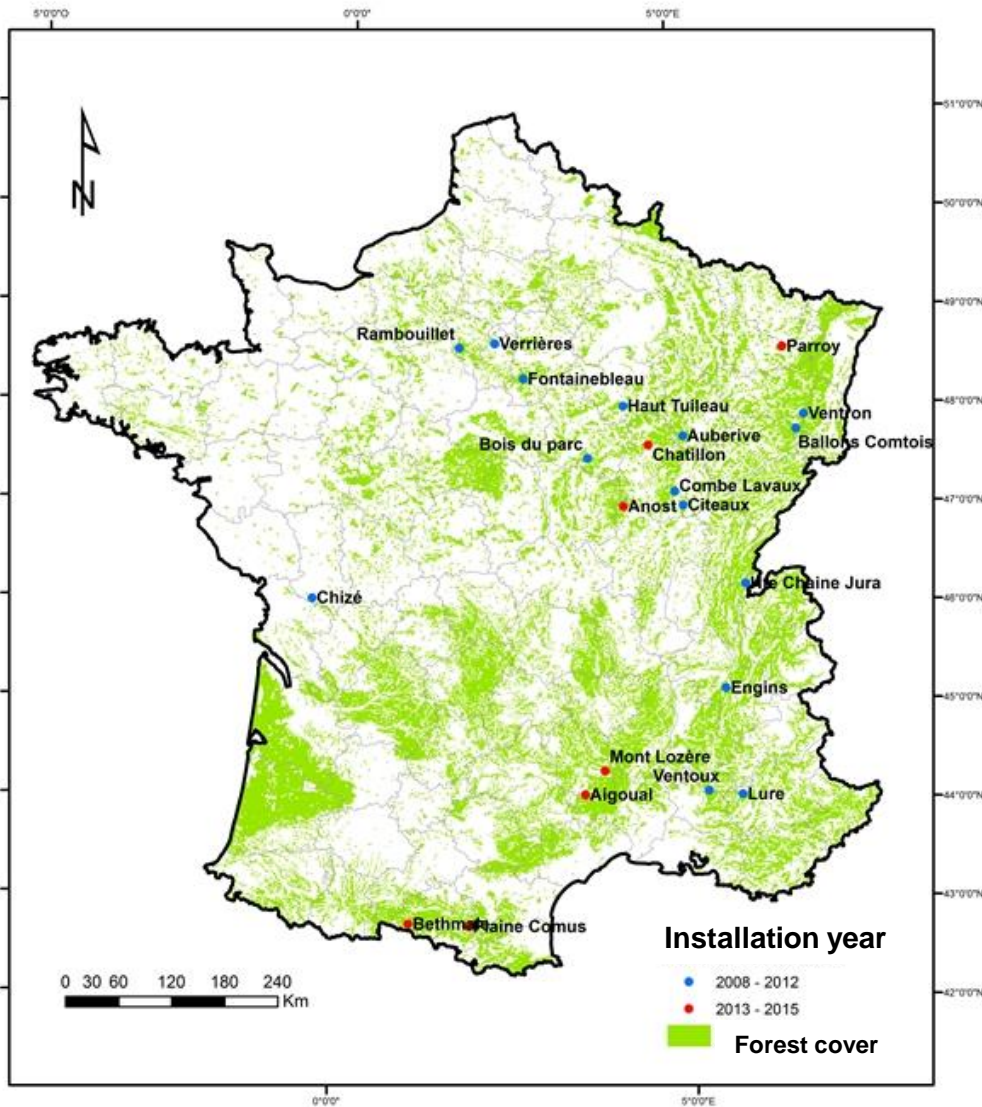
Logs D > 5cm  
(max: R=20m)





# A multi-taxa research project

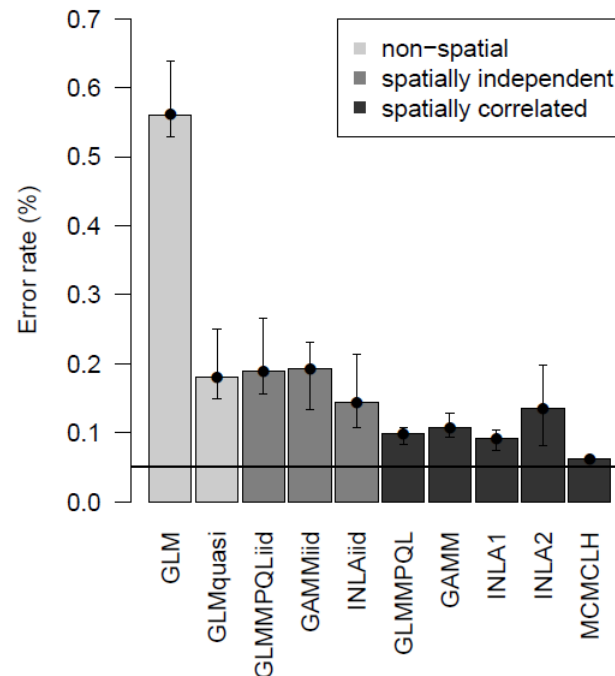
↪ **Seven taxonomic groups**  
being investigated



# Some methodological results

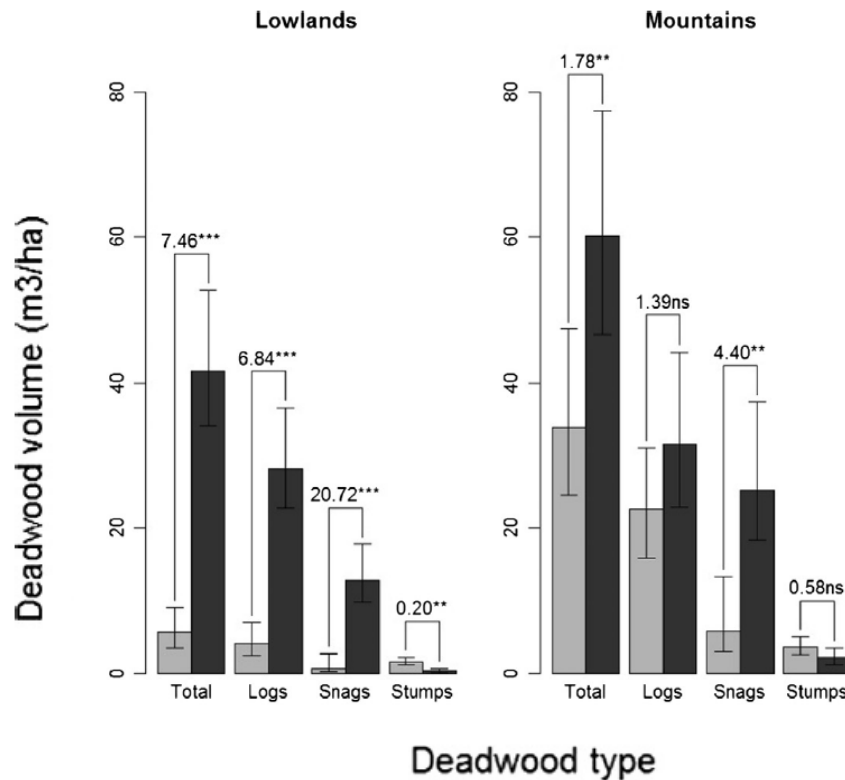
↪ available spatially-explicit Bayesian methods more adequate to account for spatial pseudoreplication than frequentist ones for count data

↪ importance of incorporating spatial autocorrelation



# Some ecological results

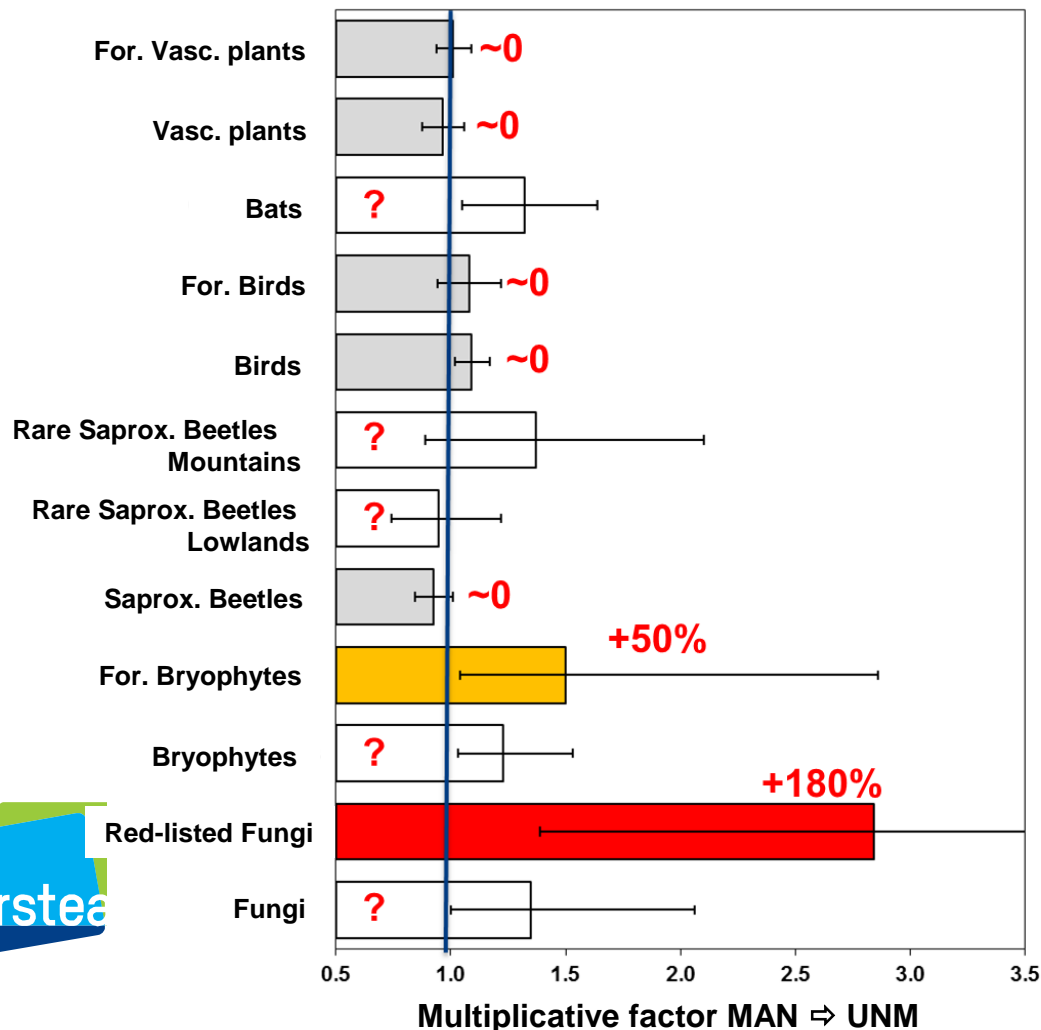
1- **Strong dendrometric differences** (very large trees, deadwood) between managed and unmanaged stands, but not uniformly



Paillet et al. (2015)  
*FEM*

# Some ecological results

## 2- Effect of management cessation on species richness



Strong positive effect for red-listed fungi & forest bryophytes

Negligible effect for birds, vascular plants, saproxylic beetles

Uncertain magnitude category : bats, rare saprox. beetles, bryophytes and fungi

Gosselin et al. (2014)  
*Research Report*

# Some ecological results

## 3- **Indicators** that best explain species richness variation

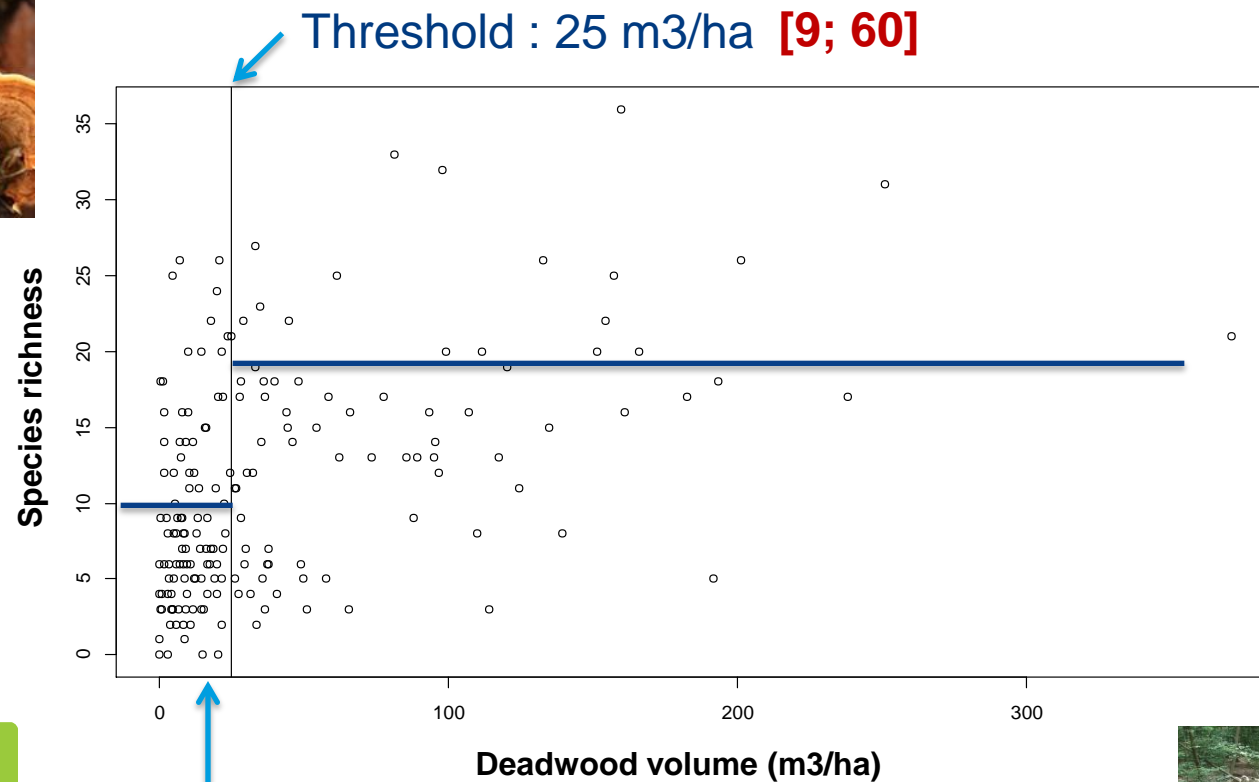
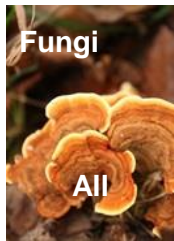


### **Other best indicators** (without strong effects):

- Deadwood metrics (birds, bats, all bryophytes)
- Living tree metrics (vascular plants, carabid beetles, all sap. beetles)
- TreMs (rare sap. beetles)

# Some ecological results

## 3- Indicators that best explain species richness variation





## Discussion

- ⇒ Some evidence for **land sparing** and related variables (deadwood, %protected area) on a **delimited part of biodiversity** (bryophytes, lignicolous fungi, **specific ecological groups**)
- ⇒ Some evidence for **land sharing** through deadwood related variables for **this delimited part of biodiversity** (but would require substantial increases)
- ⇒ Some **surprising results** (e.g. no clear/strong response of **saproxylic beetles**)



## Discussion: main **limits**/characteristics

- Mainly species richness analyzed at stand scale
- Simple biodiversity measurements (sometimes closer to sampling than inventory)
- **Not experimental:** no (complete) randomization, no control of initial states
- Few very old/very big reserves (recent policy, difficulties/pressures to find big areas)



## Discussion: **perspectives**

### ⇒ **Further analyses to come:**

- ↳ All the data
- ↳ Other metrics (abundance...) & levels (species, groups...)
- ↳ Other scales (tree level, gamma...)
- ↳ Other ecological questions (multi-trophic...)
- ↳ Improved statistical tools (sigmoid functions...)

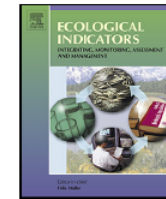
### ⇒ Updating of **management guidelines**?

### ⇒ **Going back to the stands**: from coupled inventories to spatio-temporal monitoring?



Biodiversité  
Gestion Forestière  
& Politiques Publiques

# GESTION FORESTIERE, NATURALITE ET BIODIVERSITE FOREST MANAGEMENT, NATURALNESS AND BIODIVERSITY



## Strong observation A case study

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😊😊 Many thanks to 😊😊

😊 Your attention!

😊 French Ministry of Ecology & ONF for funding

😊 All the persons (~100) that were involved at some point in the GNB project



**G****N****B** stands for *(forest) management*,  
*naturalness* & *biodiversity*

« *Gestion*, *Naturalité*, *Biodiversité* »



*A diverse interface between forest  
management and research*

