Universiteit Utrecht

Prince Bernhard Chair

Dynamics of recovering forests

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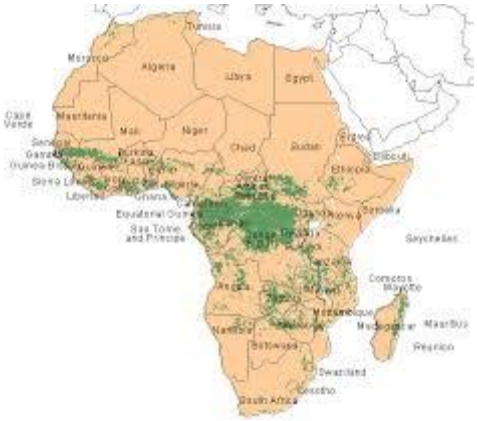
Introduction

- 1&2: Biomass dynamics in logged forests
- 3: Impact of hunting on tree community
- 4: Role of certified forest management in conservation of wildlife



1. Biomass dynamics in logged forests: the role of wood density (Nam et al 2017)

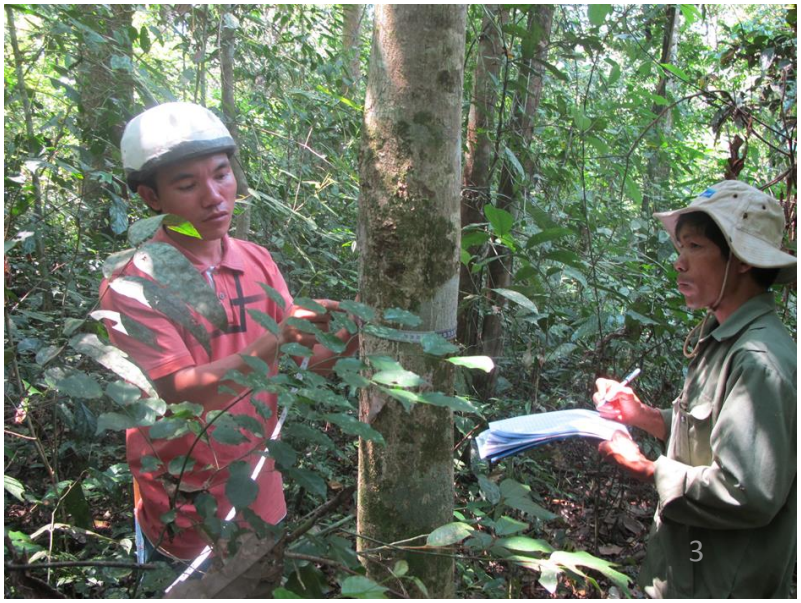
- Selective logging impacts biomass and species composition
- Functional groups may show different reponse
- Wood density (WD) key trait in growth strategies of species

- As logging disproportionally affects high WD species:

How does WD correlate to biomass dynamics at species and community level?

- Role of WD determined in a
  - one time logged forest (30 yrs)
  - second time logged forest (2-5 yrs)

- Allometric equations: Nam et al 2016



Methods

At species level:

- Mortality rate
- Recruitment rate
- Growth rates: AGB, DBH
- t=8 years for one time logged forest
- t=1 year for twice logged forest

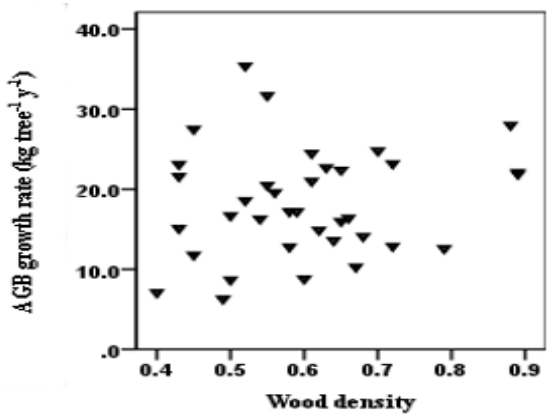
At community level (corrected for species abundance):

- net AGB increment per species per ha: $AGBI_{com} = AGBI_g + AGBI_r - AGB_m$

Results

- One time logged forest: fast growth and low mortality
- At species level: high WD species had lower mortality and lower DBH increment, but showed high AGB growth

- Twice logged forest: mortality rates much higher than in one time logged forest
- Net AGB increment rates tended to be negative in the 2-3 year plots while in the 4-5 year plots they were significantly positive



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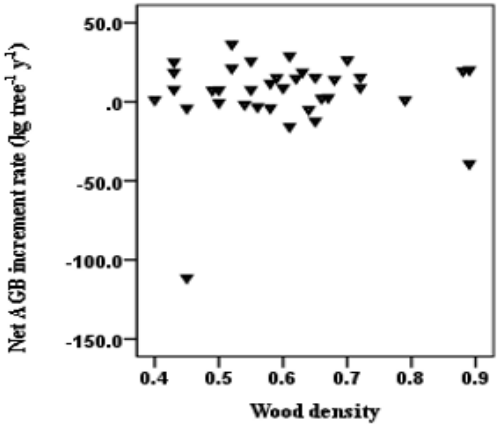
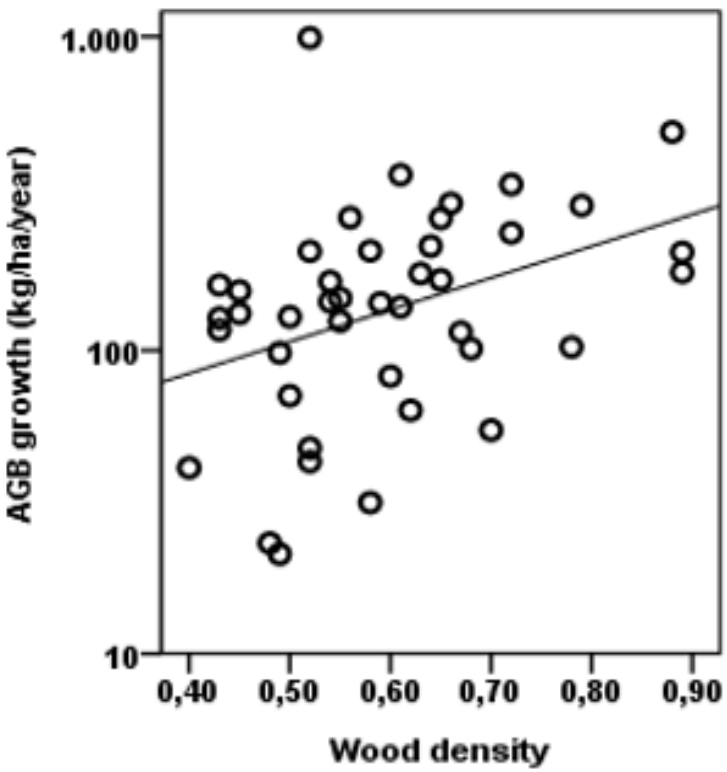
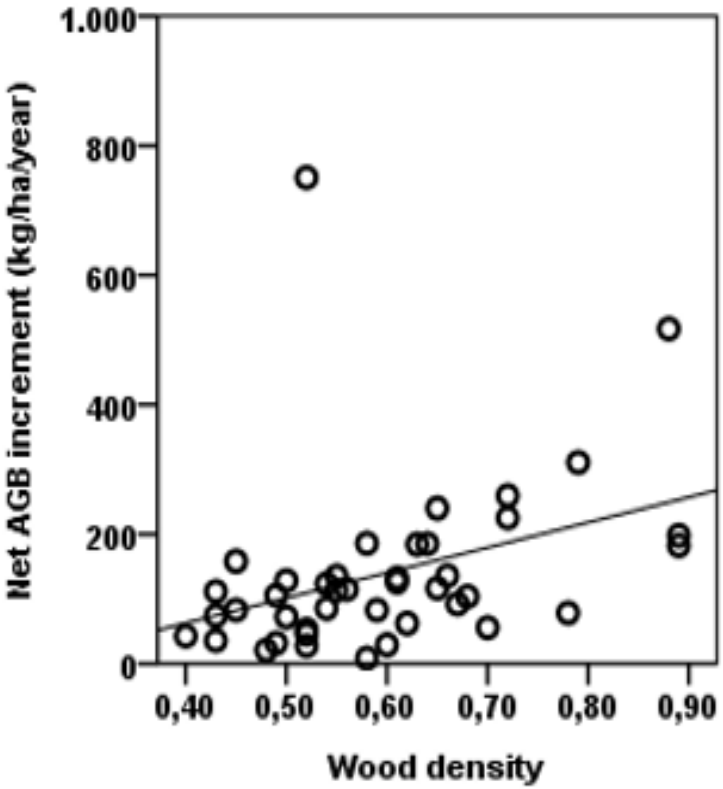


(f)

30 yrs recovery, one time logging

Community level

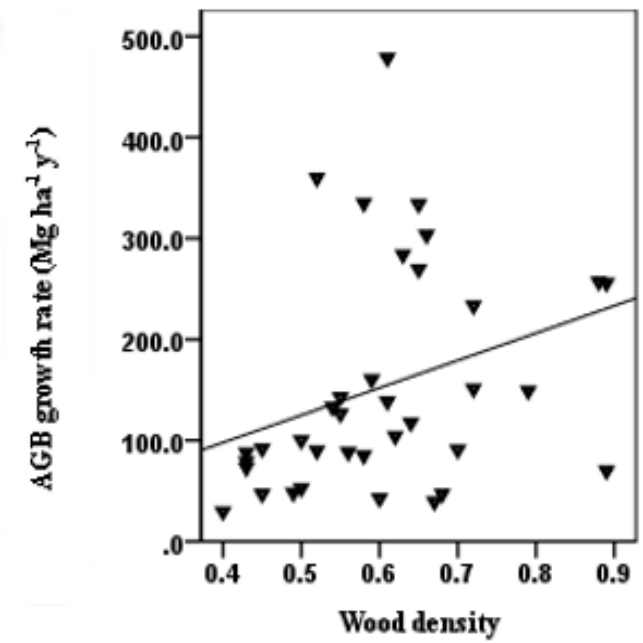




High wood density species contribute more to biomass than low wood density species

2-5 yrs recovery, second time logging

Community level



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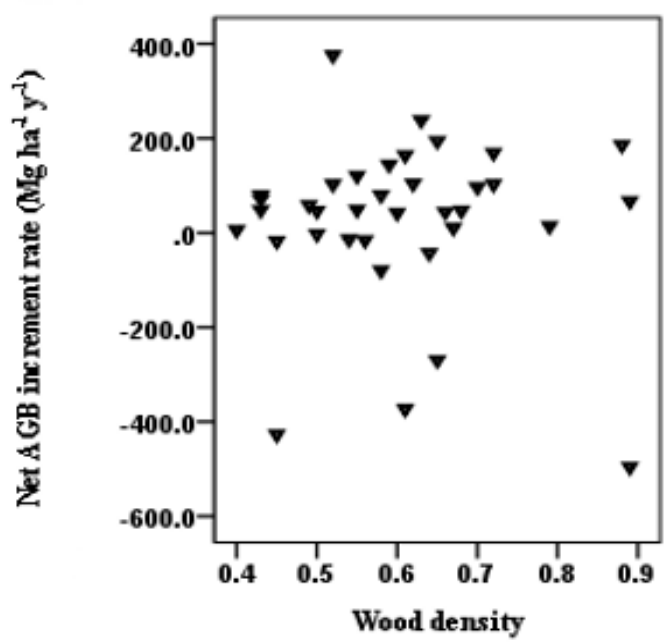


(j)

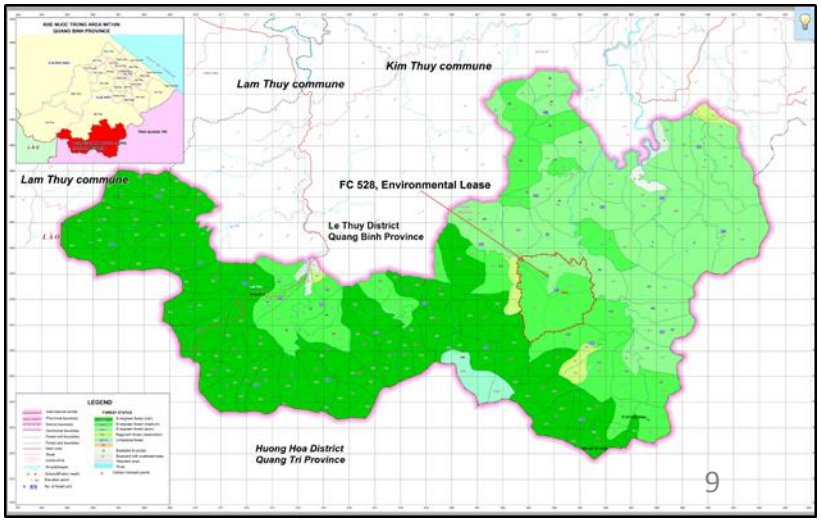
The positive relation between WD and community biomass is shifted –at least temporarily- by logging

- Logging can alter the relationship between a functional trait (such as WD) and demographic rates
- This partly explains how frequent logging alters species composition of the forest and it also impacts carbon stocks
- Maintaining high wood density species increases biomass recovery and carbon sequestration after logging
- Therefore, selective logging regimes should consider variation in WD between species

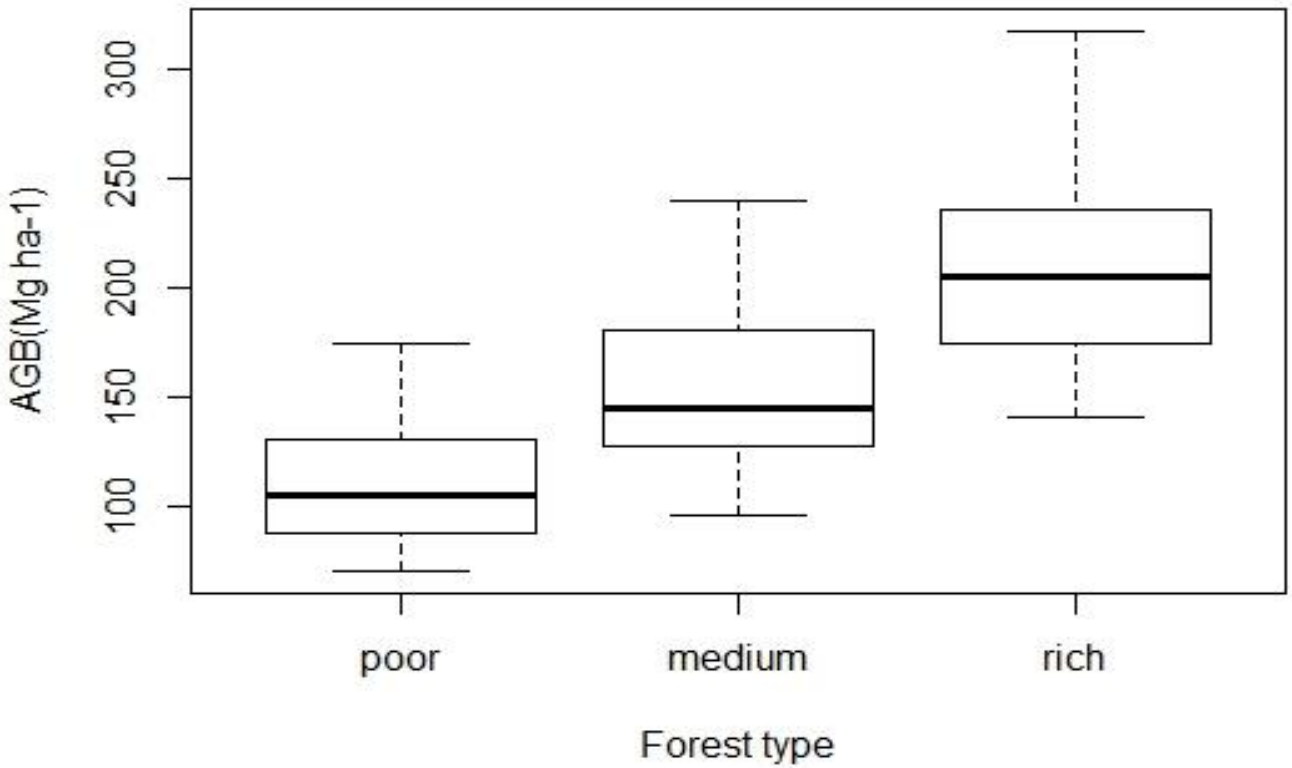
2. REDD+ project in central Vietnam

Research questions

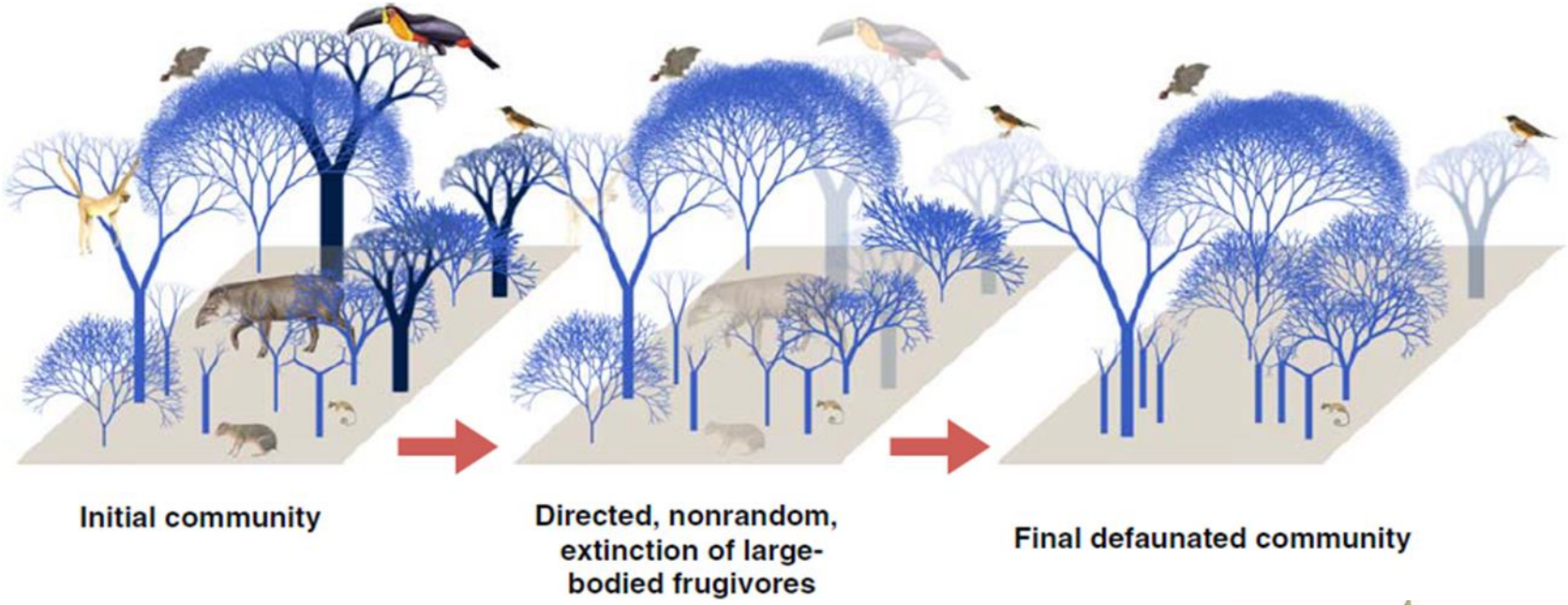
1. Spatial distribution of aboveground biomass and necromass in logged lowland forests:
what drives the biomass values in these forests?
2. Do differences in logging intensity impact tree diversity and composition?
3. Do forest recovery rates differ in forests with different logging intensities?



So far: AGB for each forest type (n=6 each)
Next: dynamics (growth, mortality, recruitment)



3. Impact of hunting on tree composition



1) Peres (2000) Conservation biology
2) Bello et al. (2015) Science advances

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Parc National

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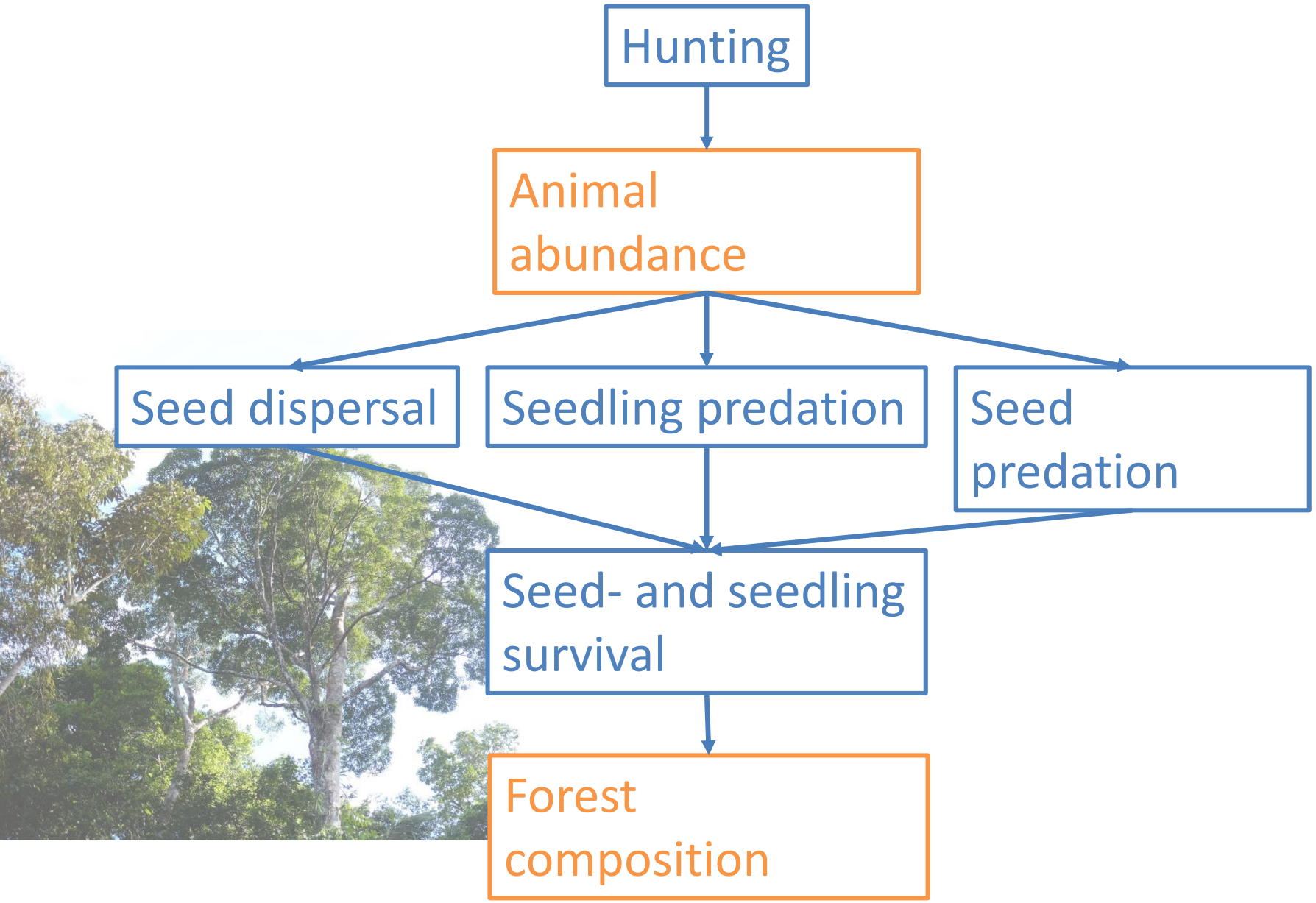
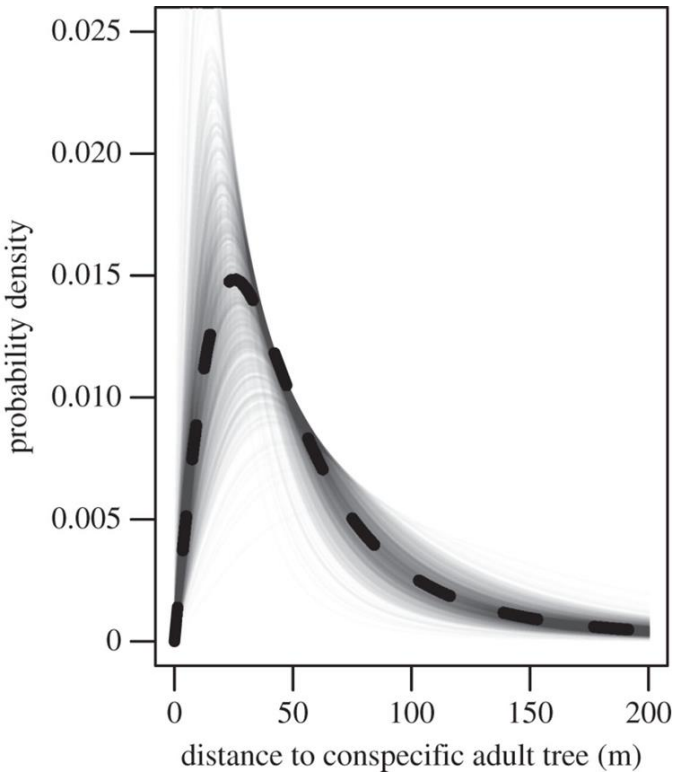
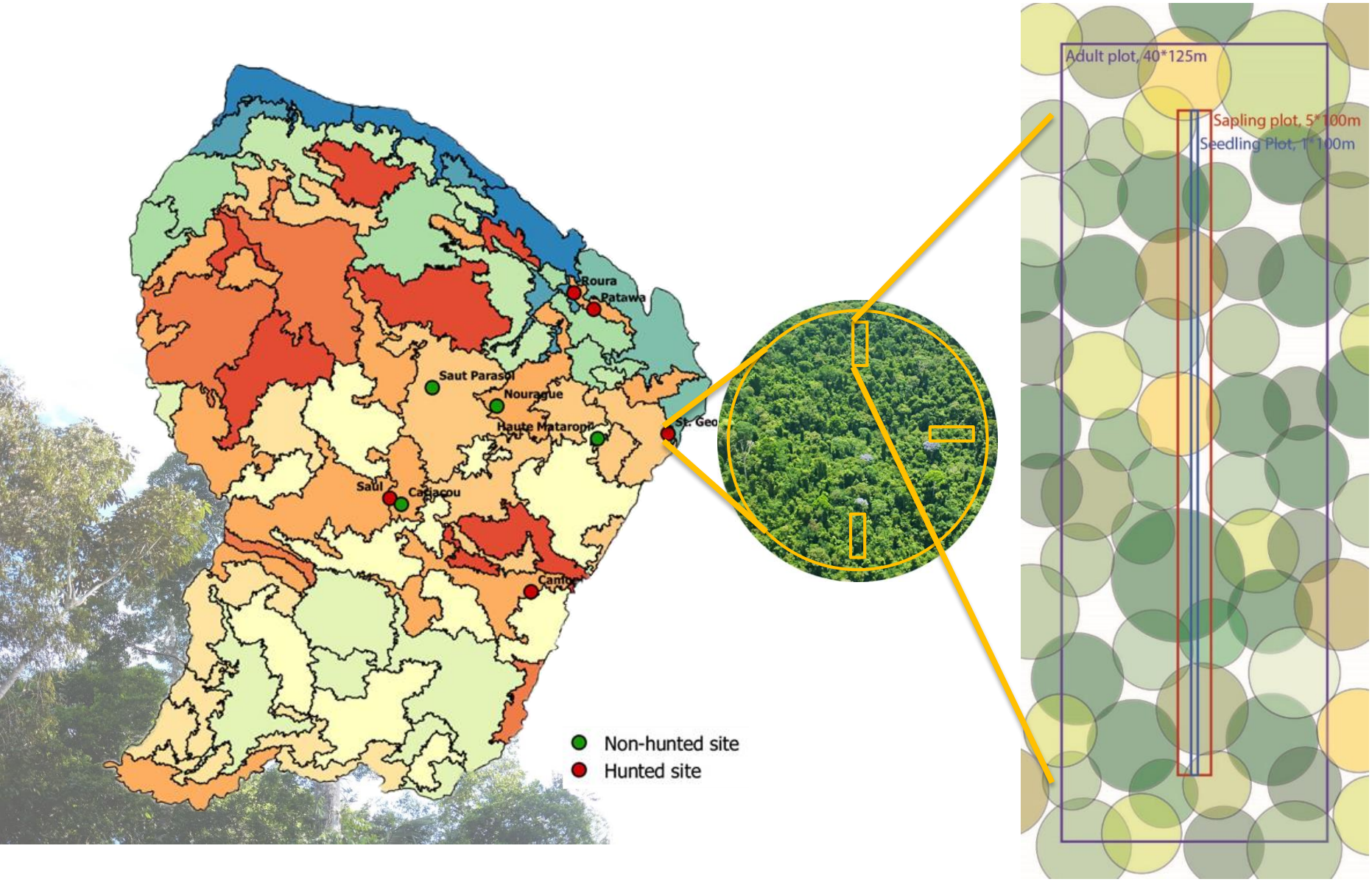

Hunting
Animal abundance
Seed dispersal
Seedling predation
Seed predation
Seed- and seedling survival
Forest composition

Research questions

- How does hunting affect seedling functional composition?
- Are shifts in seedling functional composition pervasive across life stages?
- Are functional traits good predictors for hunting induced shifts in tree community composition?
- How does hunting affect seedling kernels?

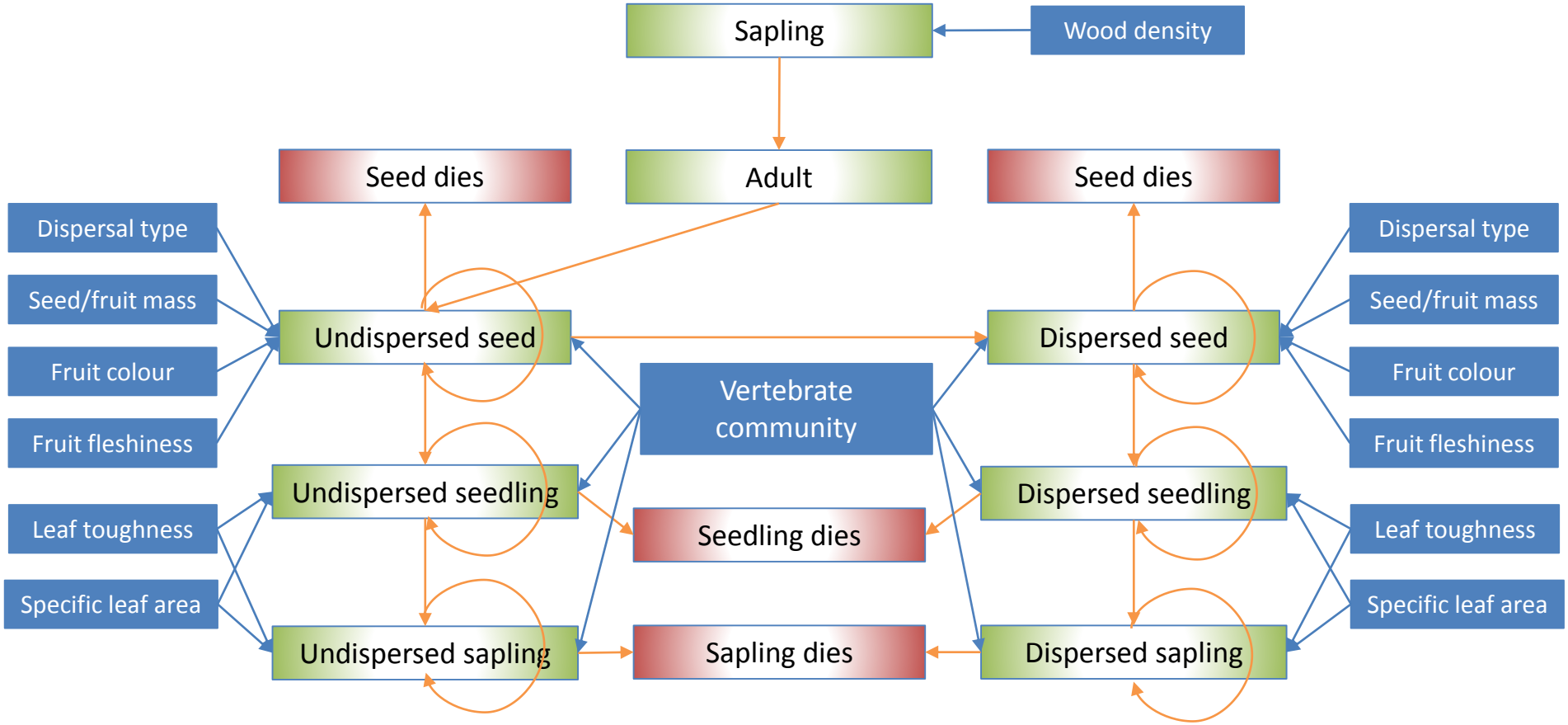


Caughlin, T. T. et al. (2014)
Proceedings of the royal society B


Roura
Patawa
Saut Parasol
Nourague
Haute Mataroni
St. Geo
Saul
Cayiacou
Camopi
Non-hunted site
Hunted site
Adult plot, 40*125m
Sapling plot, 5*100m
Seedling Plot, 1*100m

Van Roosmalen (1985) Fruits of the Guianan Flora

Modelling approach



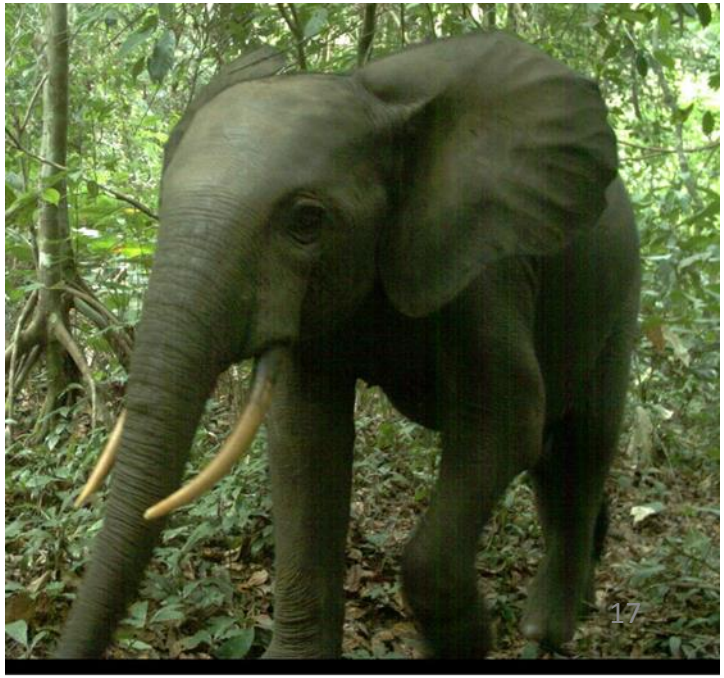
4. Certified forest management for conservation of wildlife

Effects?

- Social component → Well known (Cerutti *et al*. 2014)
- Ecological component → Very limited evidence (Sutherland and Pullin 2004; Van Kuijk *et al.* 2009; Blackman and Rivera, 2010)

Demand for concrete evidence is increasing (Gullison 2003; Ferraro and Pattanayak 2006; Lindenmayer 2008)

How does certified timber production contribute to wildlife conservation compared to convential logging and protected areas?



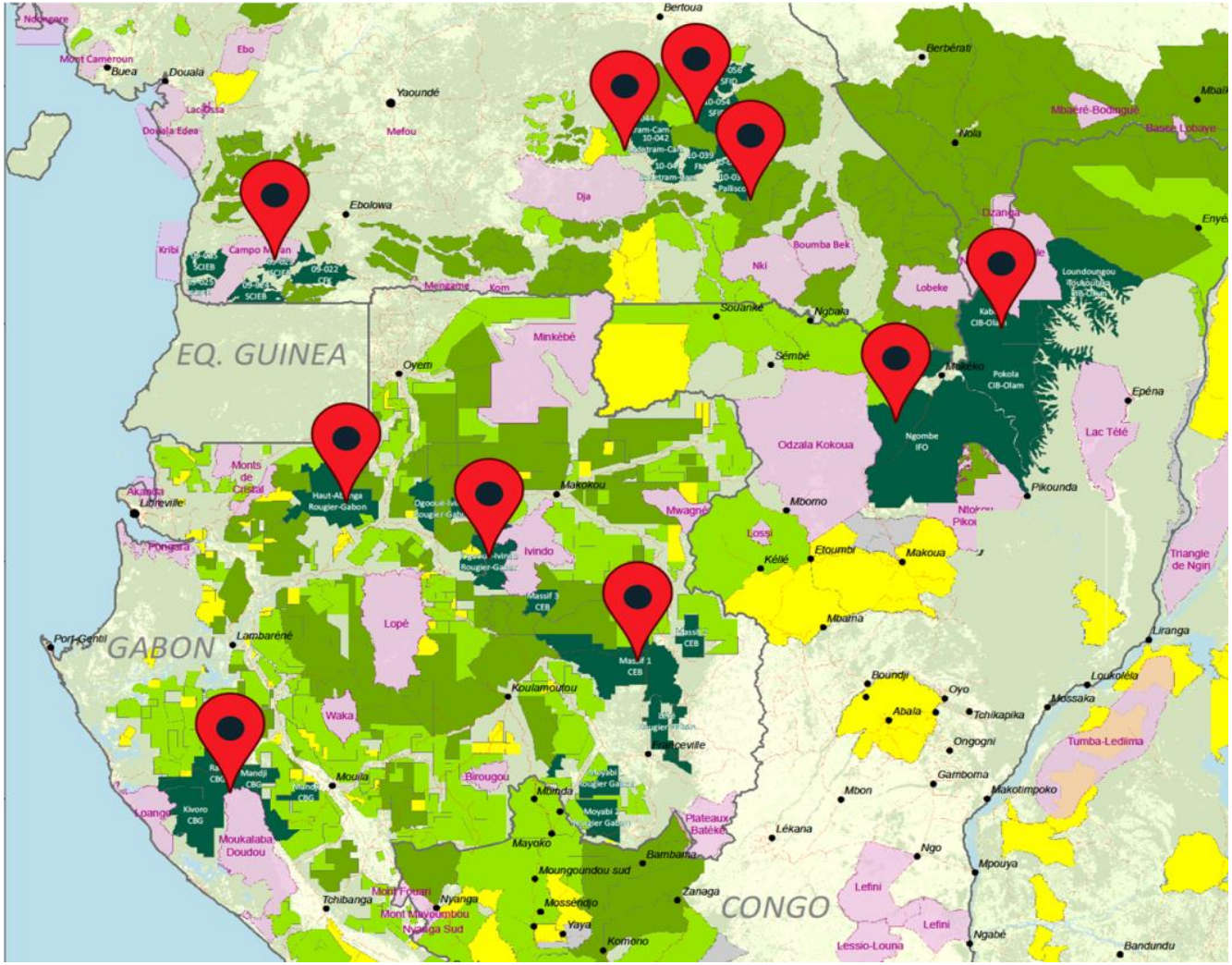
Study design

9 Clusters:

- Certified forestry
- Conventional forestry
- Protected areas

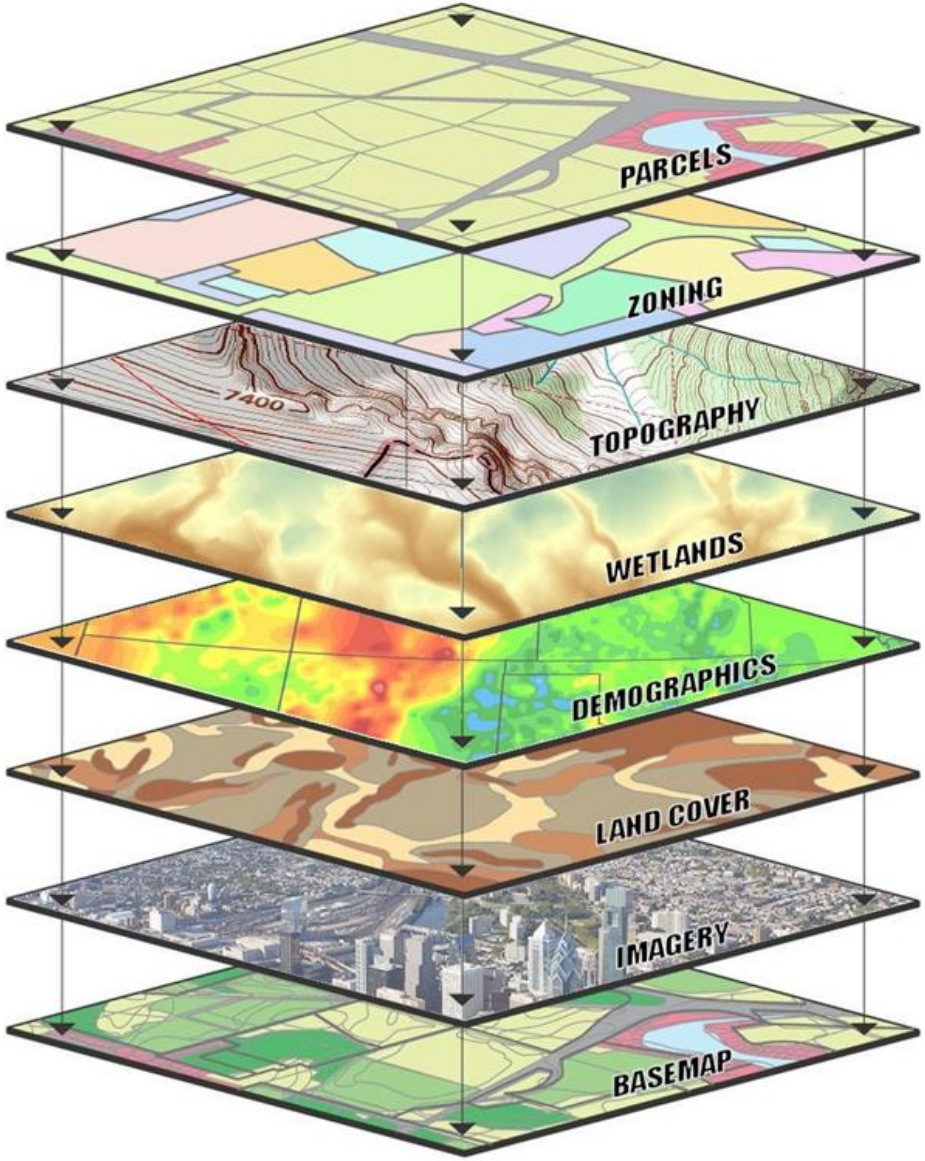
Methods:

- Line transect data
- Soundscaping
- Camera traps
- Interviews/surveys



GIS analysis for site selection

- Confounding factors:
  - Forest type
  - Logging history
  - Distance to roads, rivers, national borders, concession edge, national parks, settlements
  - Concession fragmentation and porosity
  - Population density (human pressure index)



Upcoming….results!

Thank you for your attention!

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