Reforestation success around Ranomafana National Park (RNP): survival and growth from 2007 to 2018

Background: in Madagascar, annual deforestation rate reach 1.1% (~100,000ha) per year (2010 - 2014). Reforestation is the most important and relevant recommendation for our future environment. But How can we evaluate the success of these reforestation programs? However we don't know the factors influence growth and survival.

Mechanistic question: How does environmental factor (biotic and abiotic variable) affect *native plants* survival and growth in reforestation sites around RNP?

Statistical question: What is relationship between survival, growth of native plants and environmental factor in reforestation around RNP?

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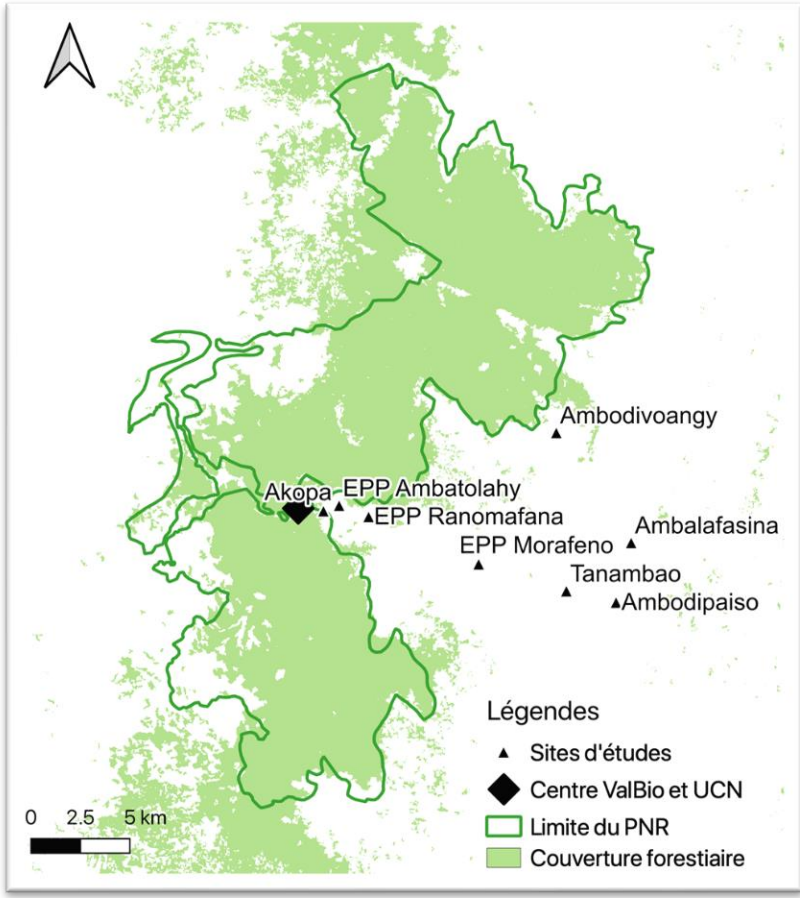

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Statistical Question:

What is relationship between survival, growth of native plants and environmental factor in reforestation around Ranomafana National Parks?

Hypothesis: Environmental factor affect growth and survival of native plants in reforestation around RNP

Model: **X:** environmental factor (pH, humidity, topography, cover plants, age, species, sites)

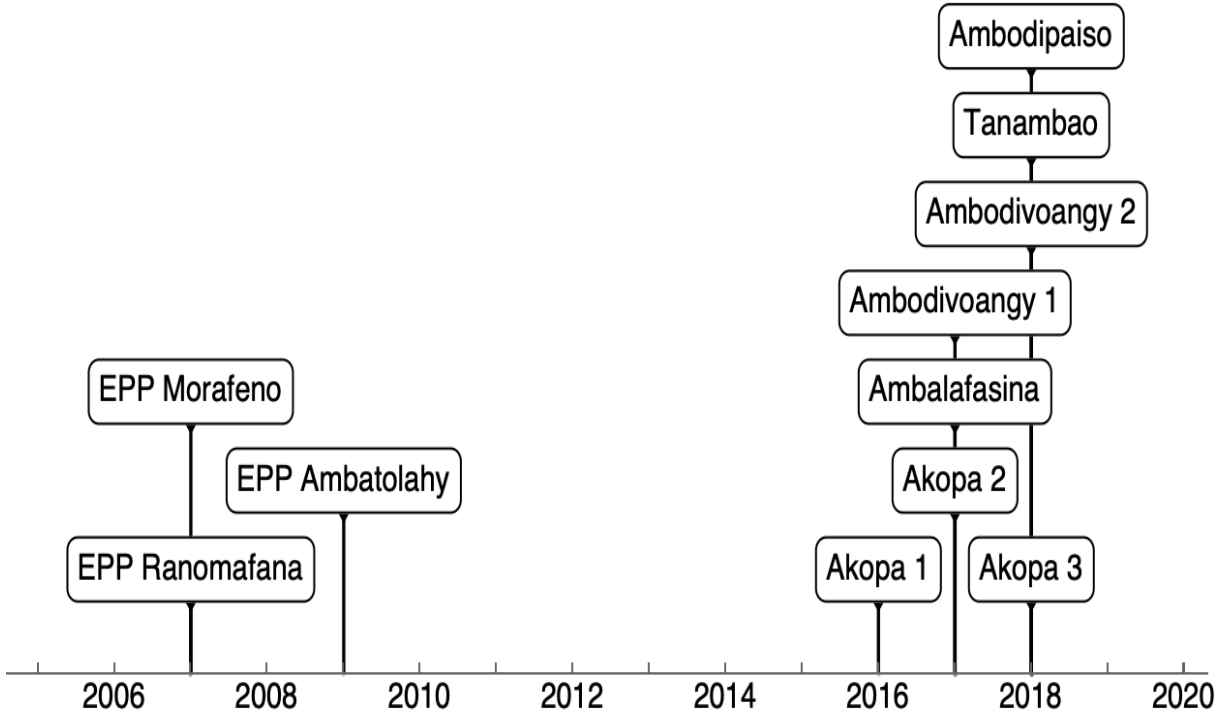
Y: Native tree survival rate

Family: Poisson

Link: Natural log

Potential Predictors: pH + humidity+ topography + cover_plants+ age+ site+ species

R code: glmer (survival/ growth~ pH + humidity+ topography + cover plant + age + (1|species/site), family= “poisson”)



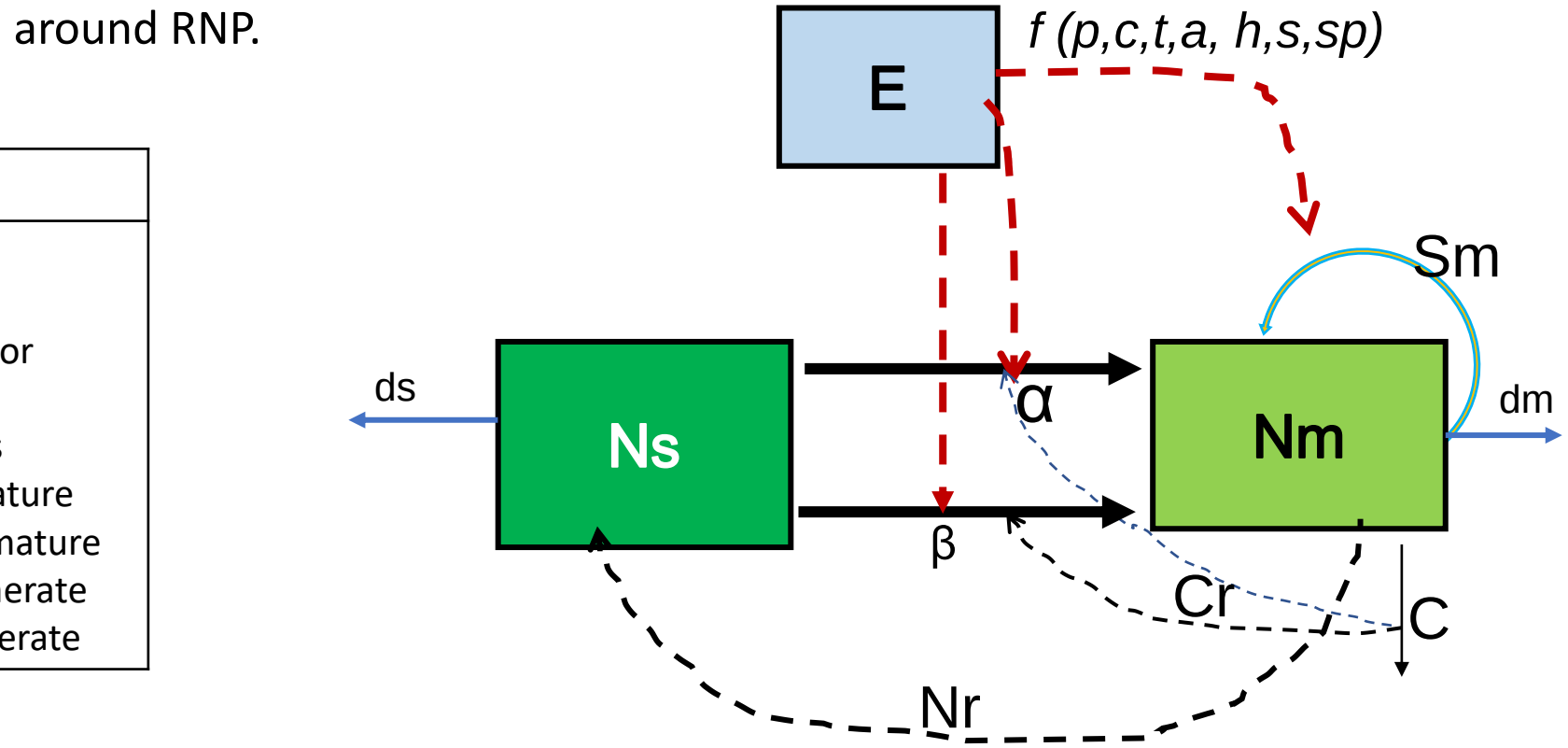
Reforestation site inventories : plantation date various

Mechanistic question:

How does environmental factor affect *native plants* survival and growth in reforestation sites around Ranomafana National Park?

✓ **Hypothesis:** environmental factor affect survival/ growth of native plants in reforestation site around RNP.

Population	Process
Ns: Native plants seedlings **Nm:** Native plants mature	**α** = Survival **β**= growth **E** = environmental factor **C**= cut (regenerate) **dn**= death of seedlings **dm**= death of plant mature **Sm**= survival of plant mature **Nr**= Native plant regenerate Cr: plant cutting regenerate



$$\frac{d\,Ns}{dt} = \mathbf{bN\ Nm} - ds\ Ns - \alpha\,\beta\ \mathbf{Ns\ E}$$

$$\frac{d\,Nm}{dt} = \alpha\,\beta\ Ns\ E + \mathbf{Sm\ Nm\ E} - \mathbf{dm\ Nm}$$

Environmental factor

- p: soil pH
- C: cover plant
- t: topography (low , middle and Hight)
- h: humidity
- a: age
- s: site
- sp: species

Next step:

- Arrange data and Analyses in R
- Fit relevant mechanistic model to survival, growth for each environmental factor and Choose the best model
- Write article and choose scientific journal accorded to the topic
- Publish article