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This is an author's version published in: <http://oatao.univ-toulouse.fr/21922>

To cite this version:

Gosselin, Frédéric and Paillet, Yoann and Gosselin, Marion [et al.] *Forest management cessation and biodiversity: a synthesis of a nationwide French project*. (2017) In: IUFRO 2017 - 125th Anniversary Congress – Interconnecting Forests, Science and People, 18 September 2017 - 22 September 2017 (Fribourg, Germany).

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

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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.*)

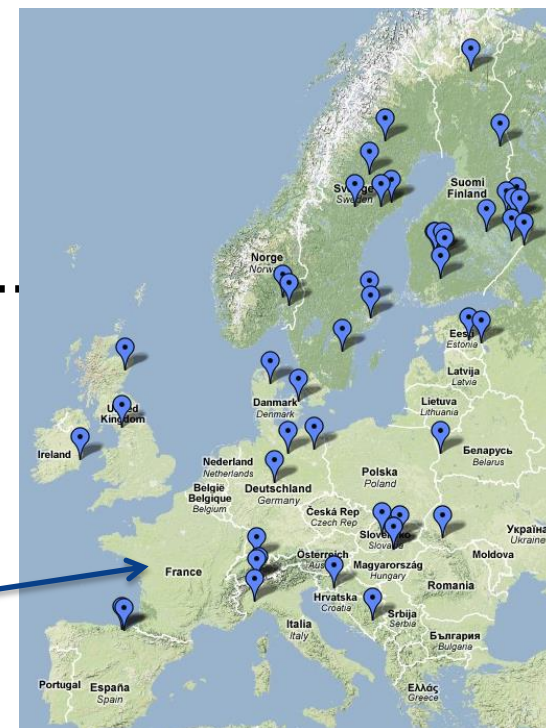
↪ **Positive effect of forest management cessation on local species richness**

↪ **... 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

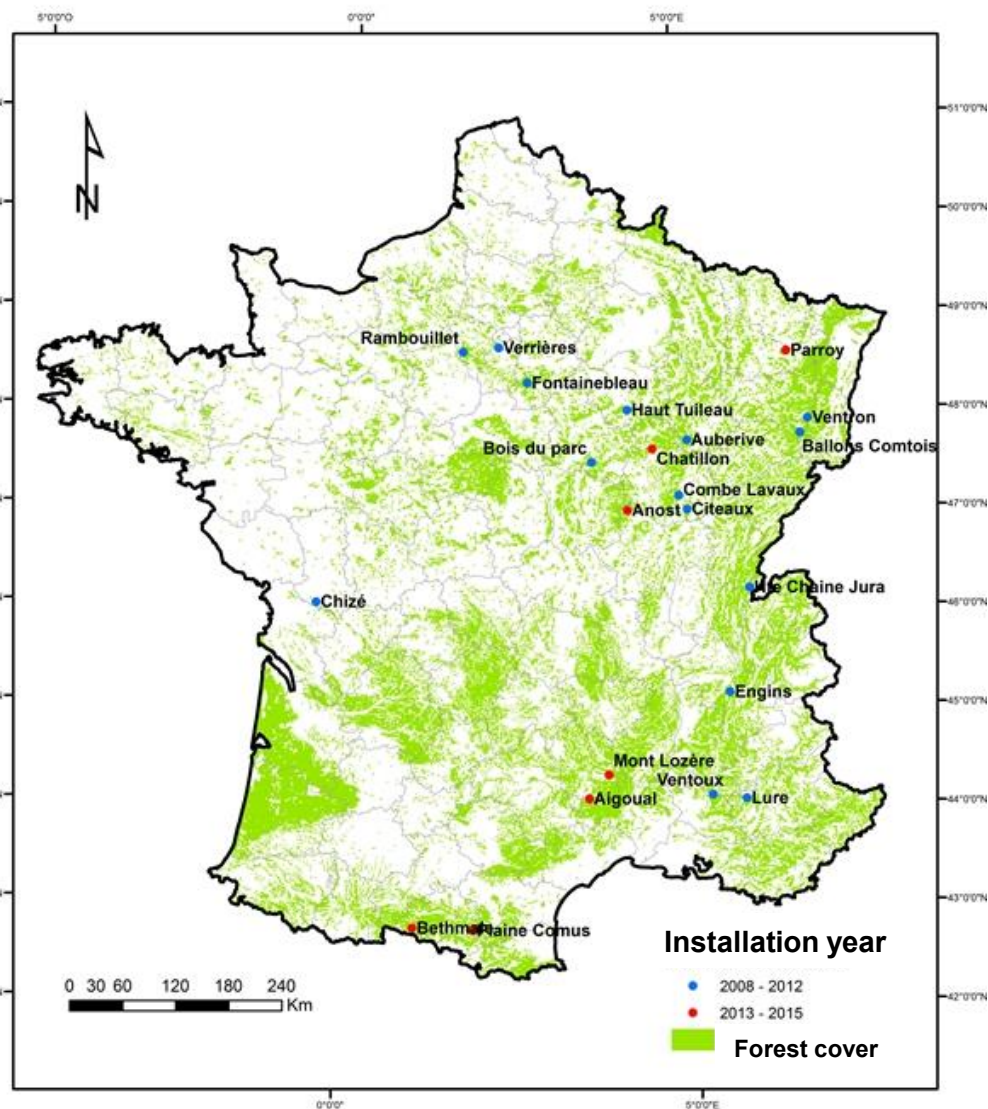
2nd Objective

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

3rd 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 ± 12 years

UNM: 46 ± 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)

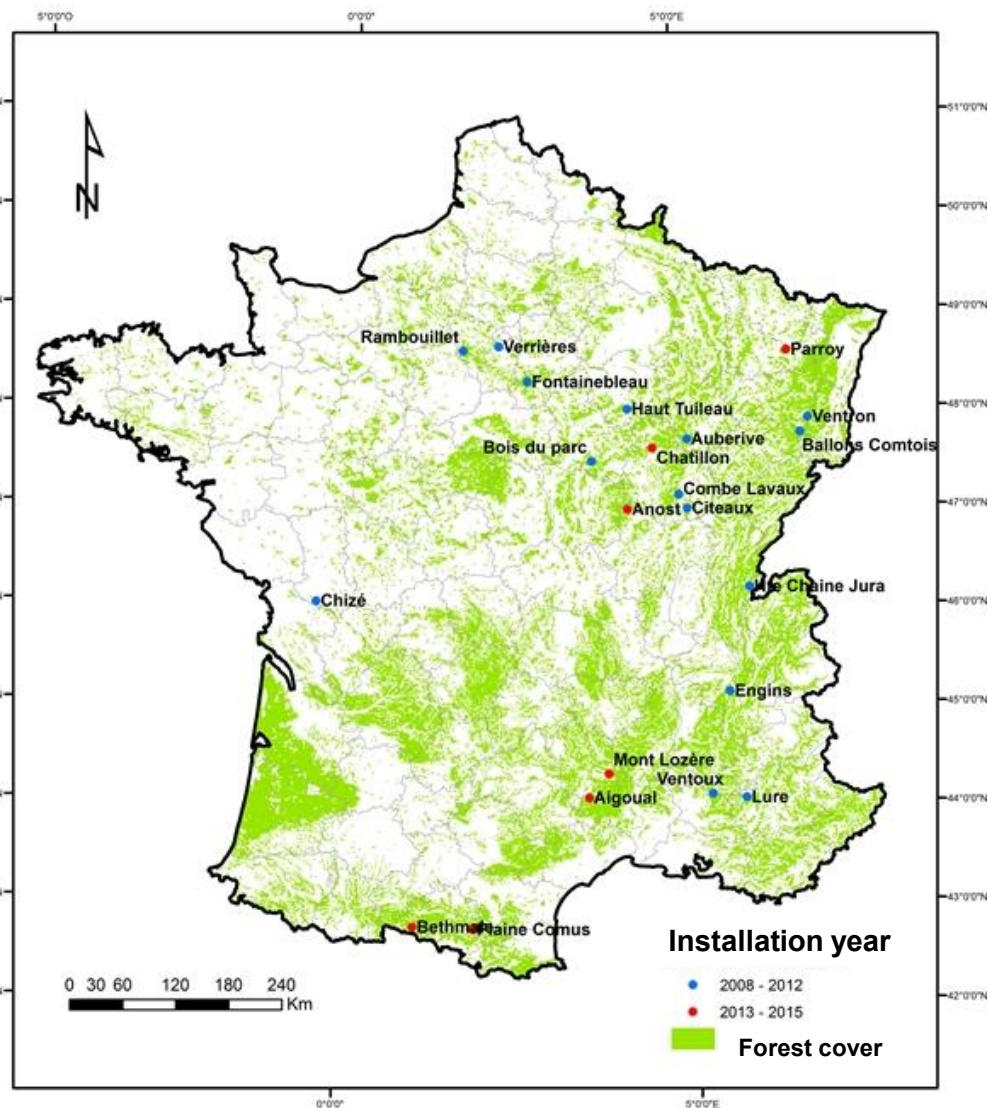


Logs D>5cm
(max: R=20m)

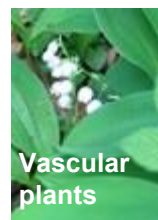
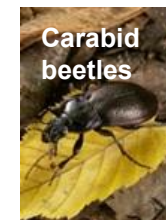


... as well as/compared to **rapid habitat assessment (IBP)**

A multi-taxa research project



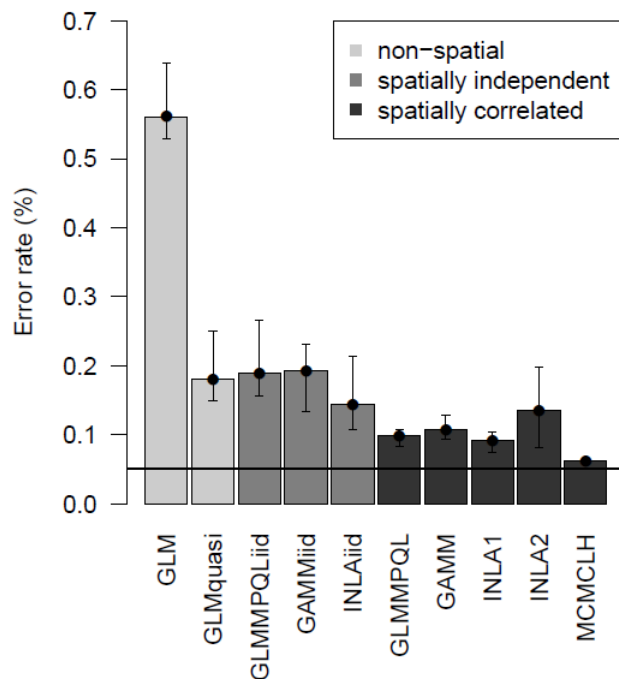
↪ **Seven taxonomic groups**
being investigated



Some methodological results

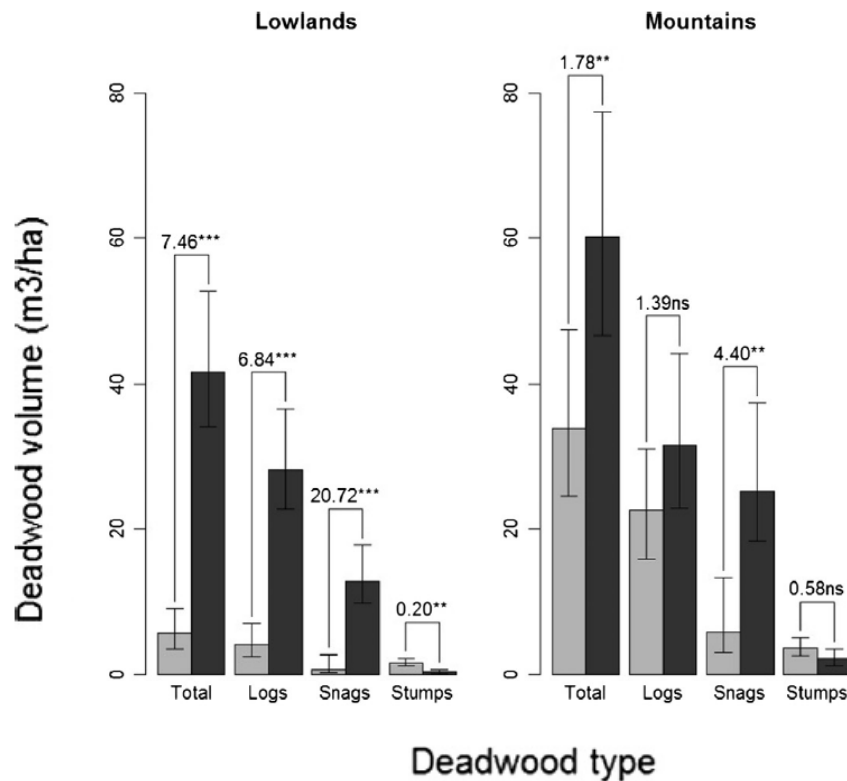
↪ available spatially-explicit Bayesian methods more adequate to account for spatial pseudoreplication than frequentist ones for count data

↪ importance of incorporating spatial autocorrelation



Some ecological results

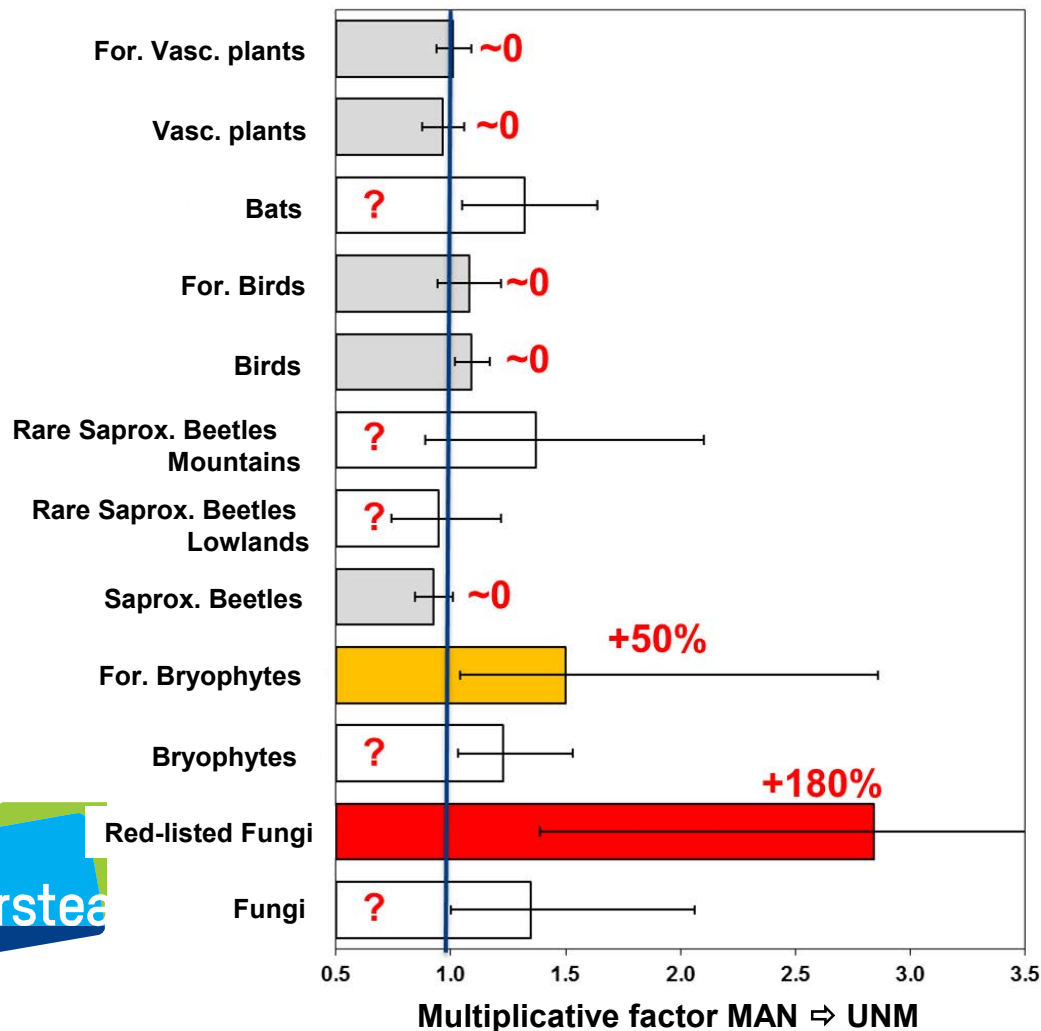
1- **Strong dendrometric differences** (very large trees, deadwood) between managed and unmanaged stands, but not uniformly



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

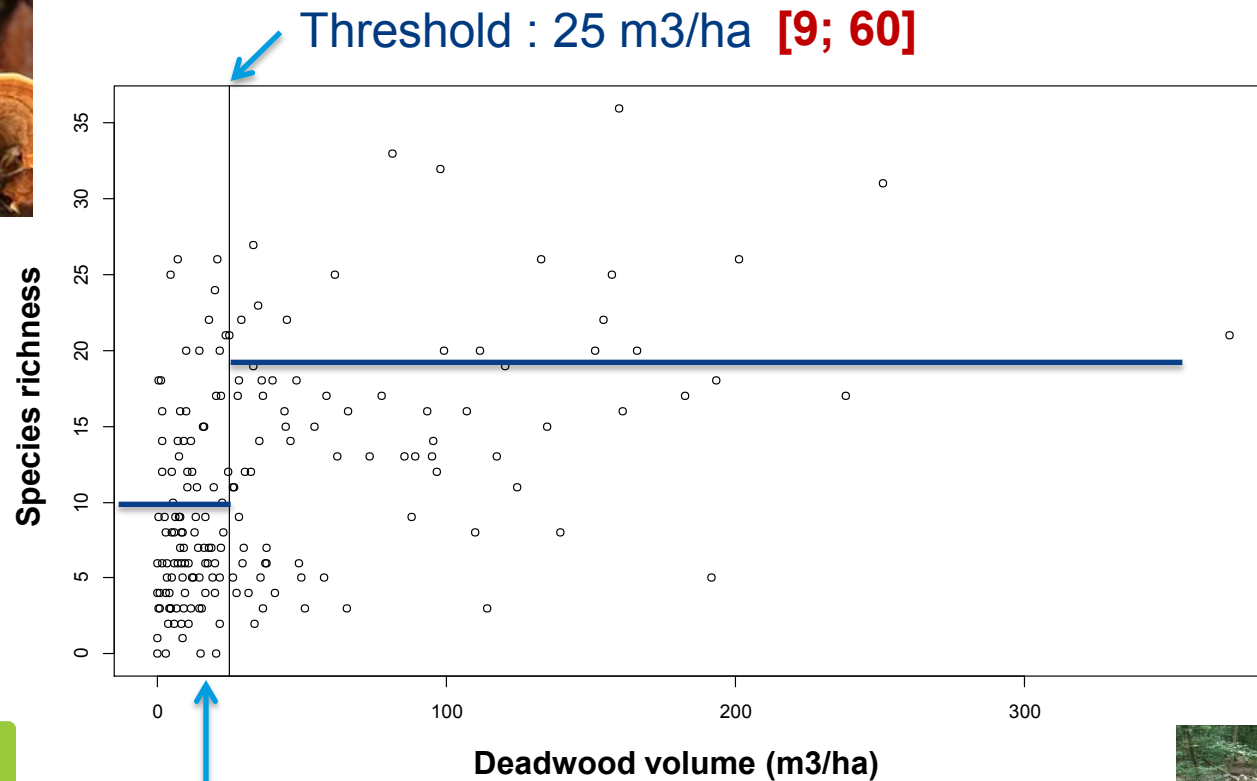
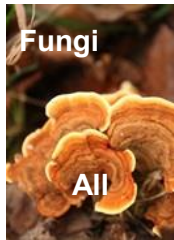


Other best indicators (without strong effects):

- 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



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Mean in managed stands : 20 m³/ha



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...)

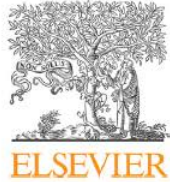
↳ Other scales (tree level, gamma...)

↳ 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



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Synthèse du rapport final
8 novembre 2014

Numéro de contrat MEDDE/MAAF : 10-MBGD-BGF-1-CVS-092, n°CHORUS 2100 214 651



Strong obser
A case study

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ARTICLE IN

Article history:

Received 10 February 201

Received in revised form

Accepted 19 August 2014

Keywords:

Data quality
Tree microhabitats
Observer effect
Detectability
Bayesian analysis

Article history:

Received 1 March 2012

Received in revised form 18

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licability, their range of validity and
to represent. In this process, assessing
on-specialist observers are involved.
characteristics – are reputed to be easily
quire prior forestry or ecology knowl-
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16 oak (*Quercus petraea* and *Quercus*
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ARTICLE INFO

Article history:
Received 8 January 2015
Received in revised form 16 February 2015
Accepted 27 February 2015

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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



GNB stands for *(forest) management,*
naturalness & biodiversity

« *Gestion, Naturalité, Biodiversité* »



A diverse interface between forest
management and research

