

the past protecting the future

locating climatically stable forest in Gabon

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Climate change and conservation

The present dilemma is that with climate change rain forest in protected areas will disappear and the risk is that non-protected climatically stable forest (in between protected areas) will be degraded into secondary forest by logging and plantations



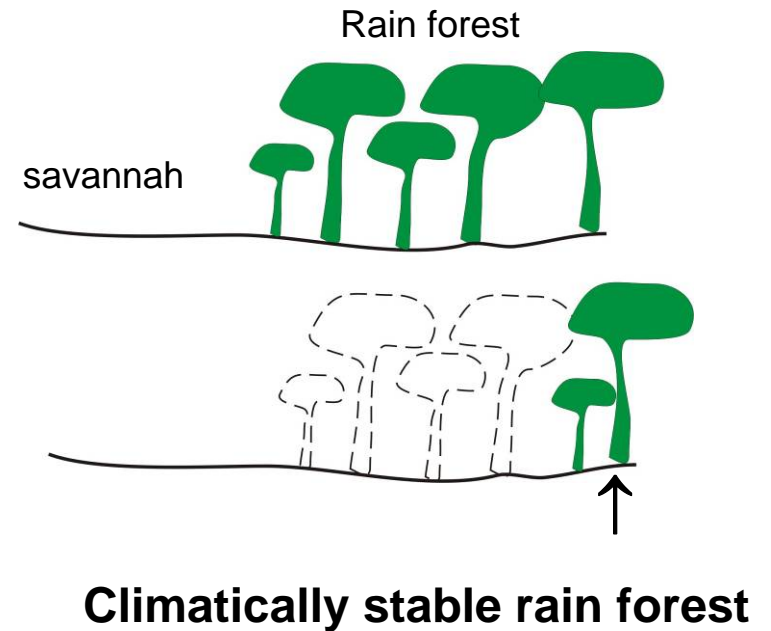
Climate change and conservation

- ***What*** are climatically stable forests
- ***Why*** are they important for conservation
- ***Where*** are the climatically stable forests
- ***How*** to locate them



Global warming

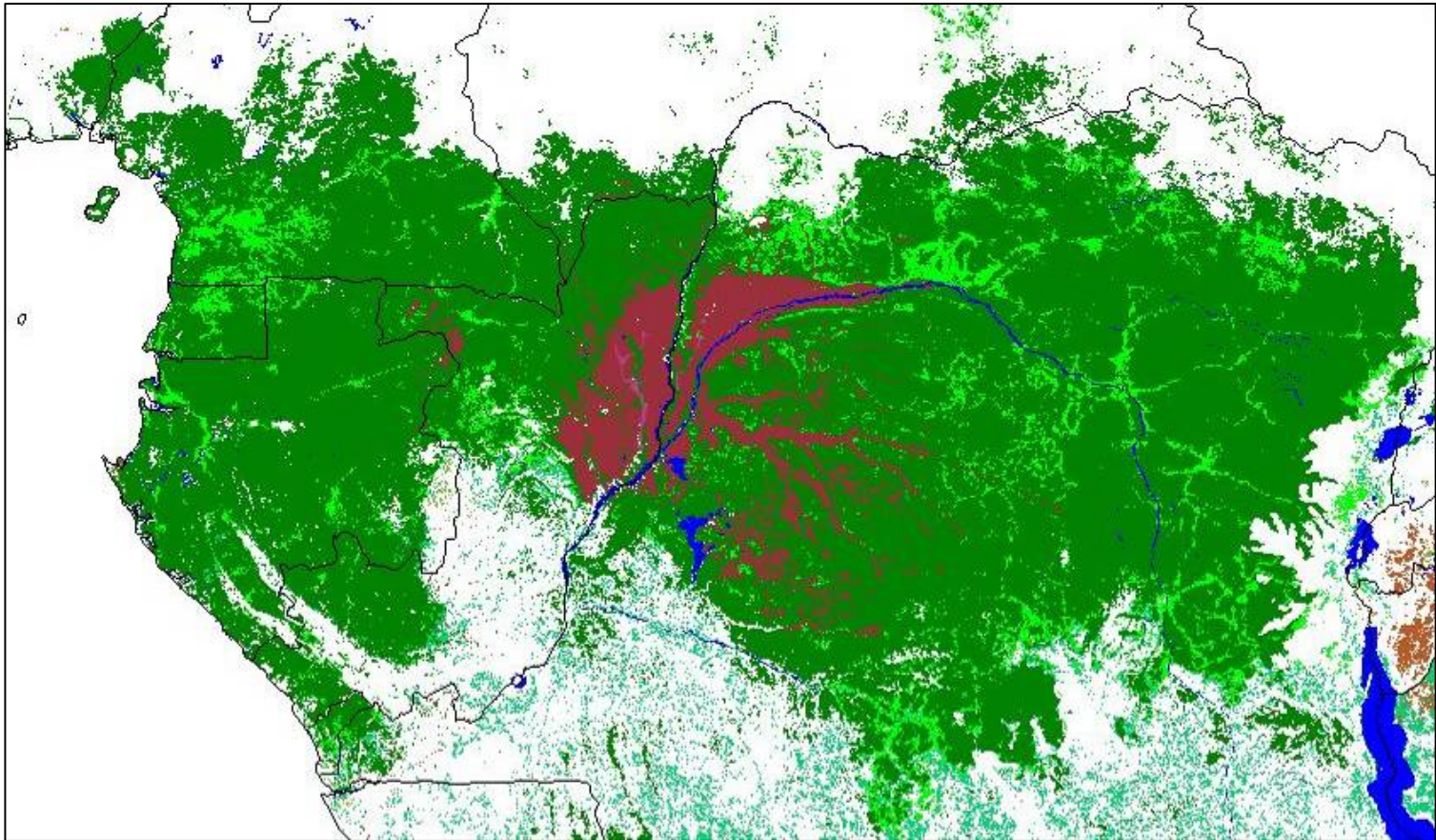
- Less rainfall
 - Longer dry seasons
- More drought stress
- Less rain forest





The present-day rain forest

- Which parts will remain?



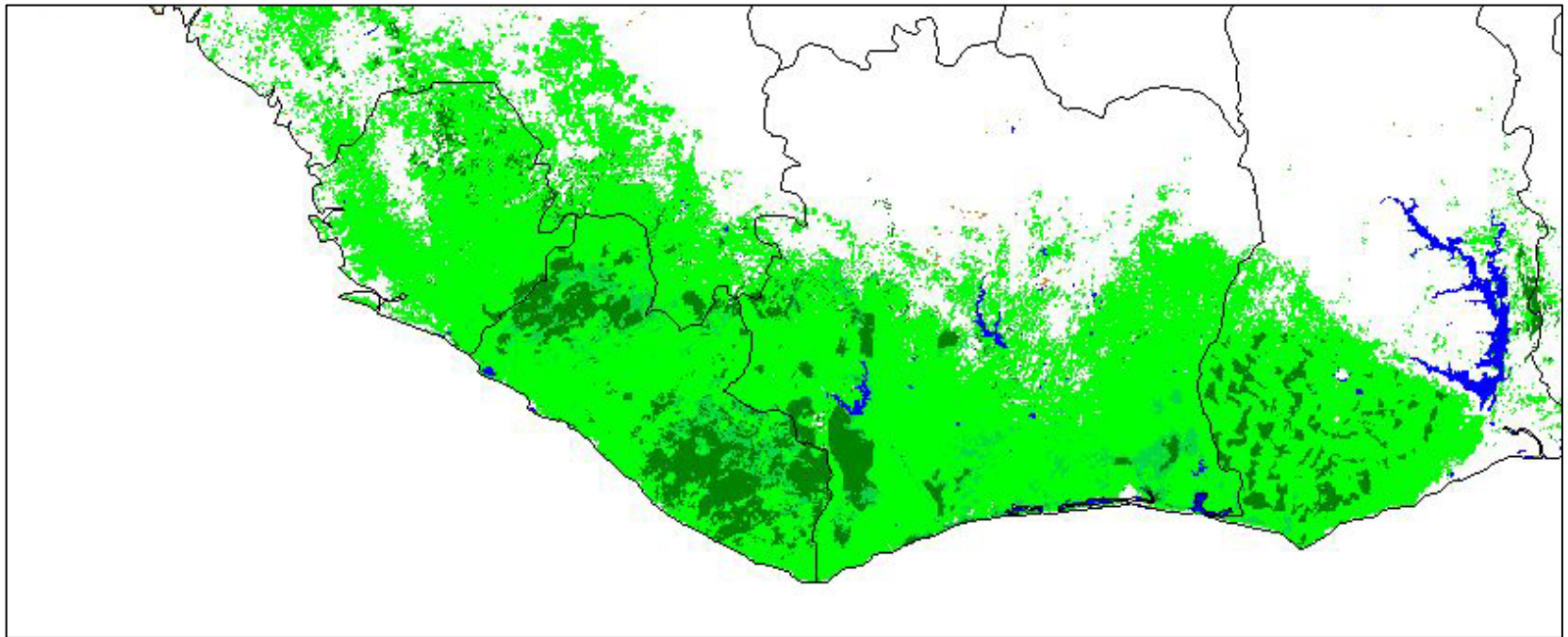
From The land cover map of Africa for the year 2000. Mayaux et al 2003



Conservation

Socio-economic development:

→ conversion of primary forests into
secondary forest

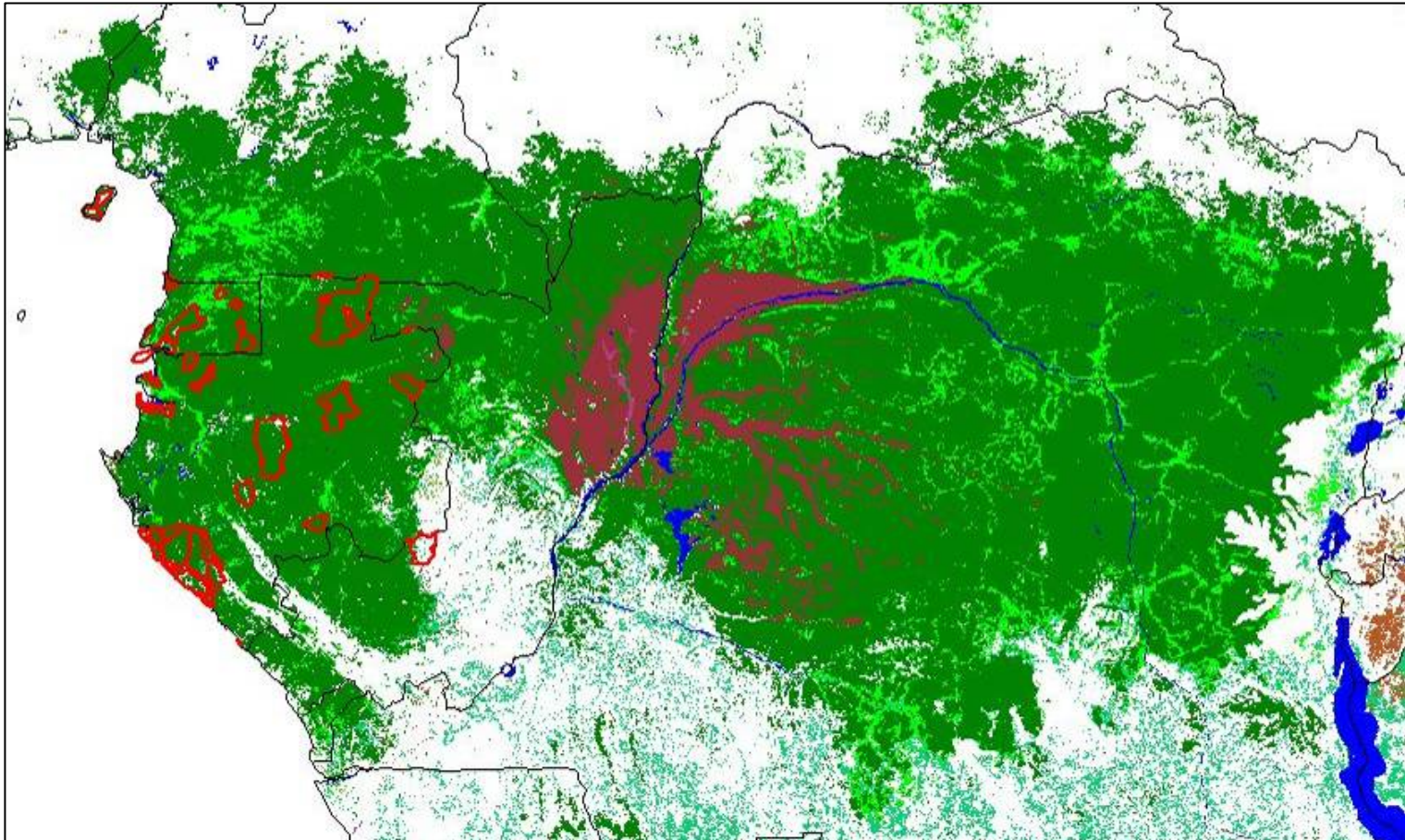




what **why** where how

Protected areas

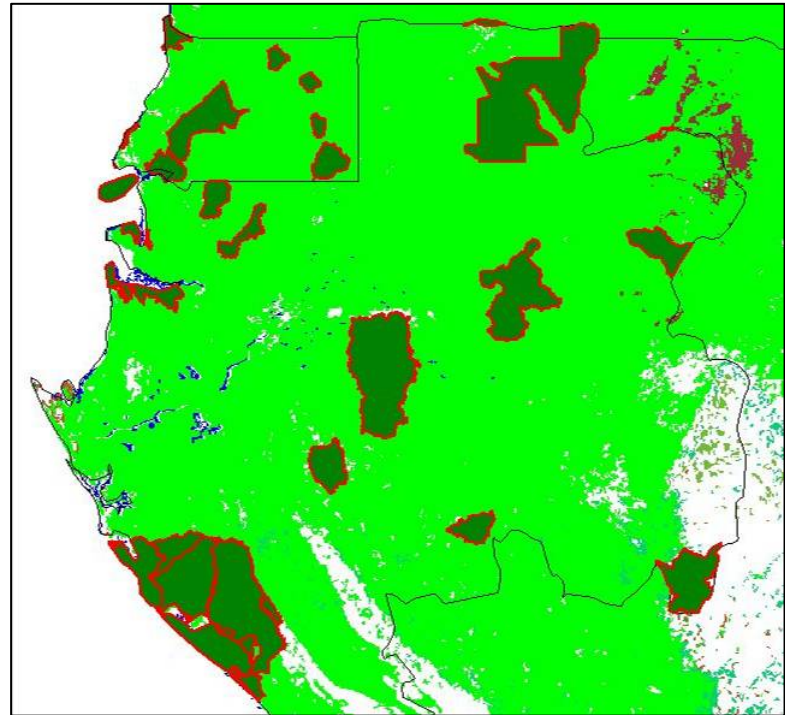
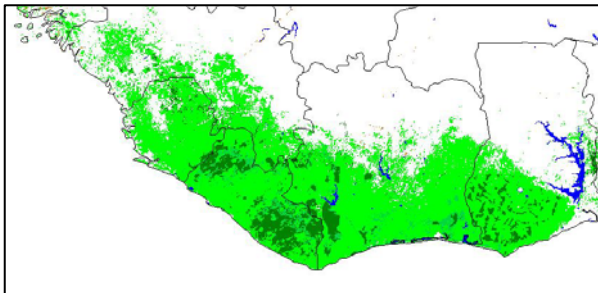
in Gabon and Equatorial Guinea





The future forest in Gabon and Equatorial Guinea

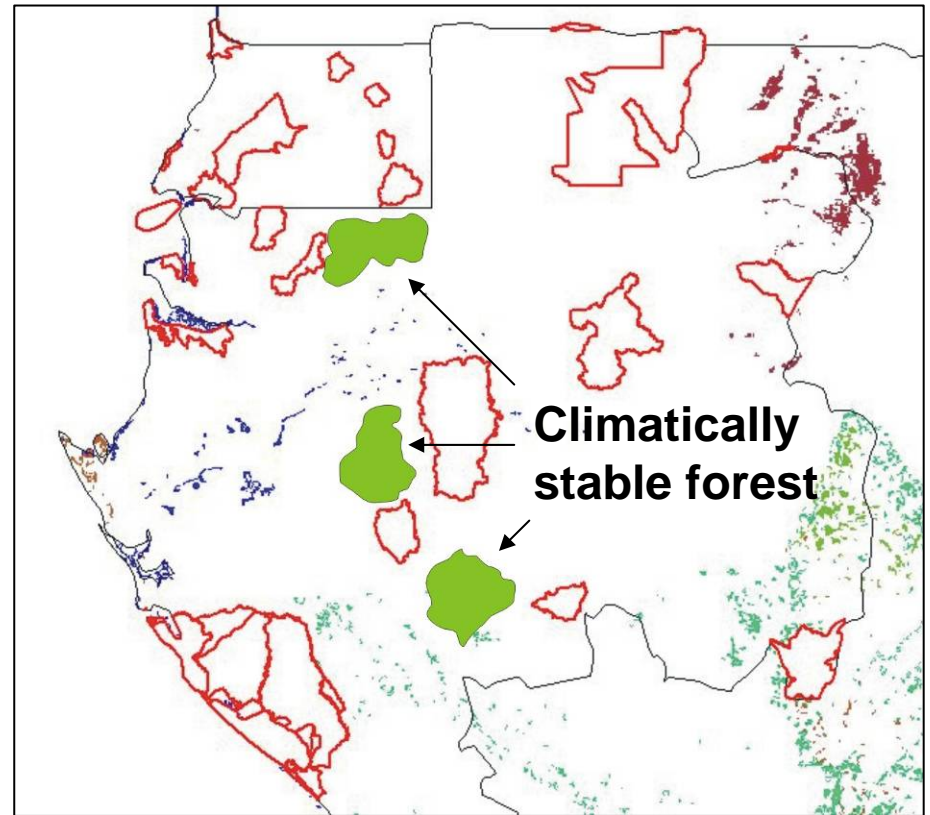
- In the parks is primary forest
- In between secondary forest





Do these parks overlap with the climatically stable forests?

- What if not?
 - the forest in the parks will disappear
 - Climatically stable forest will be turned into secondary forest





Climate change is not new

the forest has been smaller in the past:

- Global cooling (*the last age ice*) 18,000 years ago (Maley 1987, 1998, Sosef 1996, Leal 2004)
- Global/regional warming (*late Holocene perturbation*) 2500 years ago (Maley 2001, Leal 2004)

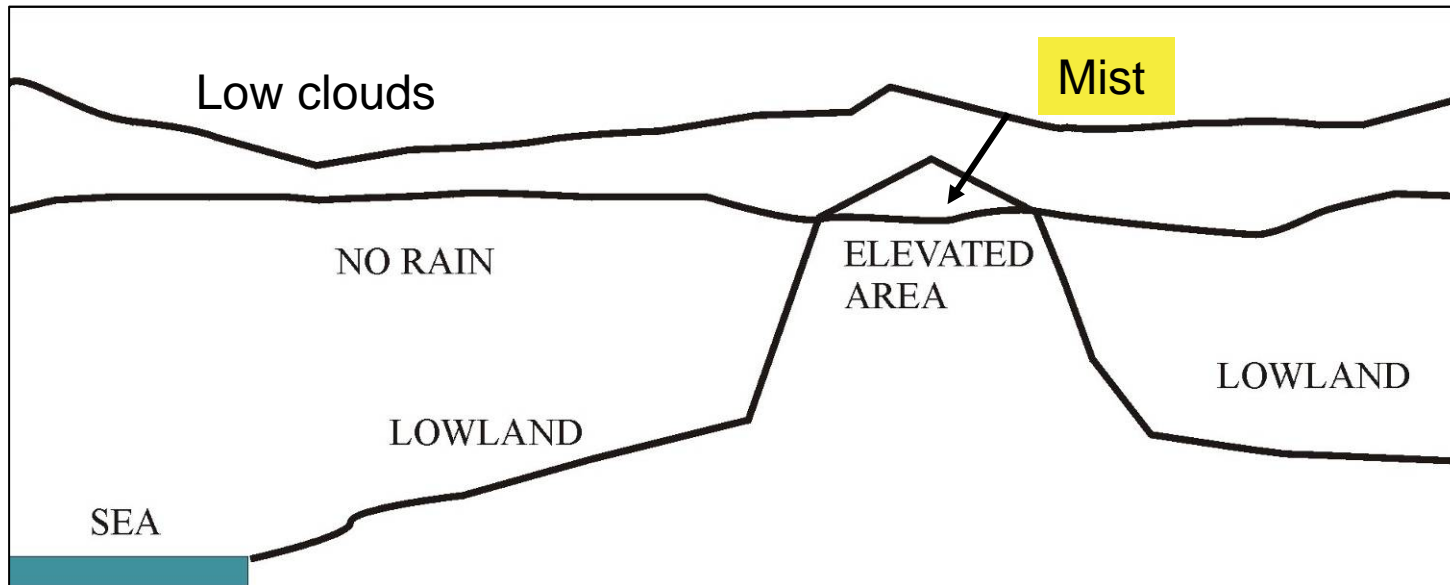
→ where were these forests then located?



The last ice age

- Forest persisted in elevated areas

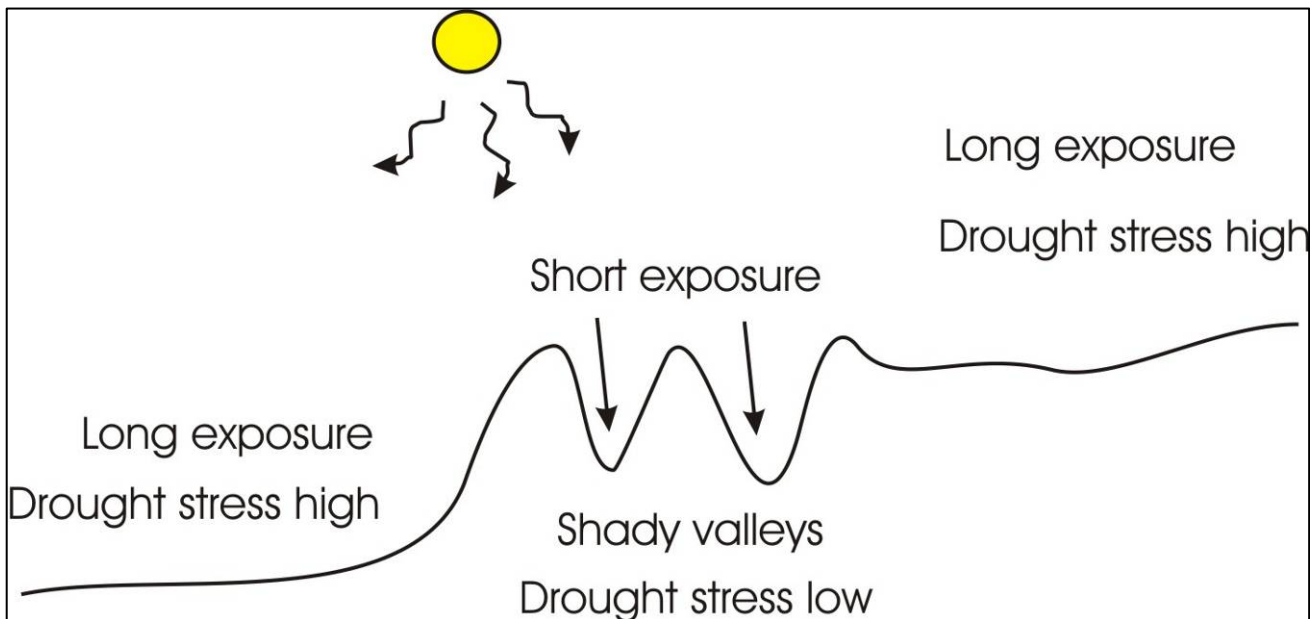
This climatic situation still exists in Gabon during the cool dry season (July/August)





The late Holocene perturbation

- Forest persisted in shady valleys
The normal dry season in tropical regions



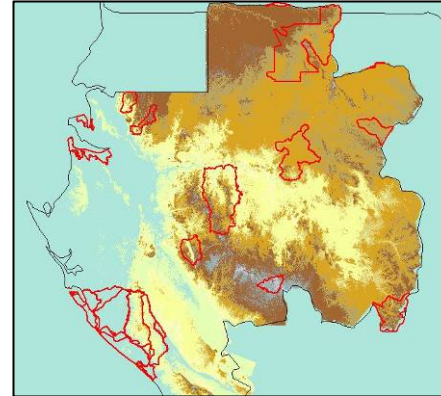
Local compensation for regional drought stress Van Rompaey 1993,
Daws et al. 2002



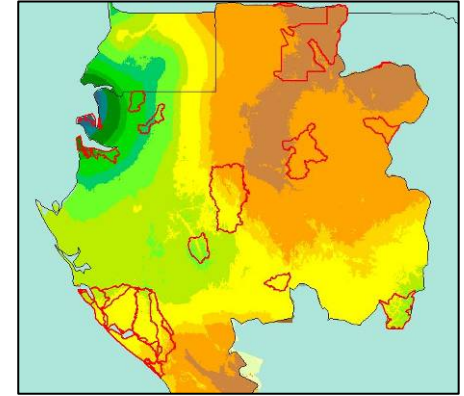
The detection model

GIS analysis (Arcview):

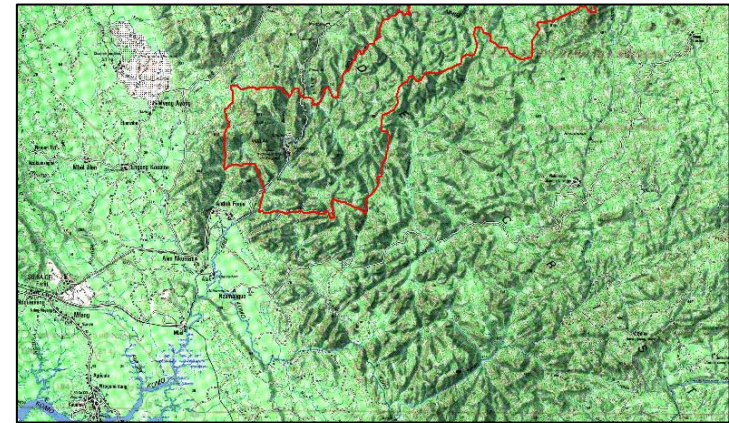
- Step 1: Ice Age refugia
→ query for areas with an $500\text{m} < \text{altitude}$ and $2300\text{mm} < \text{rainfall}$ and $1800\text{mm} < \text{rainfall}$
- Step 2: Late Holocene refugia
→ overlap areas from step 1 on national maps



topography



rainfall

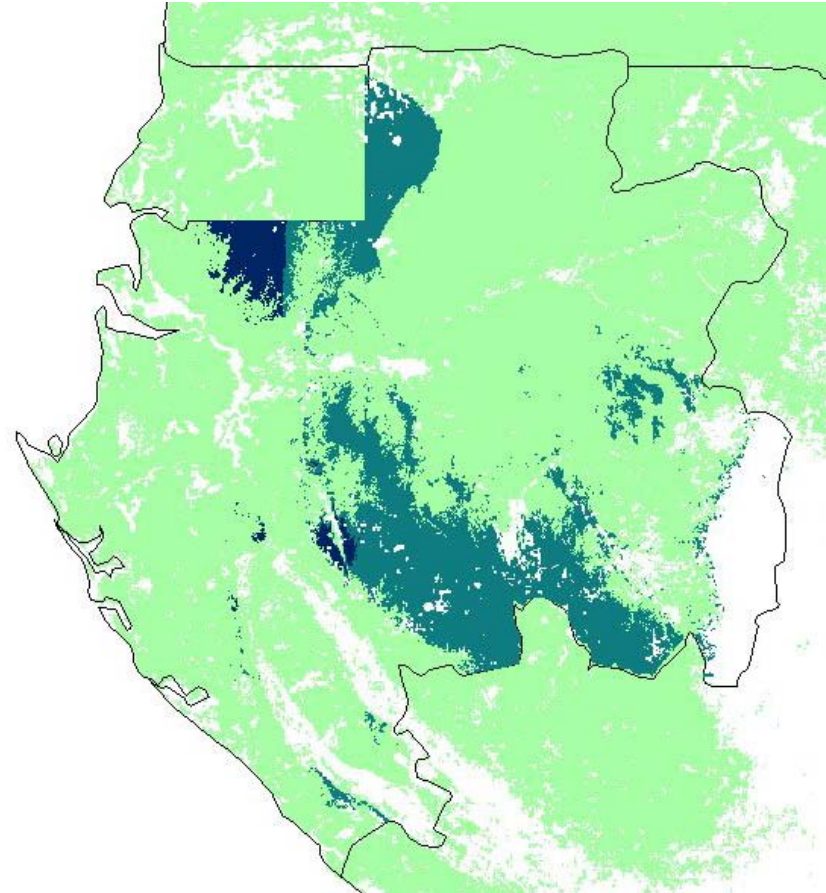


Section of a national map with relief



Step 1: Pleistocene

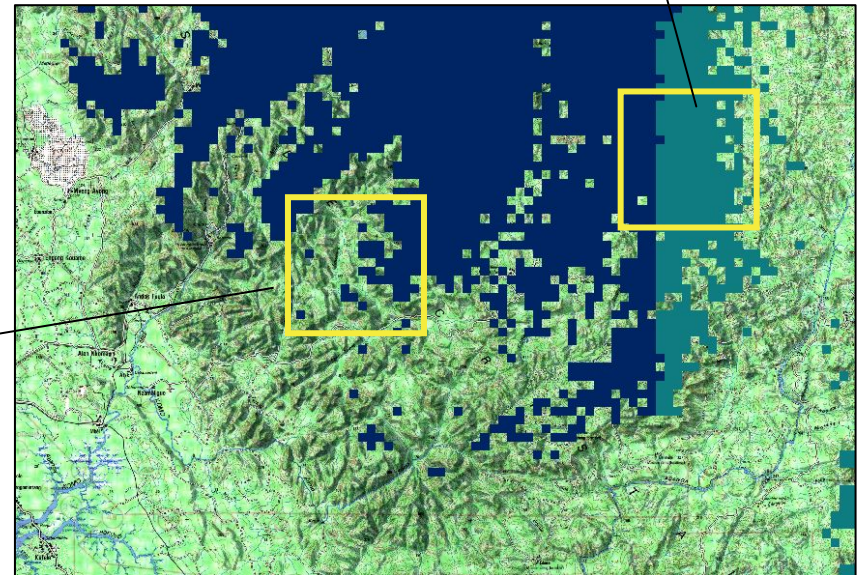
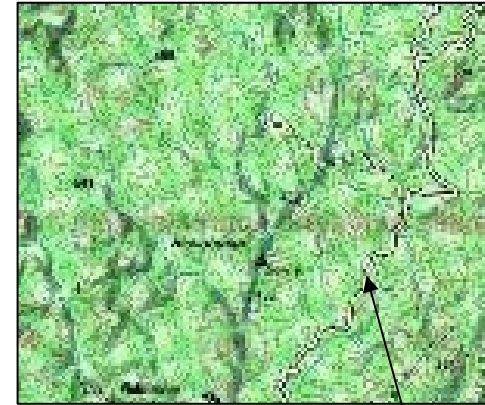
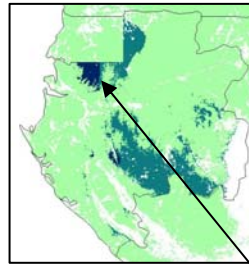
- The stable forest areas (dark blue=wet, light blue=humid)





Step 2: Late-Holocene

- Verifying the step 1- areas with underlying relief

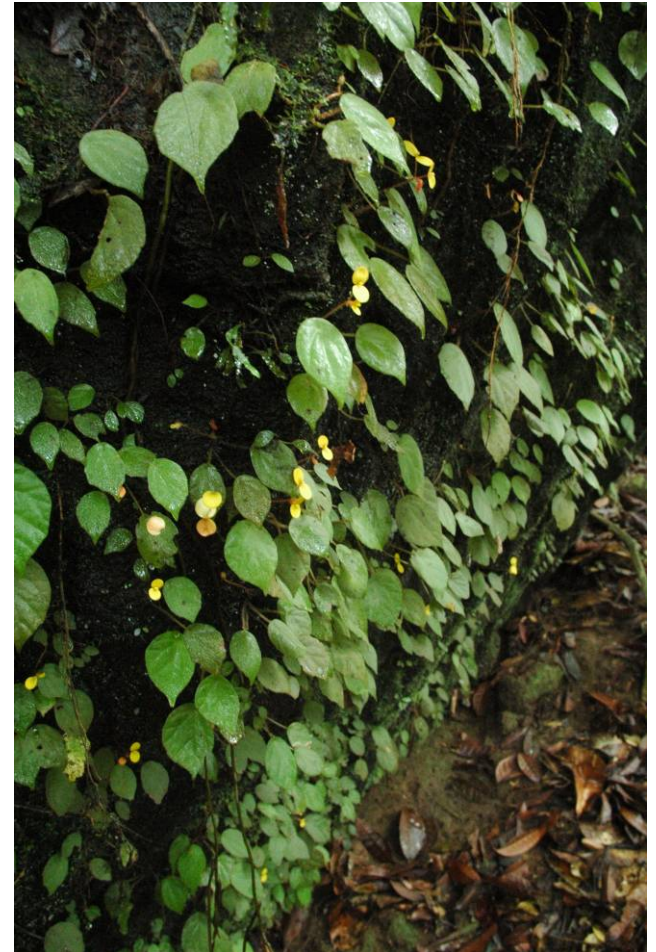




What characterizes climatically stable forests? (testing the model)

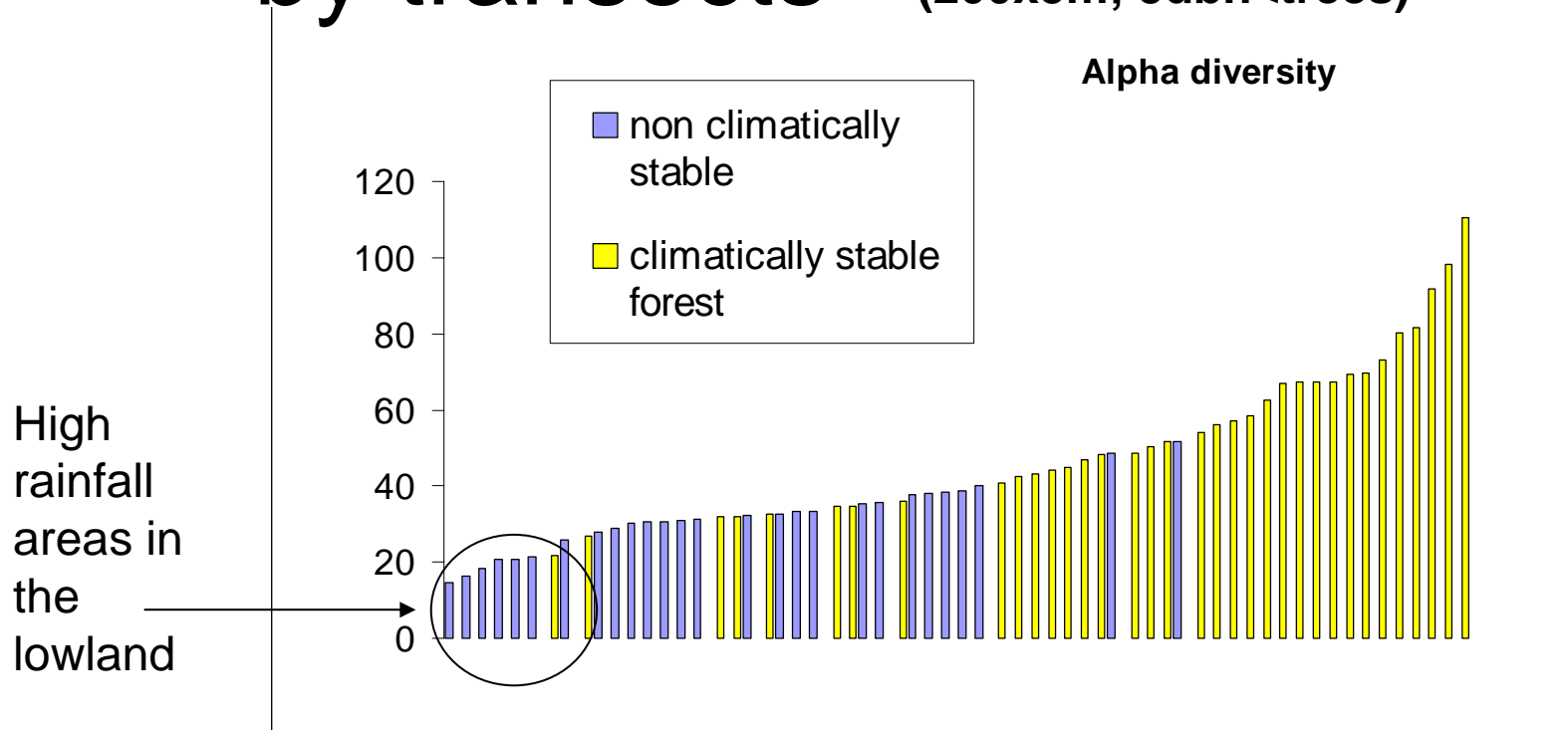
Biodiversity assessment

- climatically stable forests experienced less extinction in the past :
 - high biodiversity/ endemism
 - high number of stable forest indicator species, e.g. like refuge Begonia





Measuring biodiversity by transects (200x5m; 5dbh<trees)



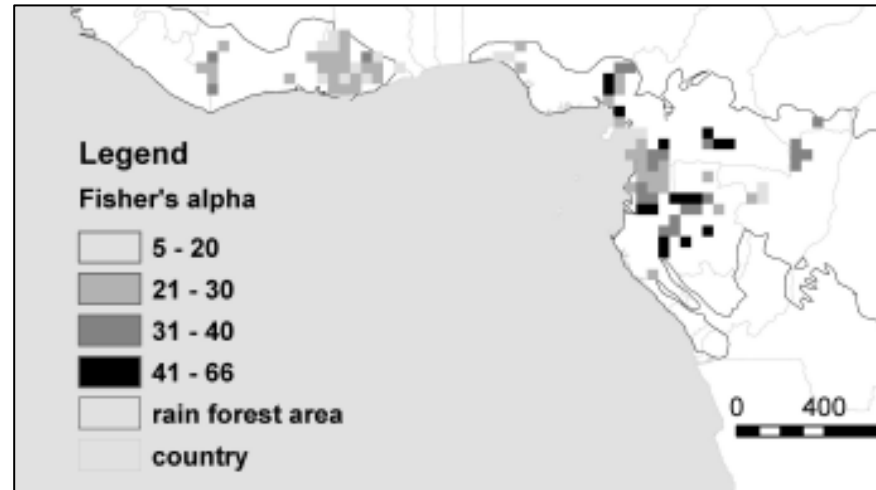
(Fisher-) Alpha-diversity on transects in and out climatically stable areas



Other data & General collecting

1 ha plots

- Alpha-diversity in 1 ha plots in the identified areas is among the highest in central Africa (Parmentier et al.2007)
- High abundance of refuge Begonias (Sosef 1994)
- new endemic species



From: Parmentier et al 2007



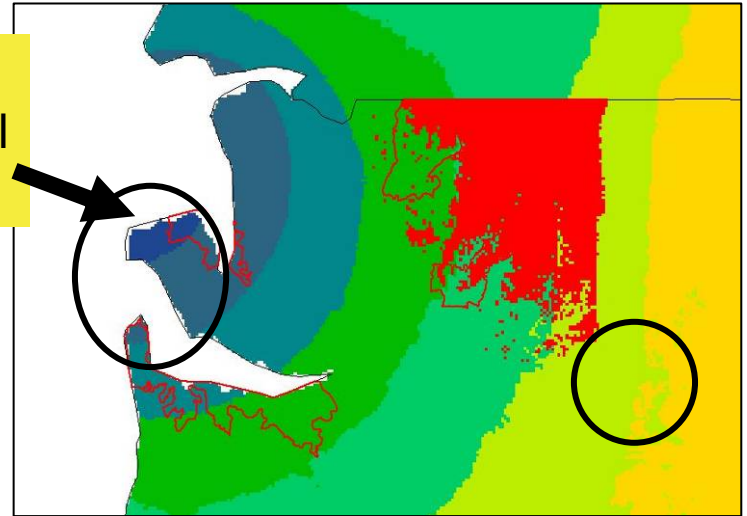


Robustness of the model

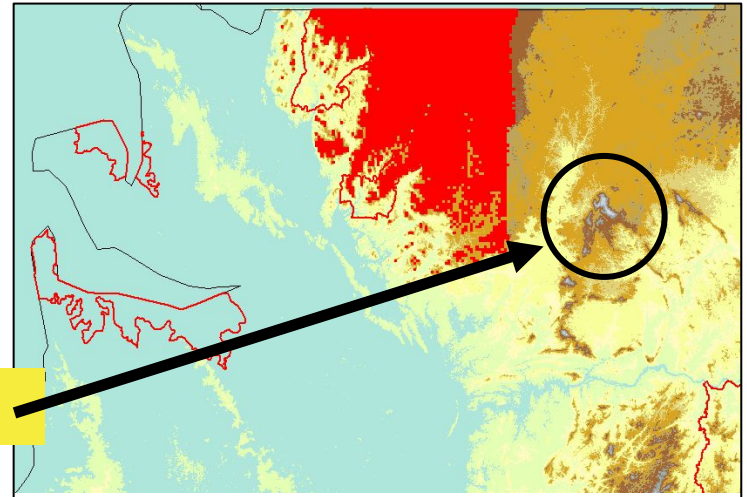
Climatically stable forests identified was compared with:

- areas in the lowland with a high rainfall
(Dauby et al. 2007)
- but
- mountain ranges with a lower rainfall still need to be sampled

High rainfall area



Mountain range

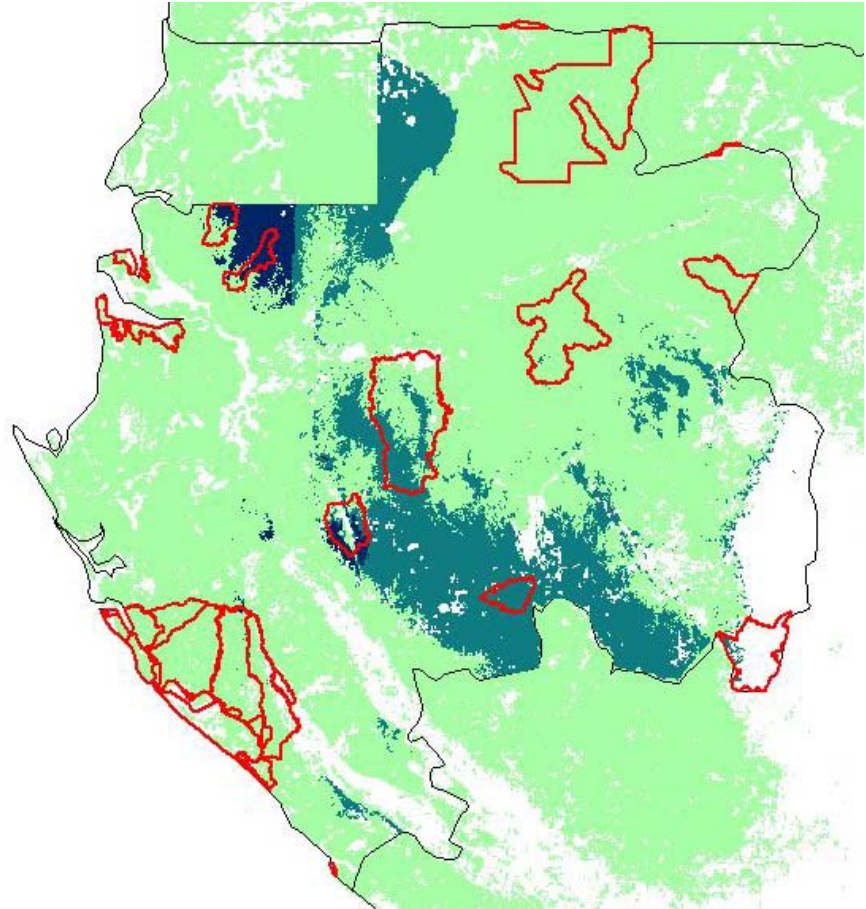




Conservation of climatically stable forests

Are the climatically stable forests protected?

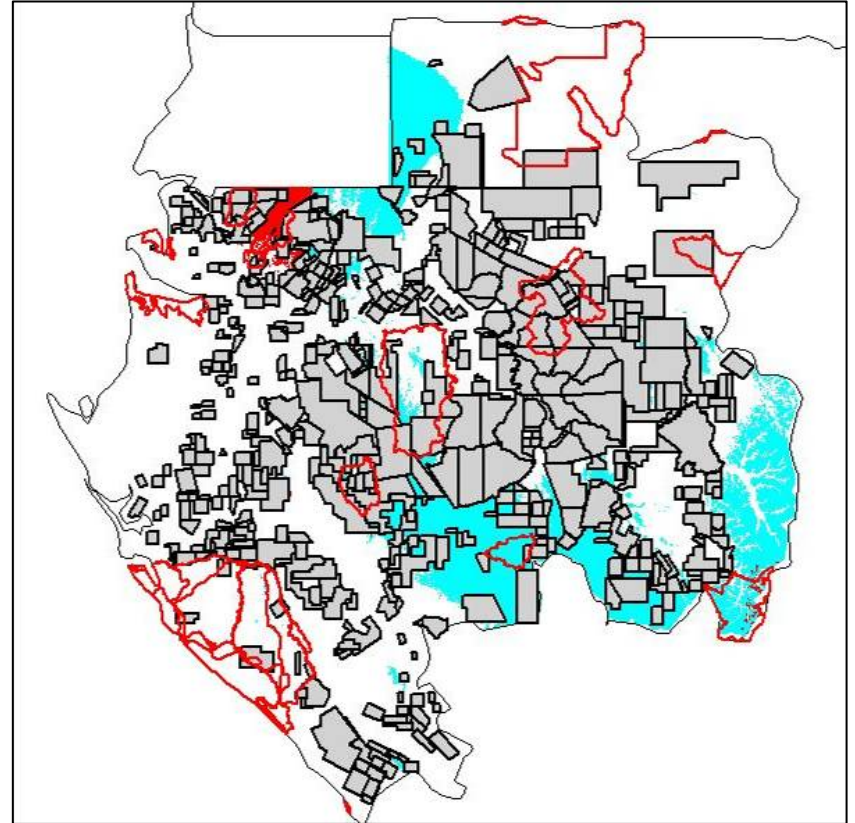
- Most of the Pleistocene (step 1-) climatically stable forest is **outside** the protected areas!





Biodiversity sanctuaries

- By Gabonese law logging companies have to set-a-side 5% of their concessions
- Over the next five years MBG will try to locate and protect as much climatically stable and botanically rich forests as possible





Acknowledgements

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- Conservation International
- The National Herbarium the Netherlands-Wageningen Branch



Thank you for your attention

Questions?