Diversity of tree species growth responses to canopy openings :

A spatially explicit approach

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Diversity of tree species growth responses to logging gaps

with regard to:

1. **Distance to logging gaps**
2. **Area of logging gaps**
3. **Ontogenic stages**

Paracou experimental plots (French Guiana)

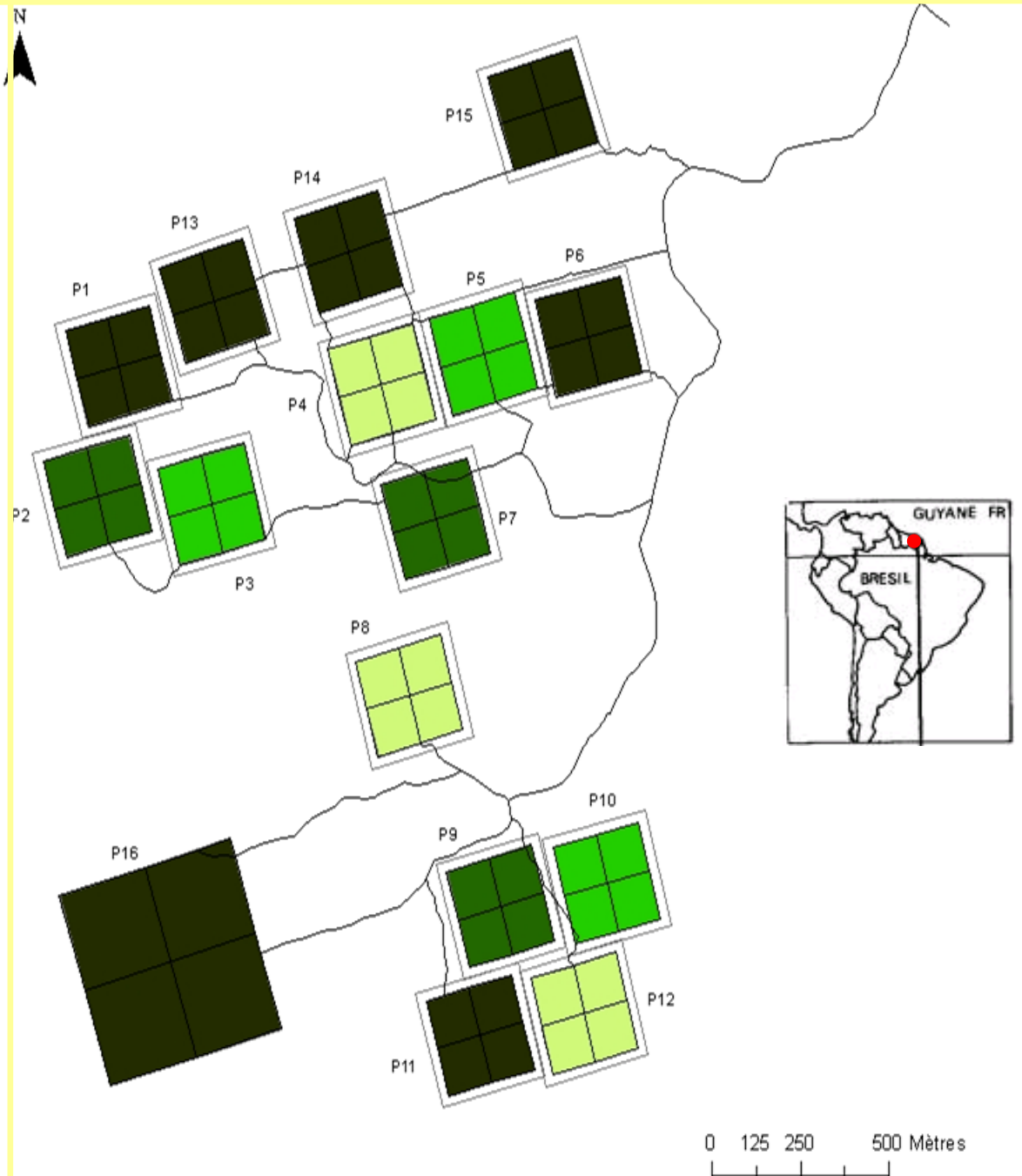
Undisturbed forests

Logging 1986-1988

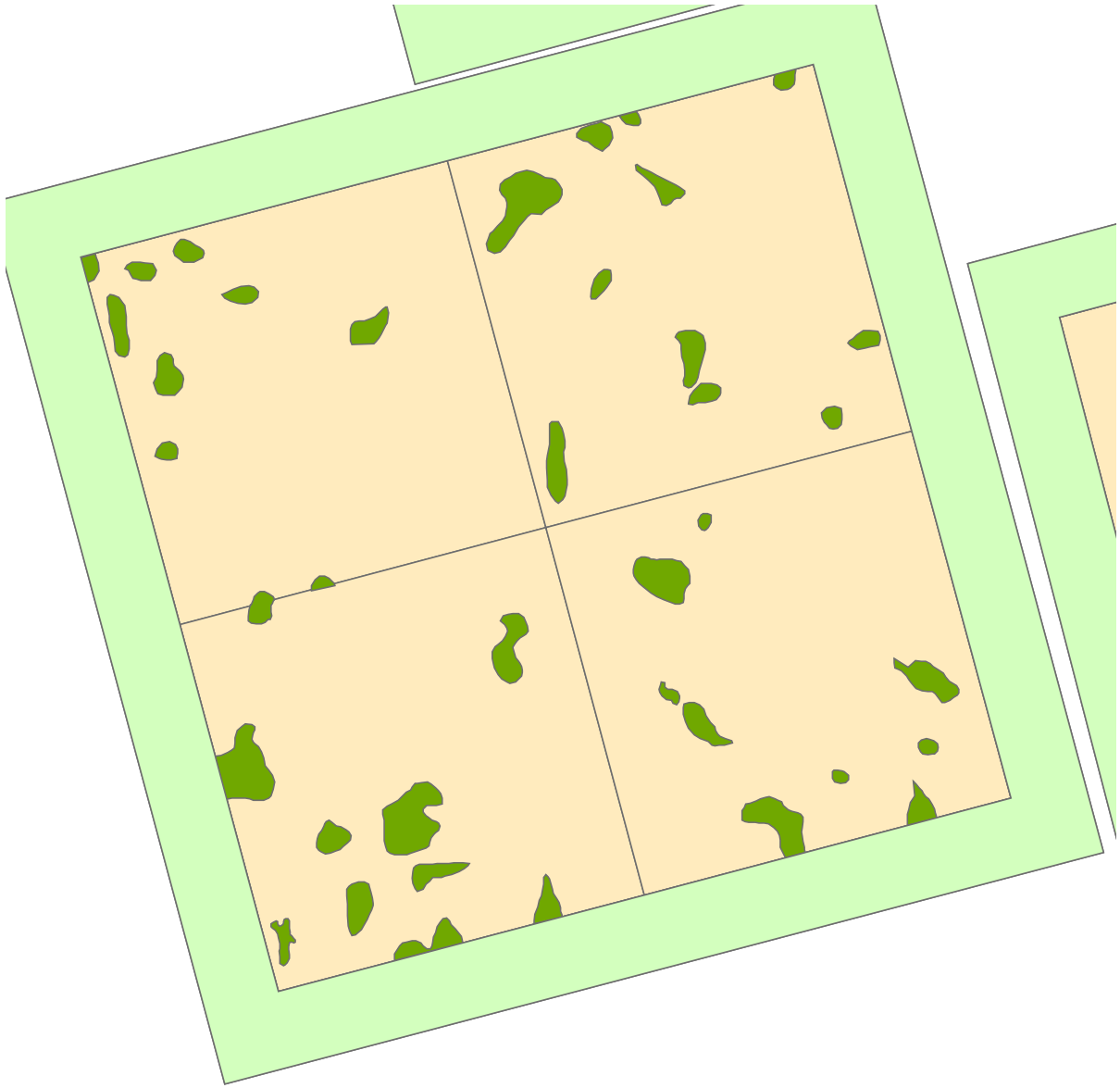
5 m² / ha – 10 trees

12 m² / ha – 40 trees

15 m² / ha – 45 trees



Canopy gaps
4.14 ha
7.4% of Forest Area



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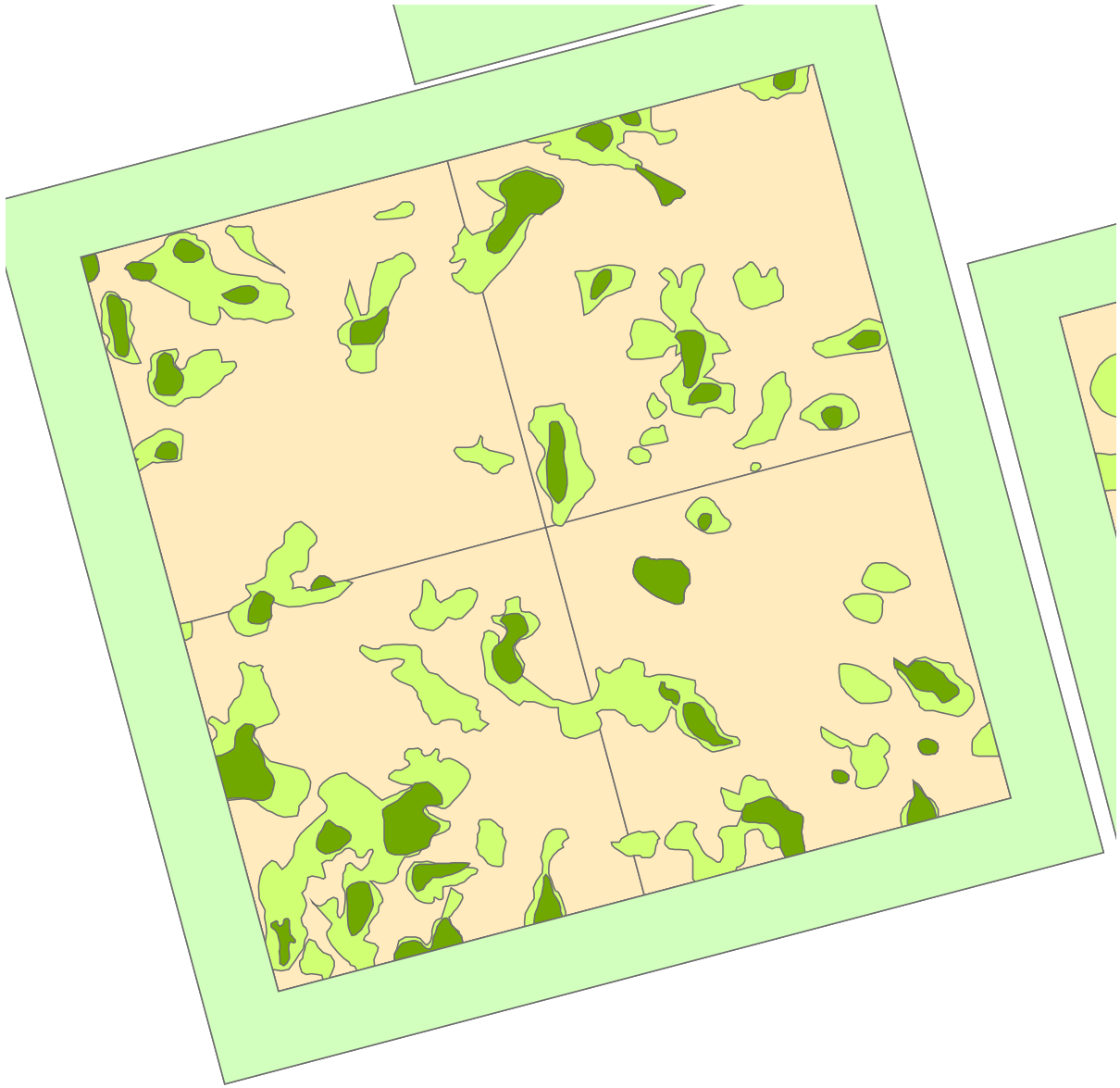
Damages area
15.63 ha
27.8% of Forest Area

Logging gaps



Canopy gaps
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7.4% of Forest Area

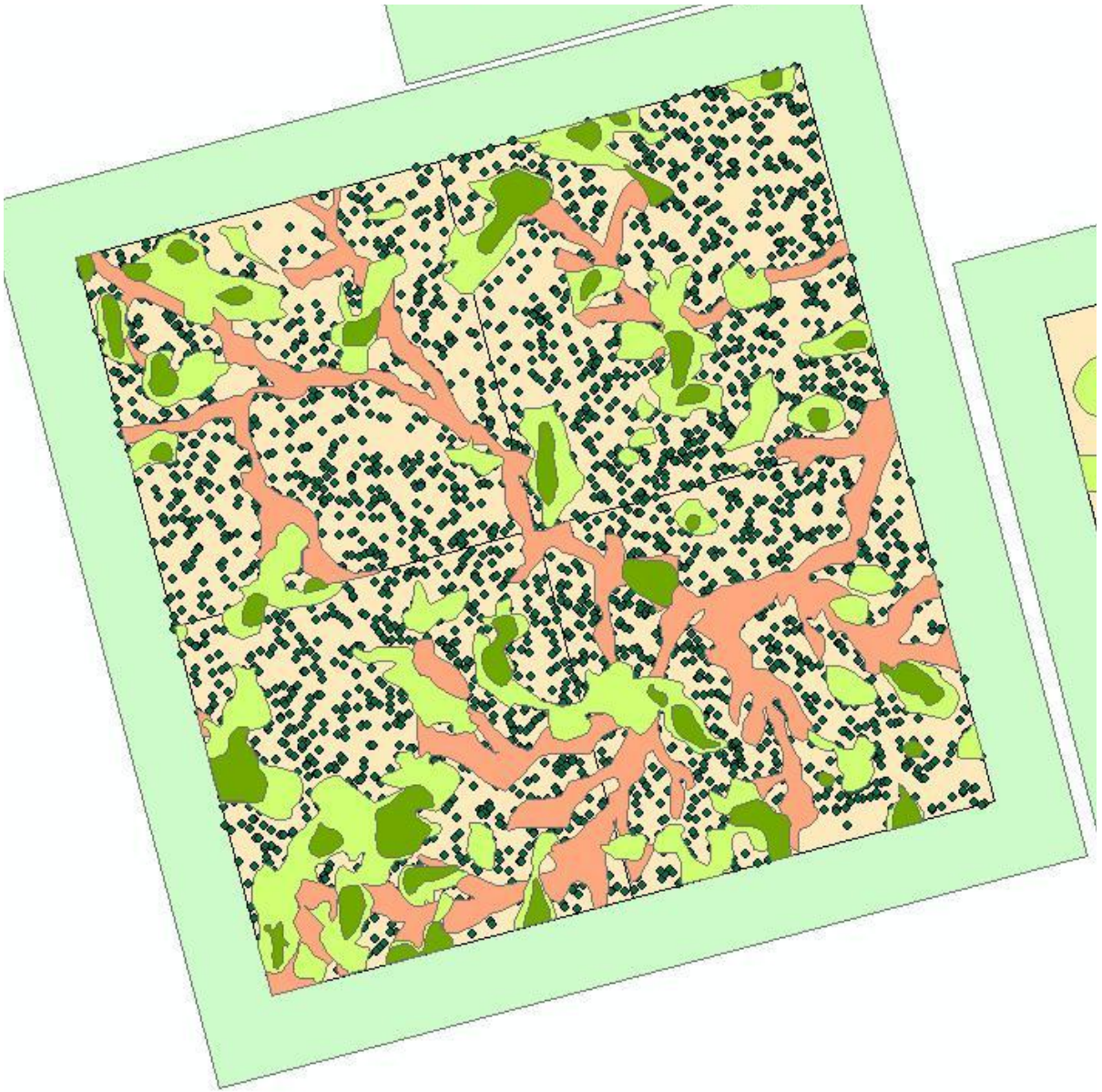
Damages area
15.63 ha
27.8% of Forest Area

Skid Trails
7.39 ha
13.2% of Forest Area

A 43 species (>30n)
7476 trees

14939 Trees

B undetermined + <30n
7463 trees



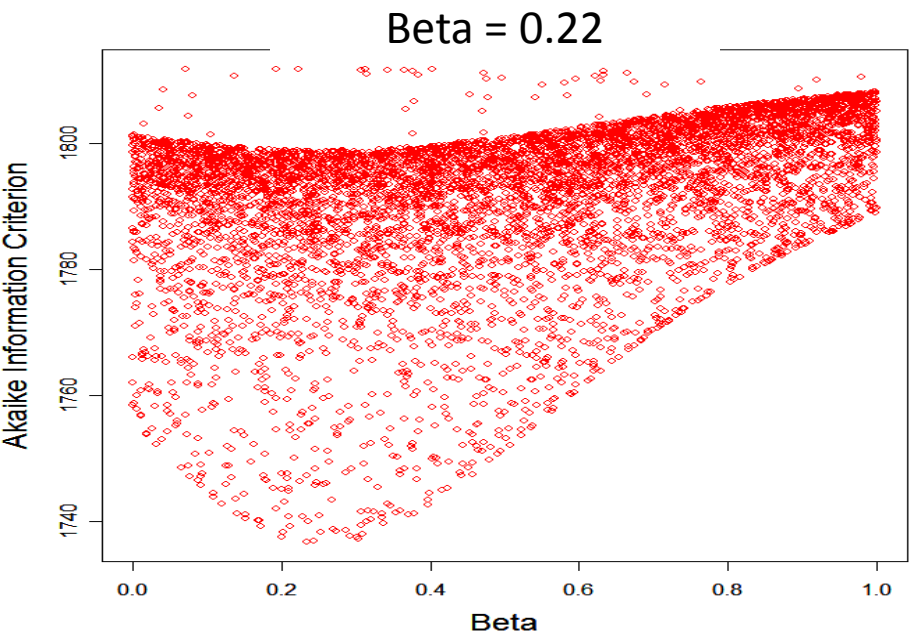
$$Iperturb_i = \sum_{1}^{j} e^{-\alpha Distance_{ij}} * Surface_j^{\beta}$$

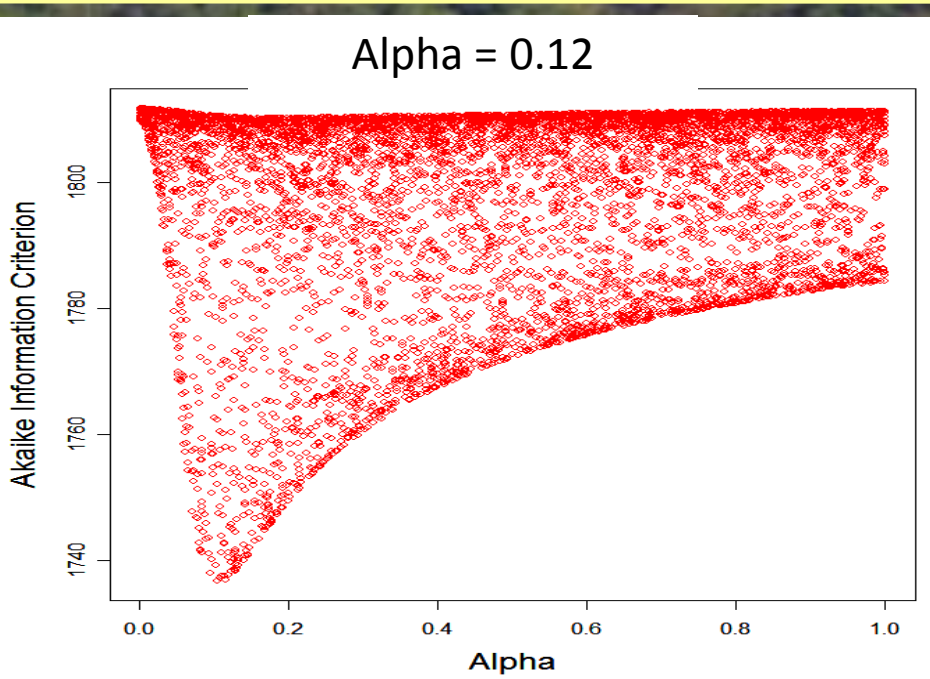
(Hanski,1994)

B undetermined + <30n
7463 trees

Parameterize Alpha & Beta

$$AGR_i = a * Iperturb_i + b + \varepsilon$$





$$\frac{1}{1}$$

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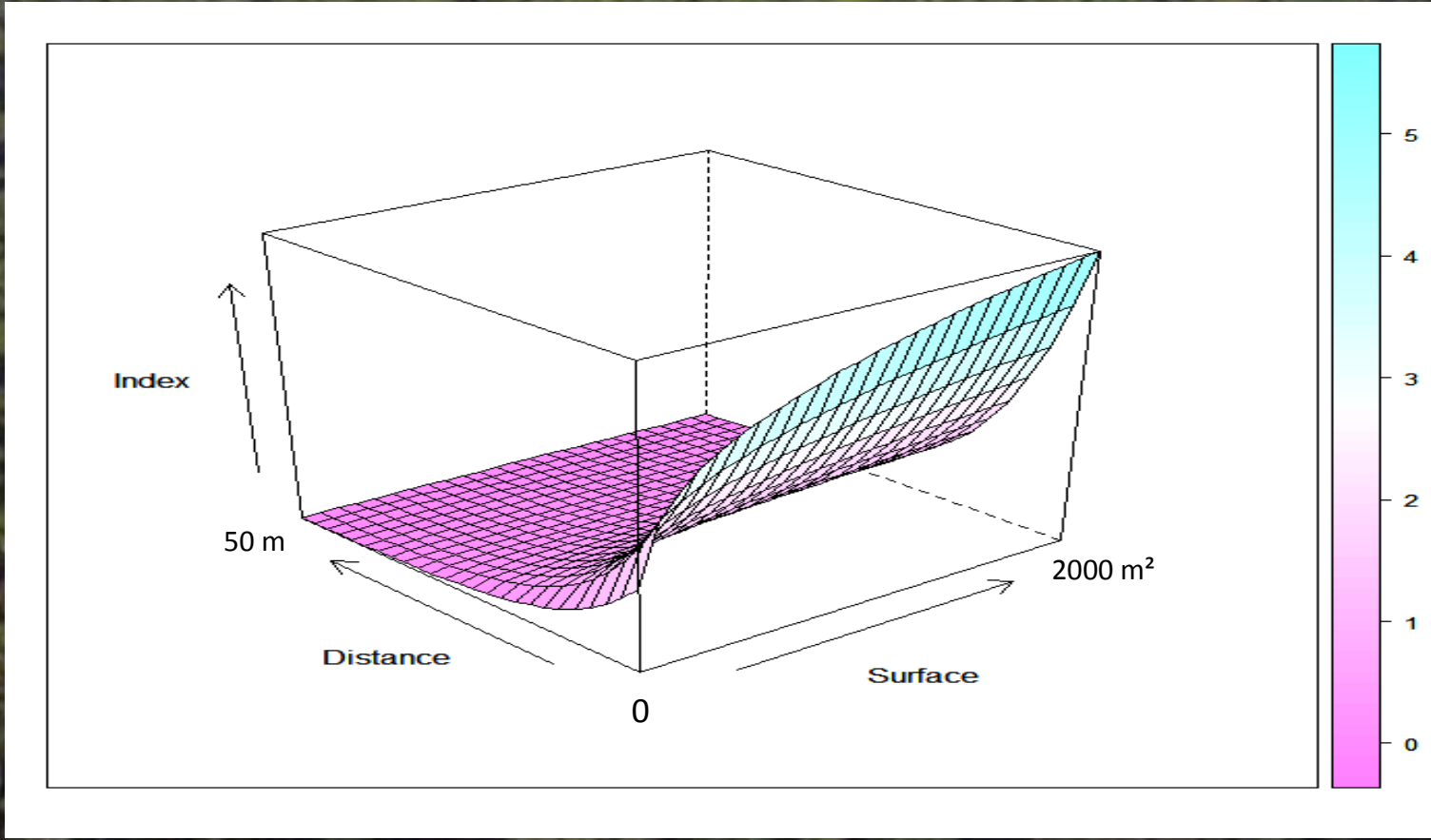

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Test Growth Species Responses

Parameterize Alpha & Beta

$$AGR_i = a * Iperturb_i + b + \varepsilon$$

$$AGR_i = Iperturb_i + Soil_i + RAP_i + Iperturb_i : RAP_i + \varepsilon$$

Soil= binary variable (terra firme, seasonnaly flooded habitat)

RAP = DBH / 95th percentile DBH in control plots

$$AGR_i = Iperturb_i + Soil_i + RAP_i + Iperturb_i \cdot RAP_i + \varepsilon$$

CELASTRACEAE

Goupia glabra

CHRYSOBALANACEAE

Licania densiflora

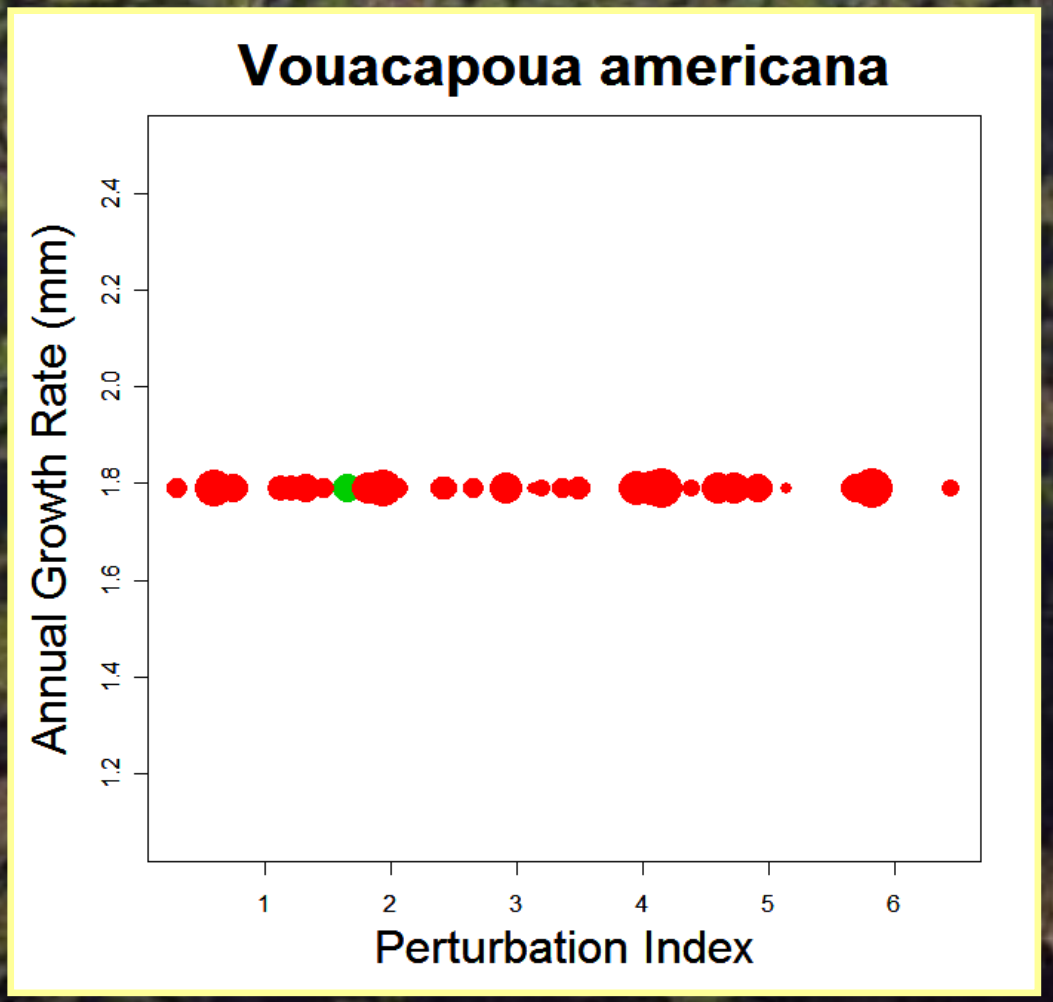
MYRISTICACEAE

Iryanthera hostmannii

SIMAROUBACEAE

Simaba cedron

CAESALPINIACEAE



$$AGR_i = Iperturb_i + Soil_i + RAP_i + Iperturb_i \cdot RAP_i + \varepsilon$$

BIGNONIACEAE *Jacaranda copaia*

BOMBACACEAE *Catostemma fragrans*

CAESALPINIACEAE *Eperua grandiflora*

CHRYSOBALANACEAE *Licania ovalifolia*

EUPHORBIACEAE *Hevea guianensis*

LECYTHIDACEAE *Couratari multiflora*

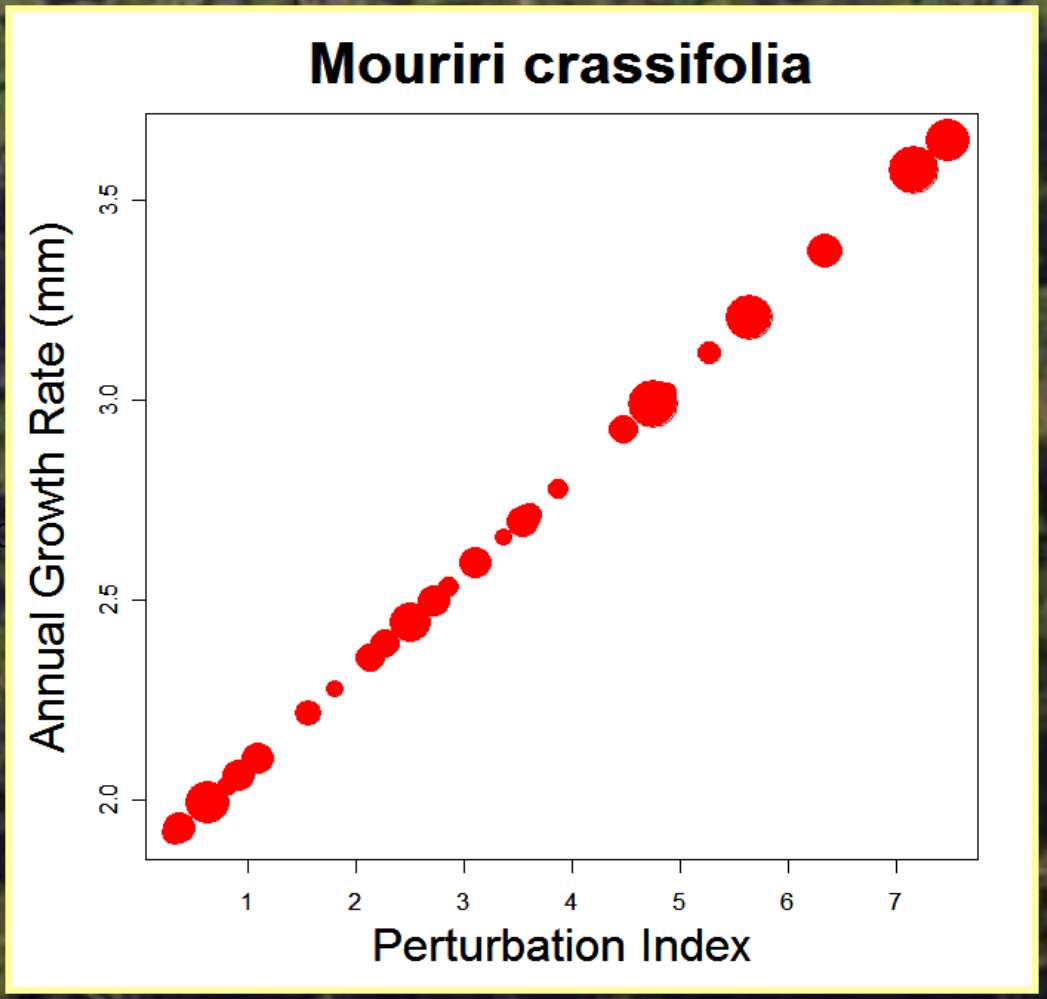
MELIACEAE *Carapa procera*

PAPILIONACEAE *Andira coriacea*

SAPOTACEAE *Manilkara bidentata*

STERCULIACEAE *Theobroma subincanum*

MELASTOMATACEAE



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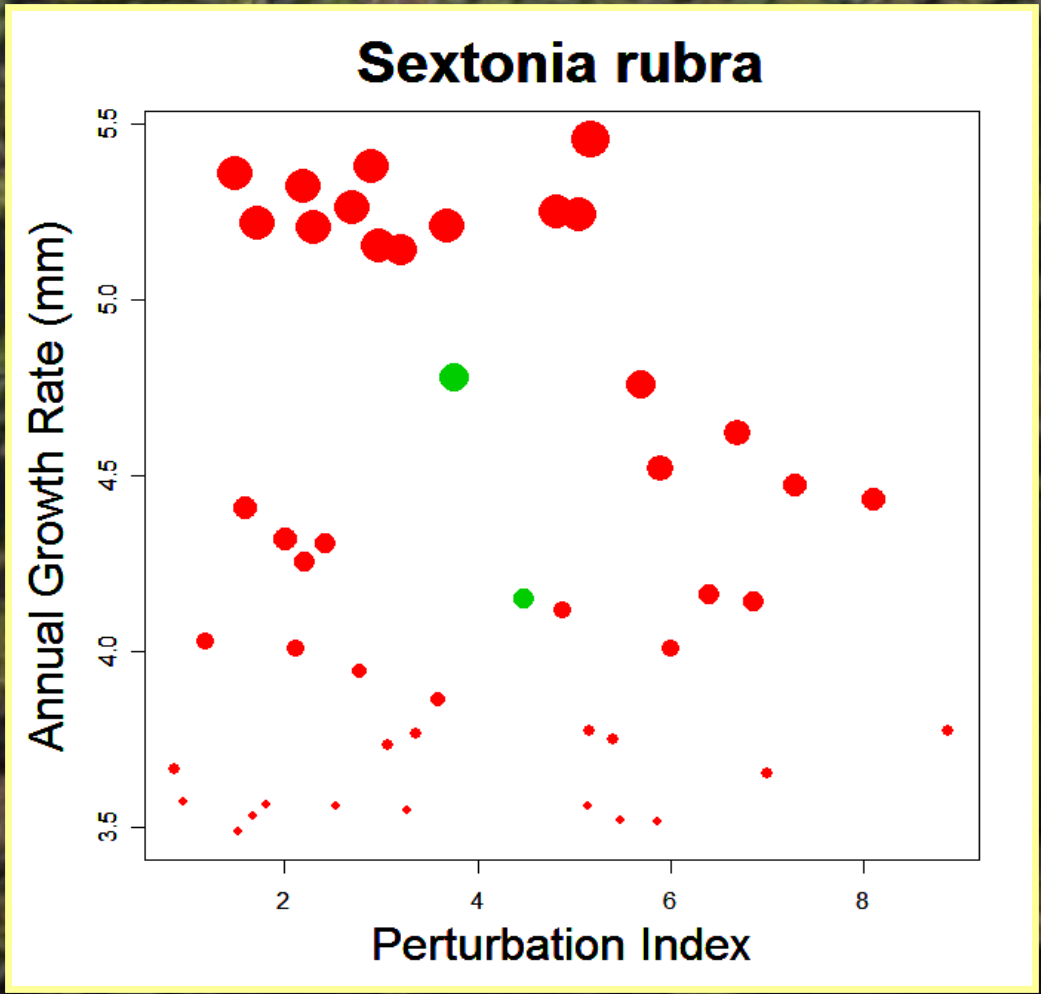
VOCHYSIACEAE
Qualea rosea

LAURACEAE



$$AGR_i = Iperturb_i + Soil_i + RAP_i + Iperturb_i \cdot RAP_i + \varepsilon$$

CAESALPINIACEAE

Recordoxylo speciosum

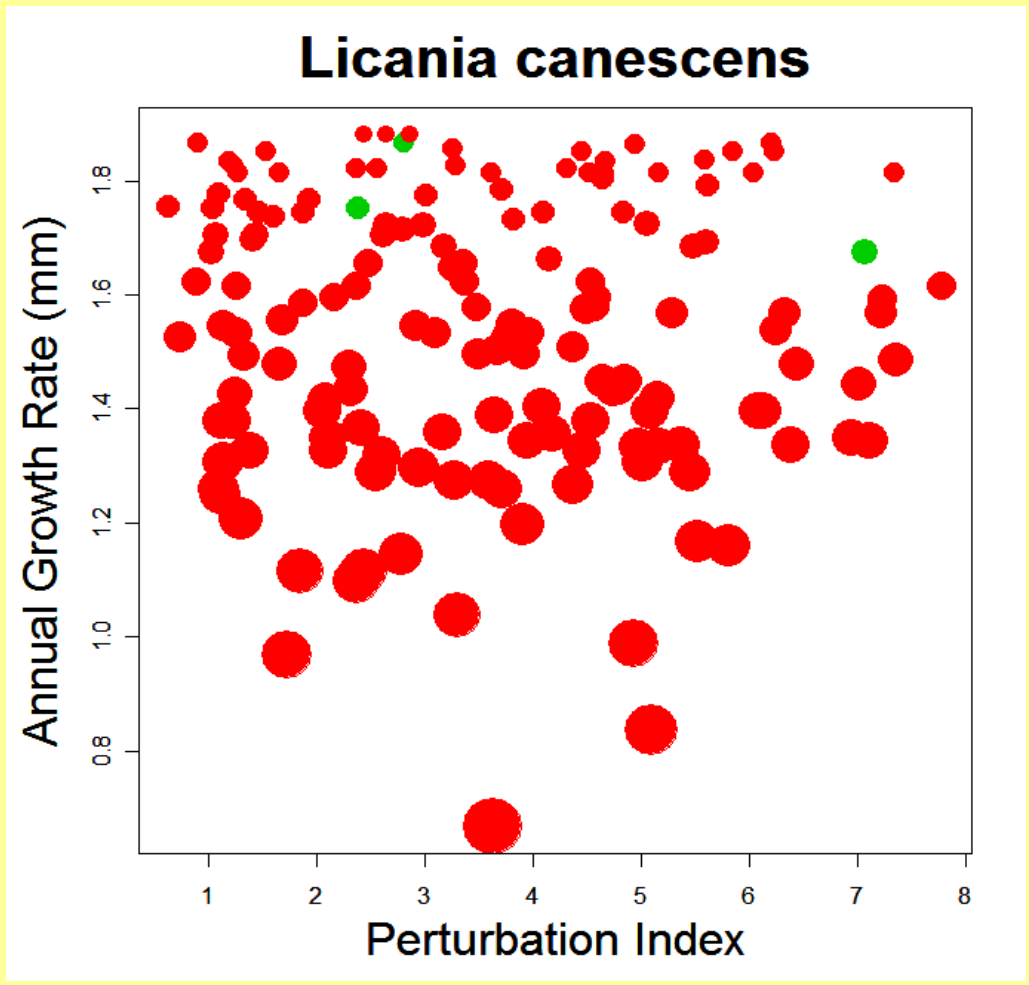
LECYTHIDACEAE

Gustavia hexapetala

MYRISTICACEAE

Iryanthera sagotiana

CHRYSOBALANACEAE



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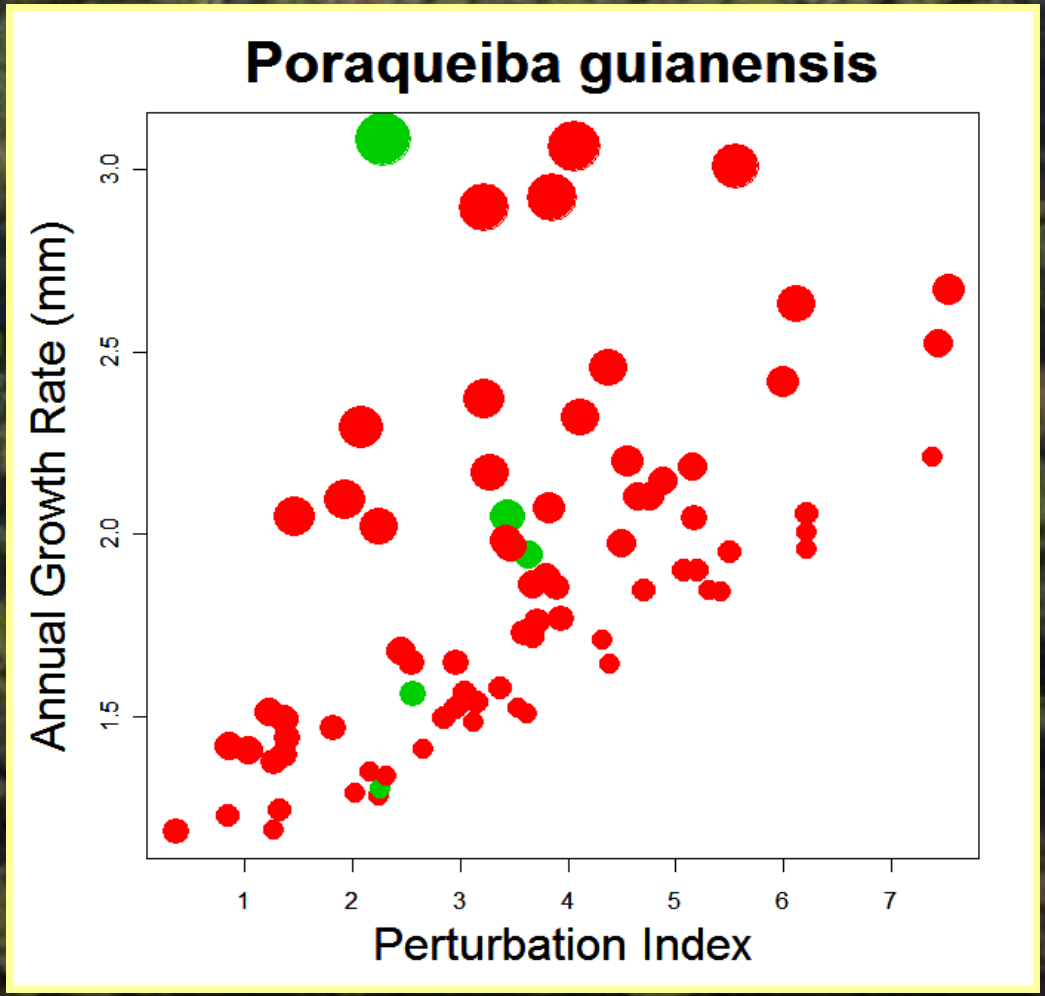
CHRYSOBALANACEAE

Licania heteromorpha

ICACINACEAE

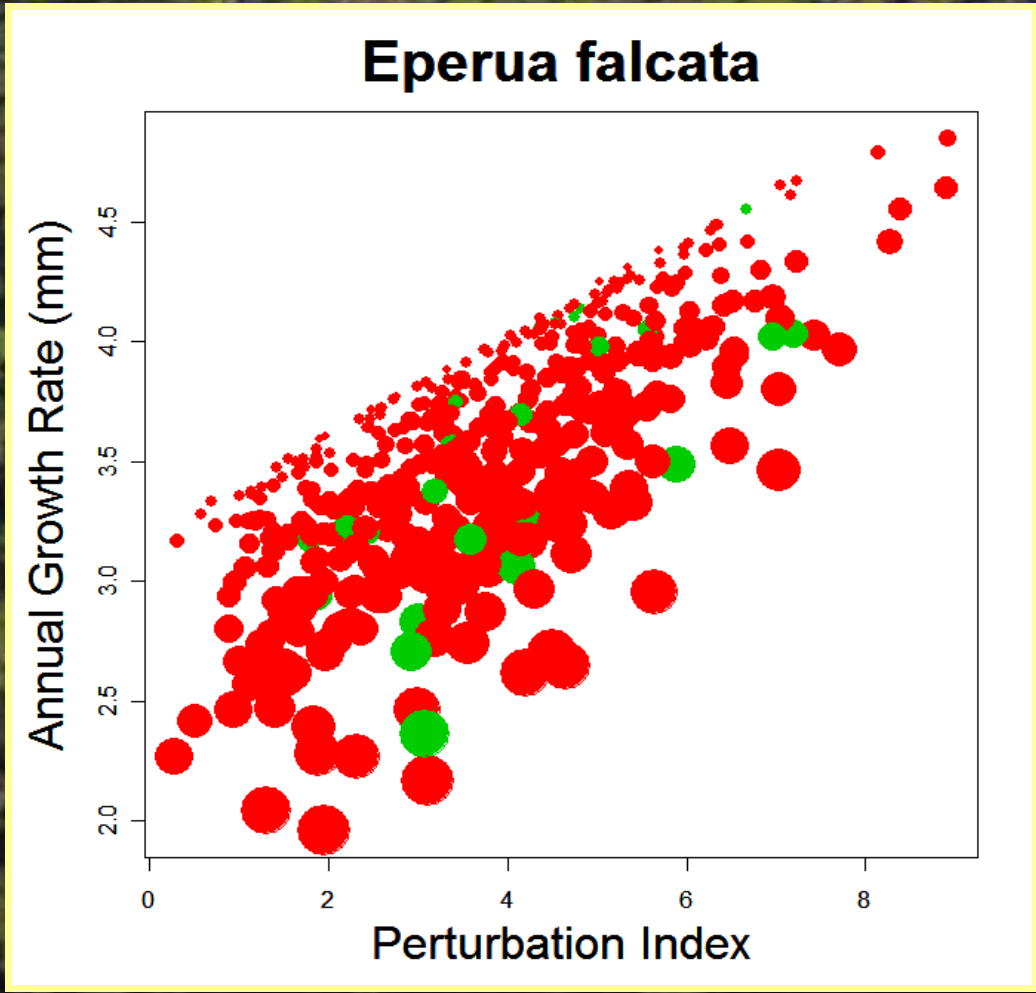


$$AGR_i = Iperturb_i + Soil_i + RAP_i + Iperturb_i : RAP_i + \varepsilon$$

CHRYSOBALANACEAE
Licania alba
Licania membranacea

LECYTHIDACEAE
Eschweilera sagotiana
Lecythis persistens

CAESALPINIACEAE



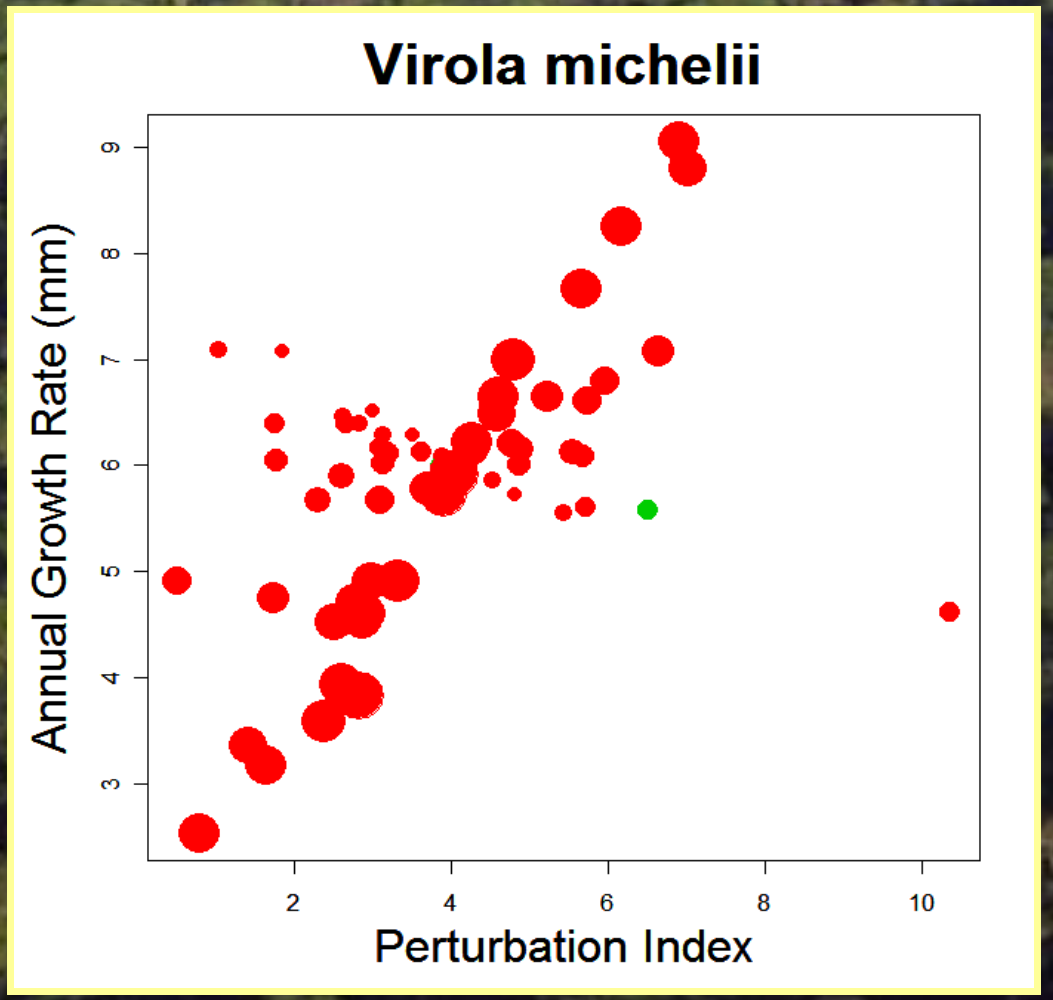
$$AGR_i = Iperturb_i + \cancel{Soil_i} + RAP_i + Iperturb_i : RAP_i + \varepsilon$$

CHRYSOBALANACEAE
Licania sprucei

CLUSIACEAE
Moronobea coccinea

LECYTHIDACEAE
Eschweilera congestiflora

MYRISTICACEAE



$$AGR_i = Iperturb_i + Soil_i + RAP_i + Iperturb_i : RAP_i + \varepsilon$$

ANNONACEAE

Oxandra asbeckii

CAESALPINIACEAE

Bocoa prouacensis

Dicorynia guianensis

LECYTHIDACEAE

Eschweilera coriacea

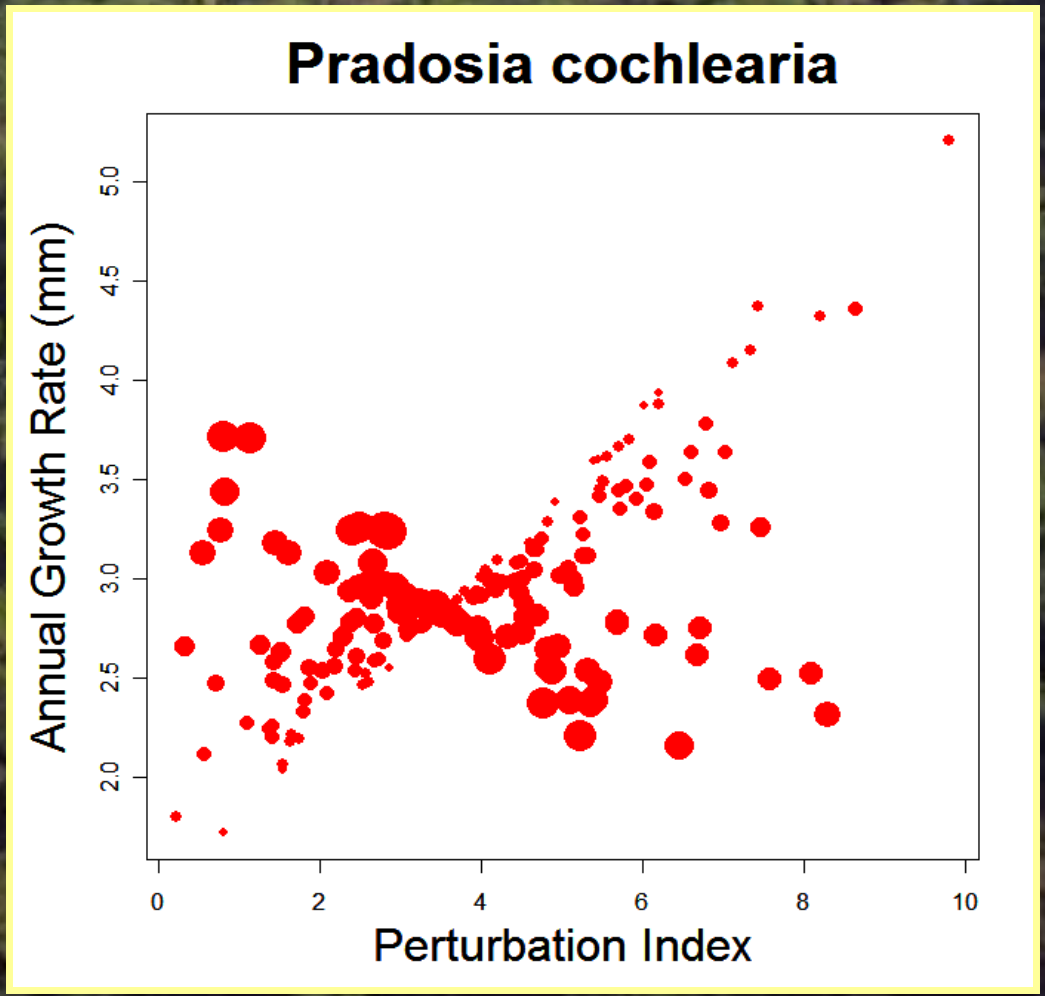
Eschweilera decolorans

Lecythis poiteaui

LINACEAE

Hebepetalum humiriifolium

SAPOTACEAE



1. **Strong effect of distance (< 10m)** to loggings gaps for 28 species

2. Weak effect of logging gaps area

3. **High diversity of species growth responses** to logging gaps and, for some species, the growth response was strongly dependent on the species ontogeny

4. To enhance tree post-logging growth → **small logging gap strategy**

Thank you for your attention