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**

Hunter 1999 Cambridge U. Press
Lindenmayer & Franklin 2002 Island Press
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

- Vascular plants
- Bryophytes
- Lignicolous fungi
- Saproxylic Beetles
- Carabid beetles
- Bats
- Birds
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)

Gosselin et al. (2014)
Research Report
Some ecological results

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

![Graph showing relationship between deadwood volume and species richness](image)

- **Threshold**: 25 m³/ha [9; 60]
- **Mean in managed stands**: 20 m³/ha

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**Fungi**

**All**

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**Species richness**

**Deadwood volume (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?
Strong obse
A case study
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est biodiversity, such as forest
😊😊 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