Production capacity in oak high forests

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Tradeoffs between wood production, biodiversity preservation and attractiveness for recreation

Nicolas Robert (IFN-LEF)
PhD supervisor: Anne Stenger (LEF)

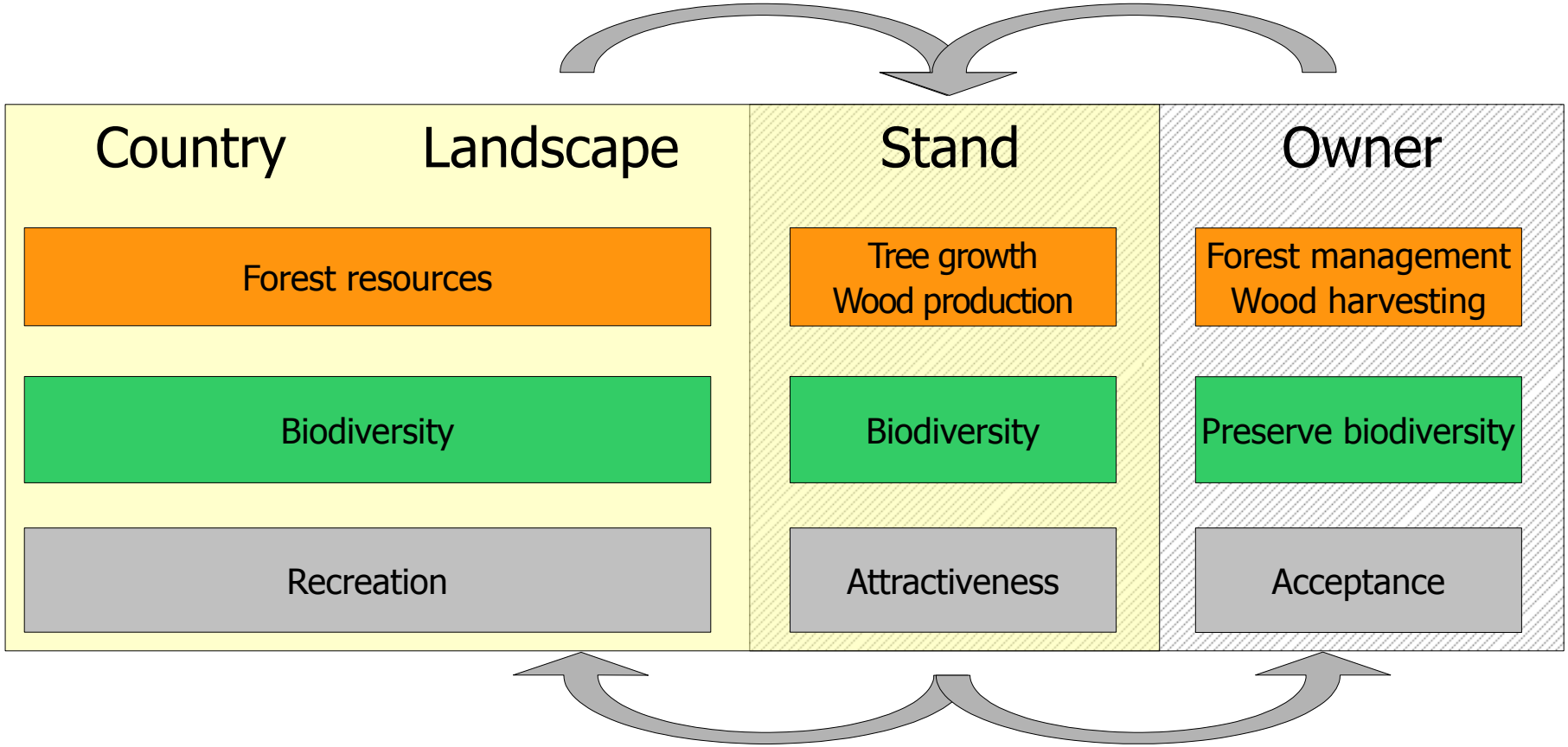
IUFRO – Paris – May 28, 2010

Context
Multiple stakes of forests

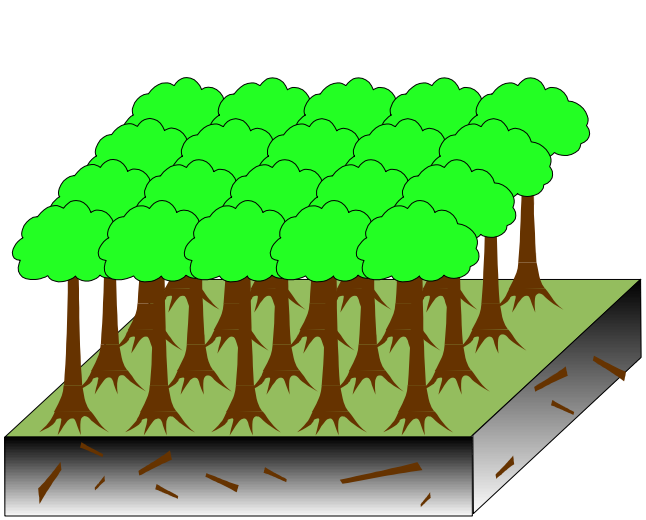
1

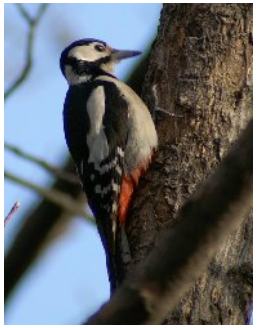
Harvest more wood and preserve the environment

Context
A multiple scale question



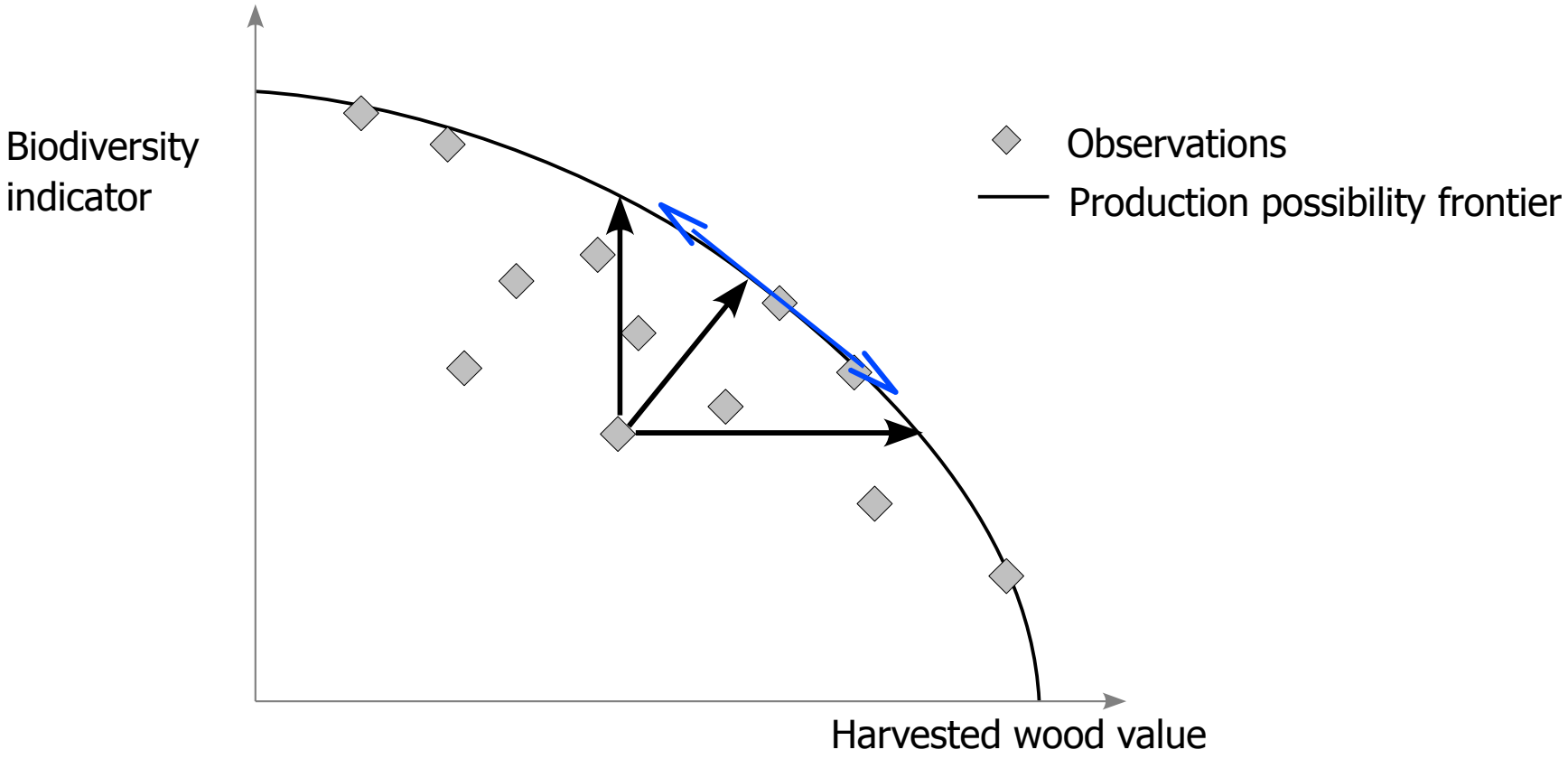
Multi-functionality at the stand level





Material and methods 1

A production possibility Frontier approach

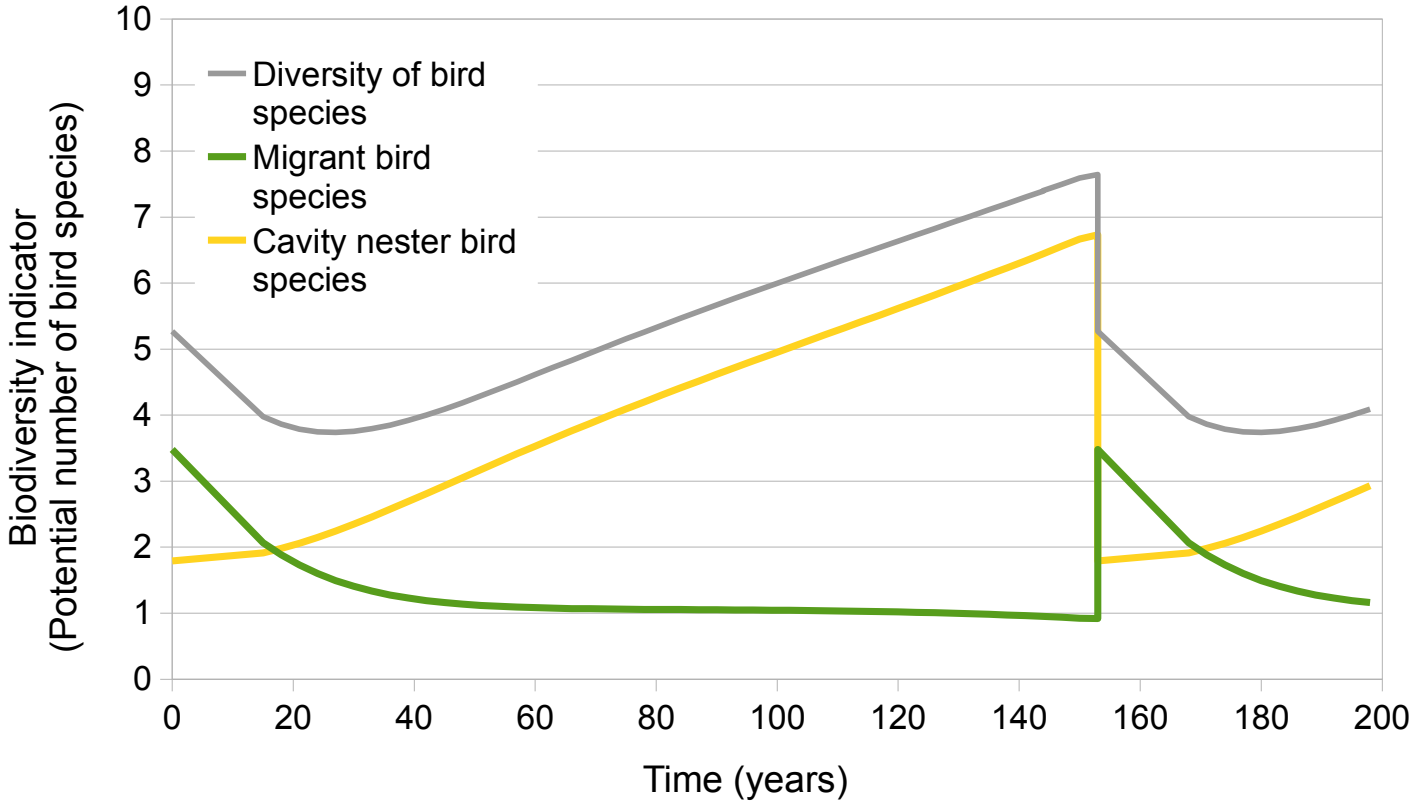


Material and methods
Choosing indicators

2.1

Biodiversity

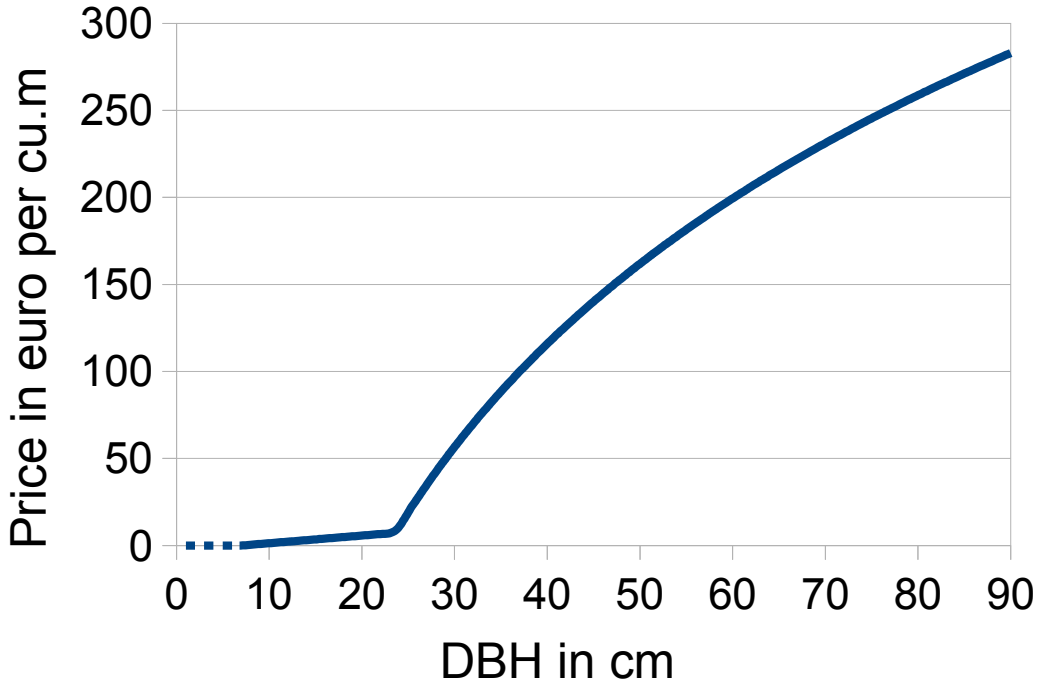
$$Bio(t) = Bio_{\text{cavity nesters}}(h_{dom}(t)) + Bio_{\text{migrant}}(h_{dom}(t))$$



Choosing indicators

Wood

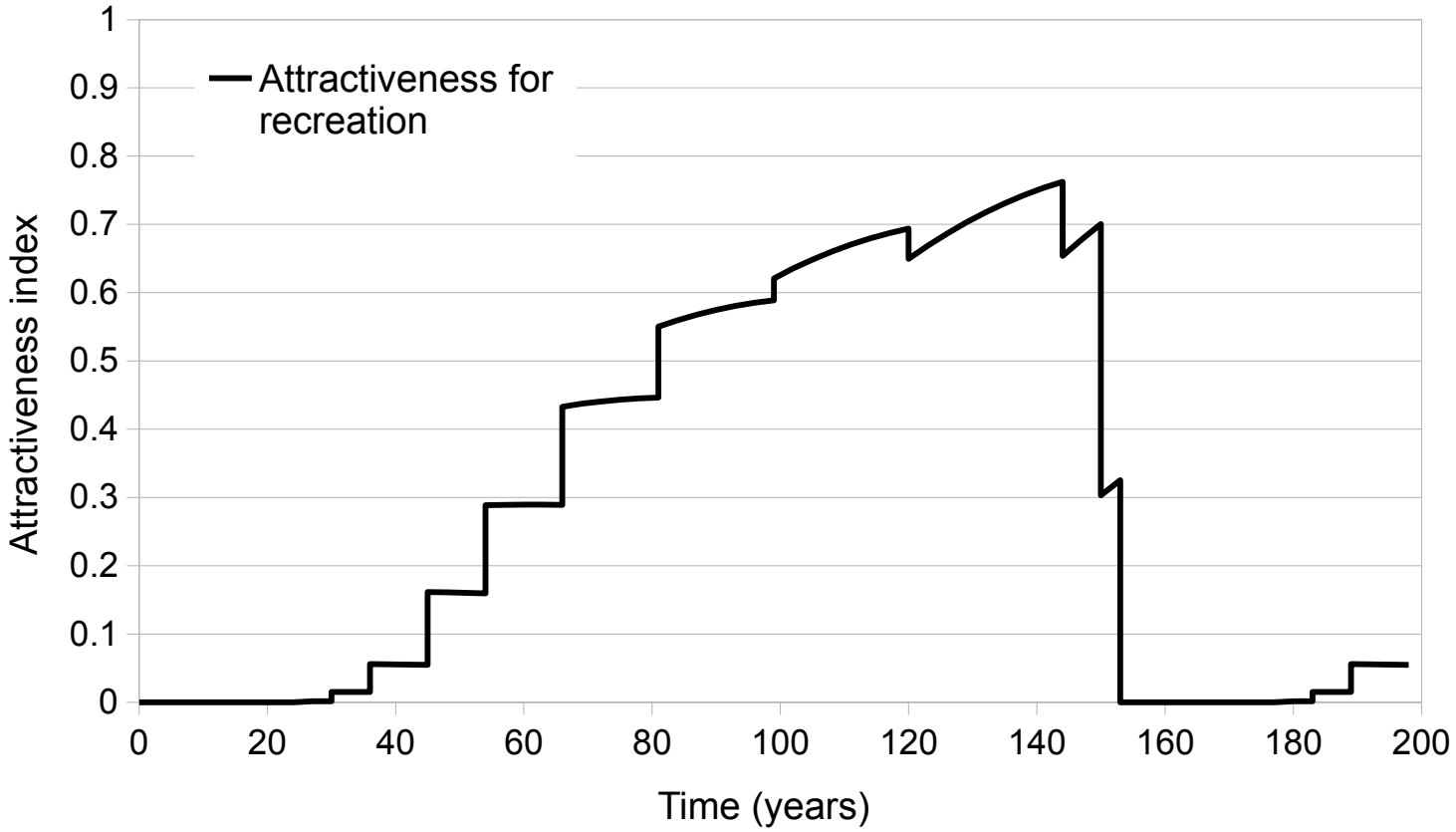
$$B(t) = V_{\text{timber sold at } t} \times f\left(d_{g\,\text{timber sold at } t}\right)$$



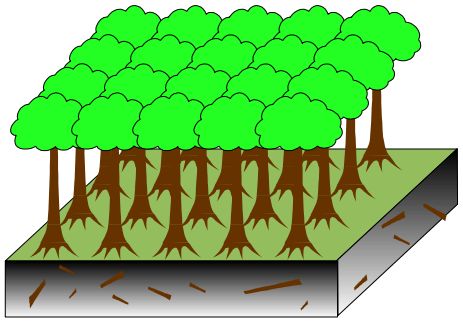
Choosing indicators

Recreation

$$A(t) = f\left(Age_{Stand_t}, nb_{stems_t}, d_{g_t}\right)$$



Material and methods
Output from rotations



Net present value of an infinite series of rotations

$$NPVIS = \frac{\sum_{t=0}^{T} \left(B_t \cdot (1+r)^{T-t}\right) - C_0}{((1+r)^T - 1)}$$

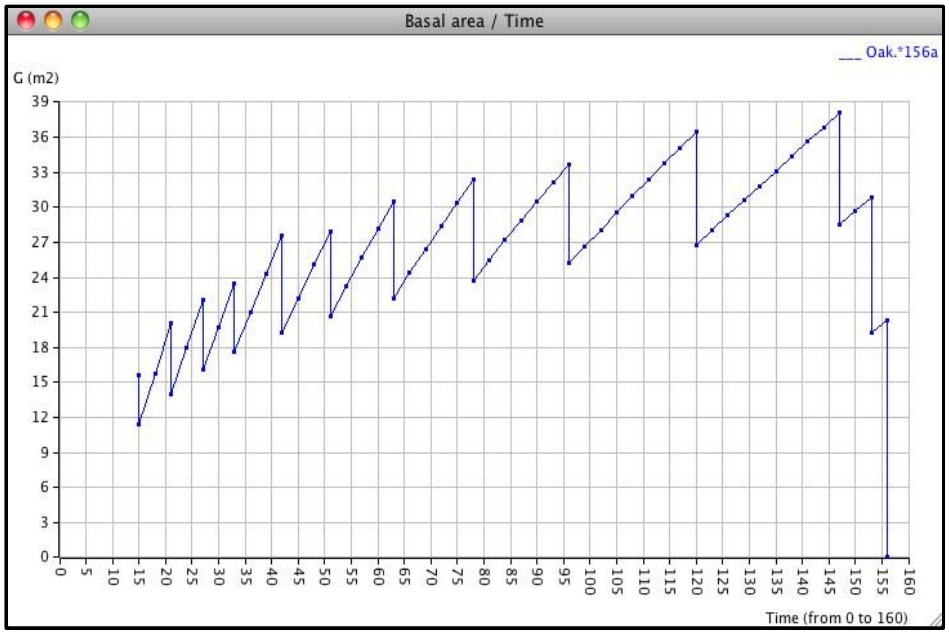
Average value

$$\mu_A = \frac{\int_{t=0}^{T} f_A(t)\,dt}{T}$$

Material and methods 4
Biological simulation of the rotations

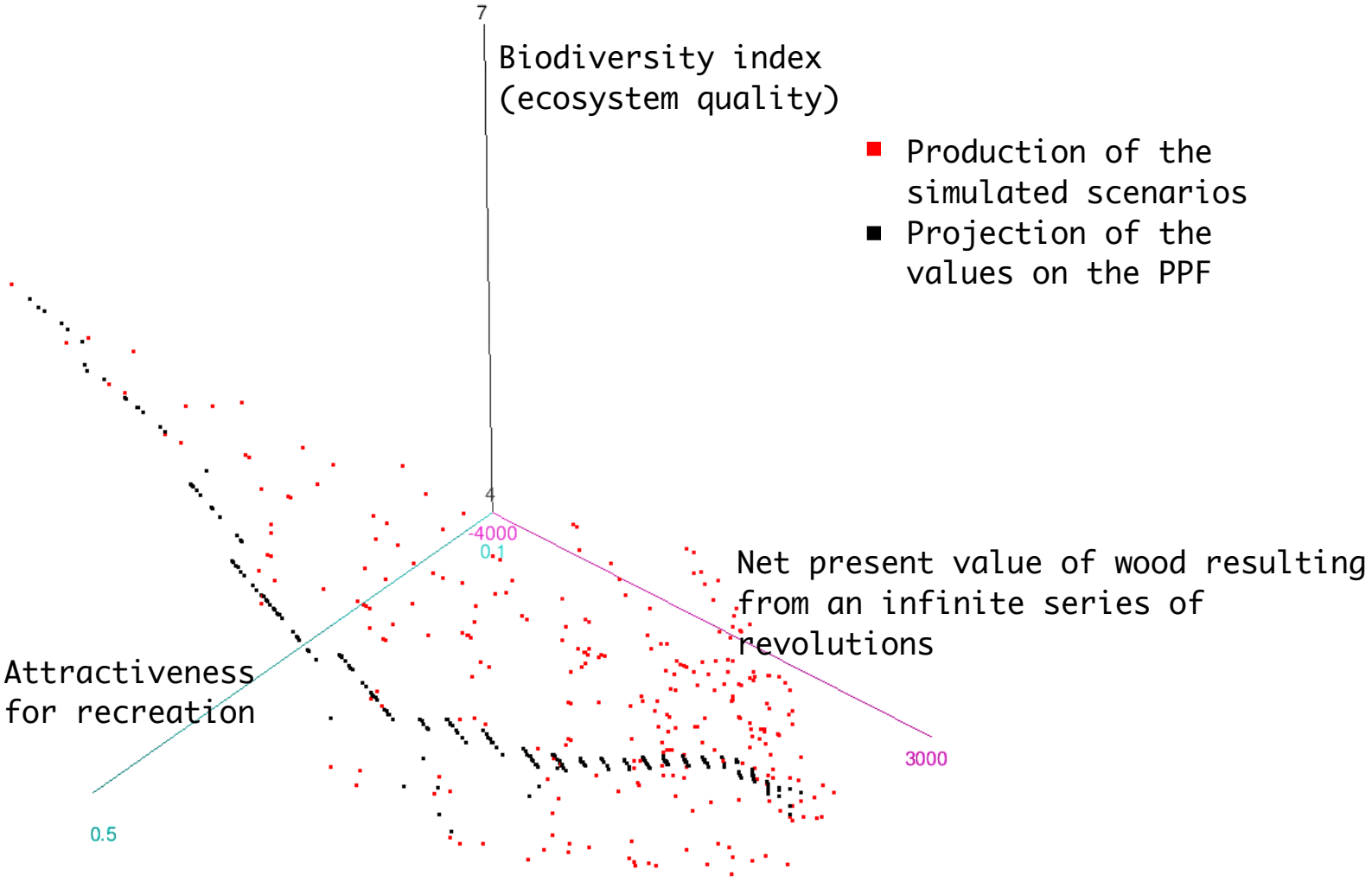
- Growth and yield simulator
  - At the stand scale
  - With cutting planning

- Simulations parameters
  - For all simulations
    - area : 1 ha
    - fertility : 32.5 m at 100 years
  - variable
    - Number and intensity of cuttings
    - Target diameter

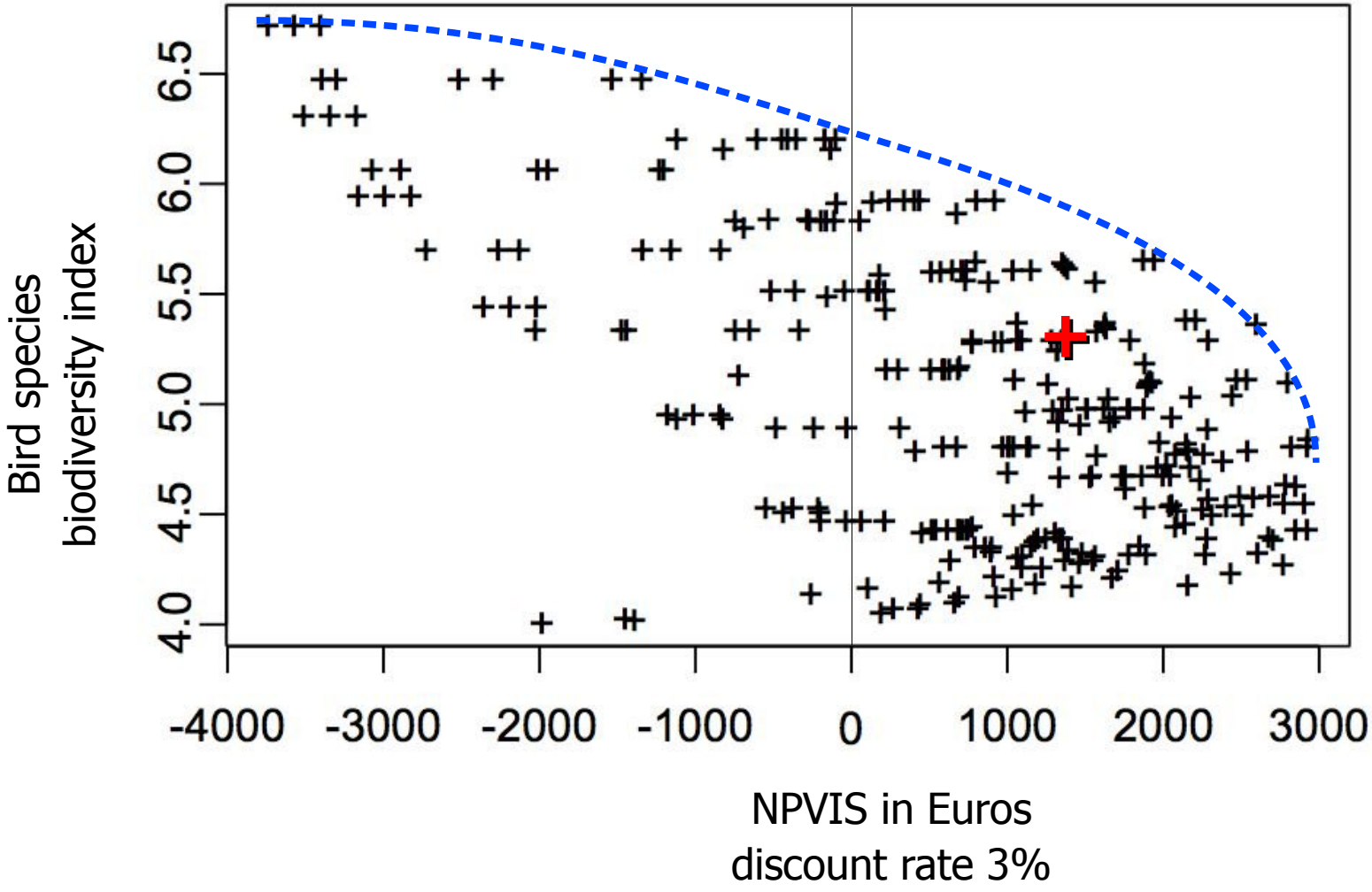


Fagacées / Capsis

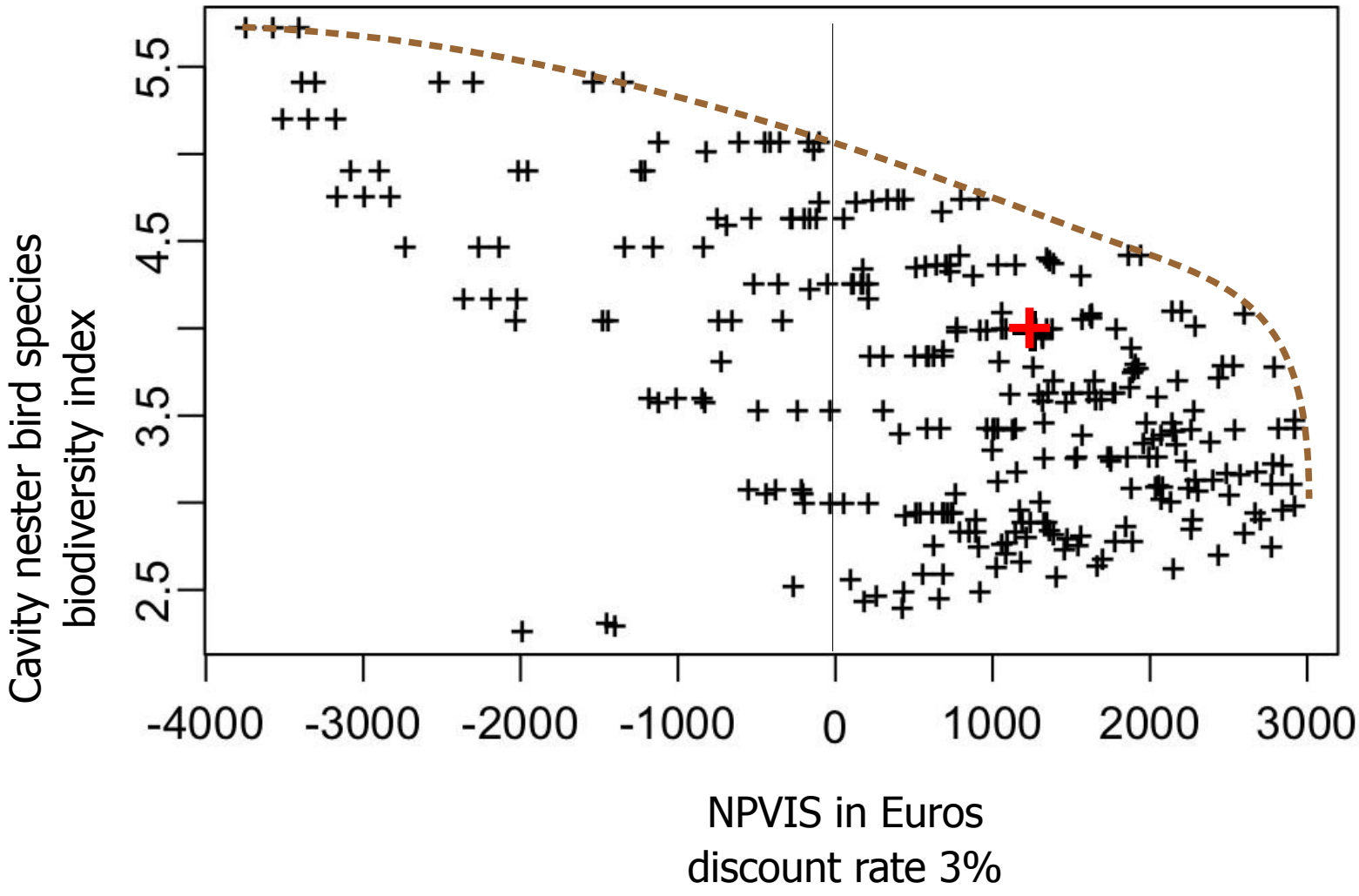
3 dimensions frontier analysis



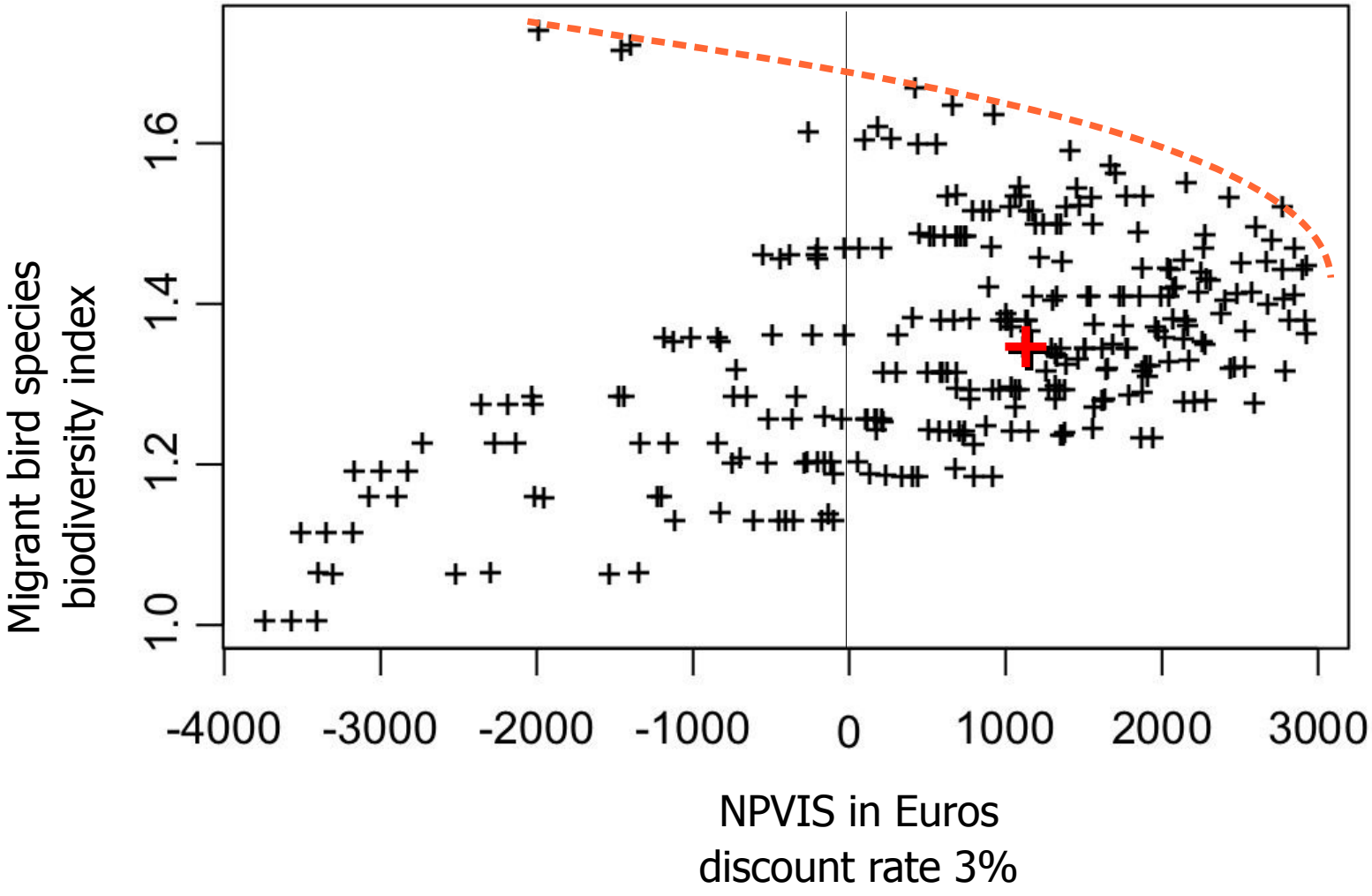
Reduce NPVIS to protect bird species



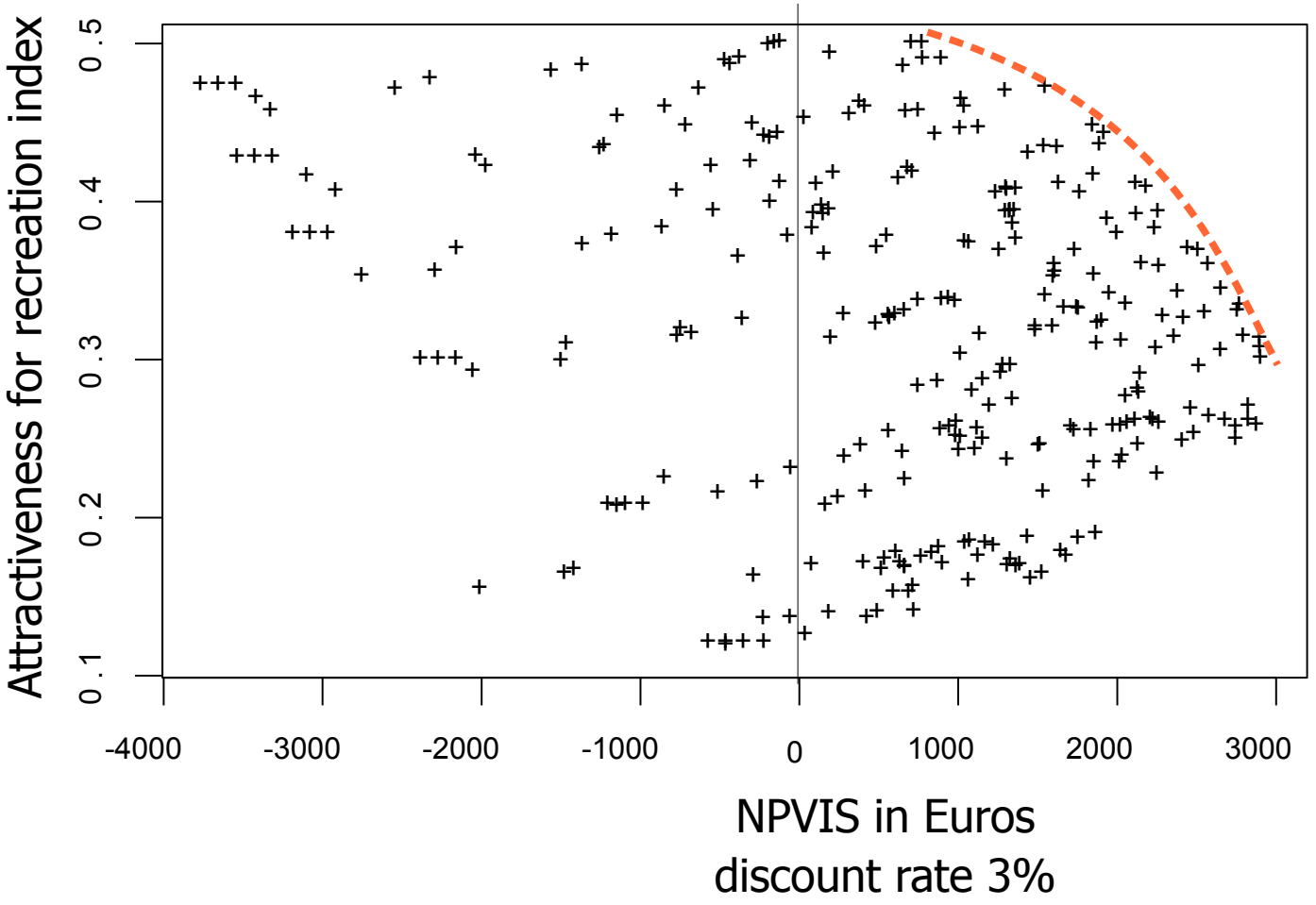
Protection of cavity nester bird species



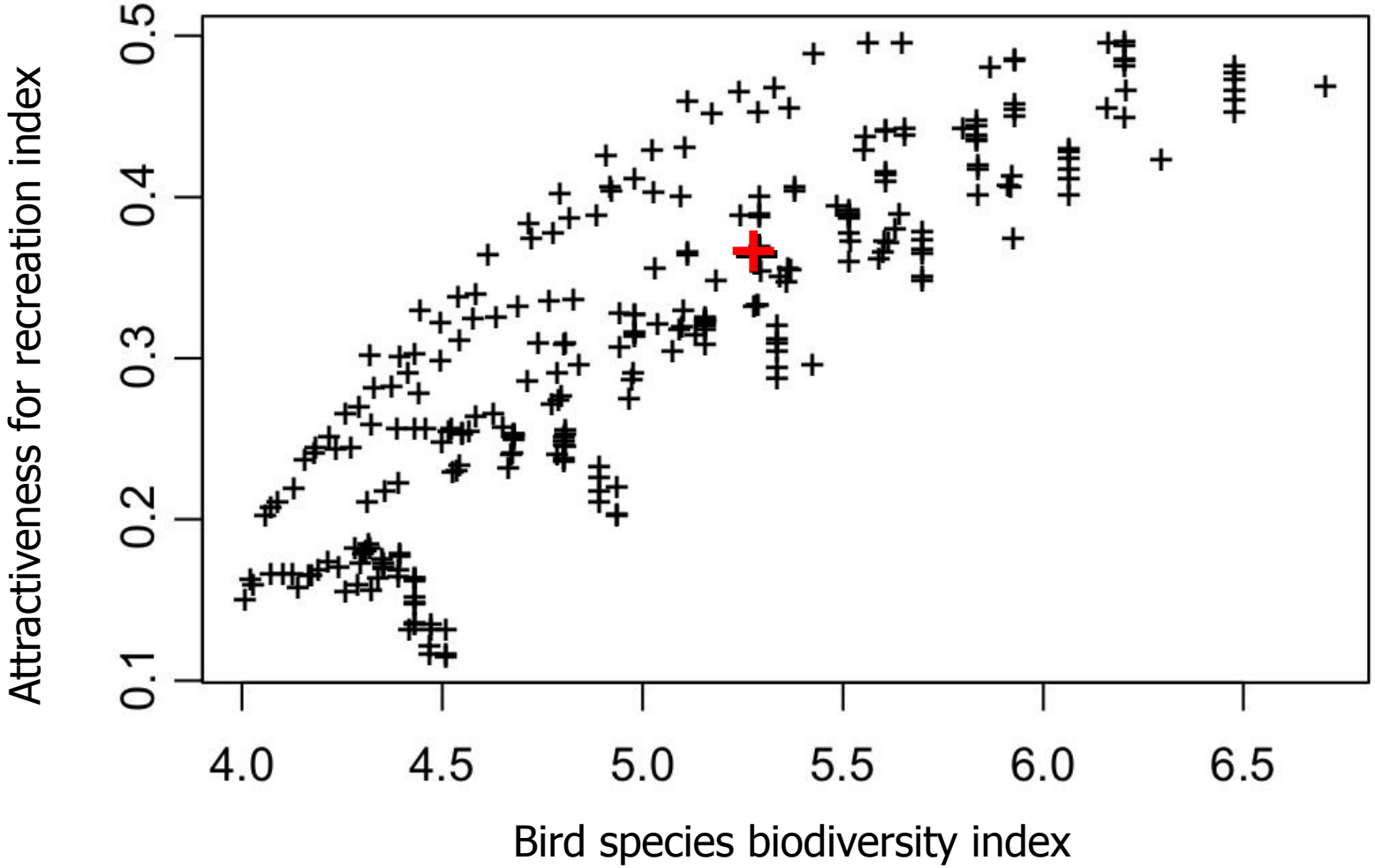
Preserve places for migrant bird species



Attractiveness v.s. NPVIS



To protect bird species and to propose attractive forests: two compatible services



Conclusions

- DEA analysis of simulated data
  → no values of the products required
  → compatibility of products
- Simulation
  → oak high forest stand management

- Further work:
  → other species and forest types
  → other indicators
  → change scale

Thank you for your attention

Nicolas Robert
nicolas.robert@ifn.fr