Biodiversity in human-modified Amazonian forests

Jos Barlow
Lancaster Environment Centre, Lancaster University

Linkages at different scales

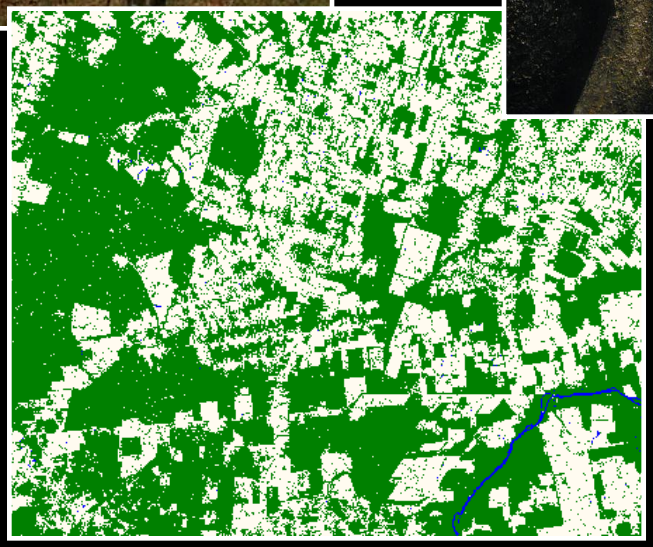
1. Basin wide scale – quantifying emissions from fires in a network of degraded plots
2. Landscape scale – examining the consequences of land-use change and degradation in Paragominas and Santarem
3. Local scale - Experimental manipulation in plots

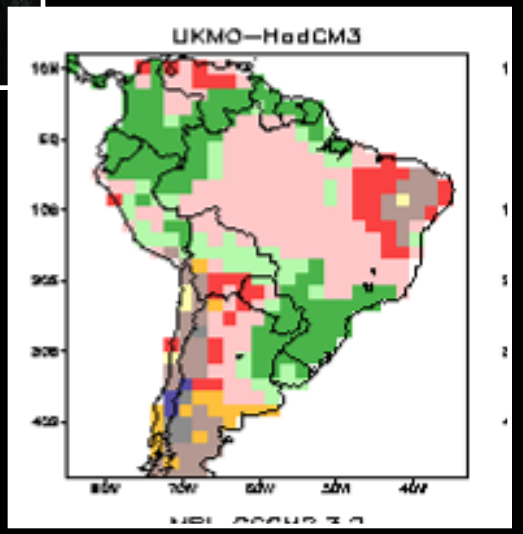
1. Wildfires in Amazonian forests

Wildfires have many negative impacts…

- Significant loss of forest specialist birds, primates, invertebrates
  - Barlow et al. 2002, 2004, 2008, Silveira et al. 2011, Andrade et al 2011
- Forest fauna very slow to recover
  - Mestre et al. in review
- Up to 40% of trees die immediately after fire
  - Cochrane et al. 1999, Haugaasen et al. 2002, and many others.
- Large trees initially resilient, but take longer to die
  - Barlow et al. 2003

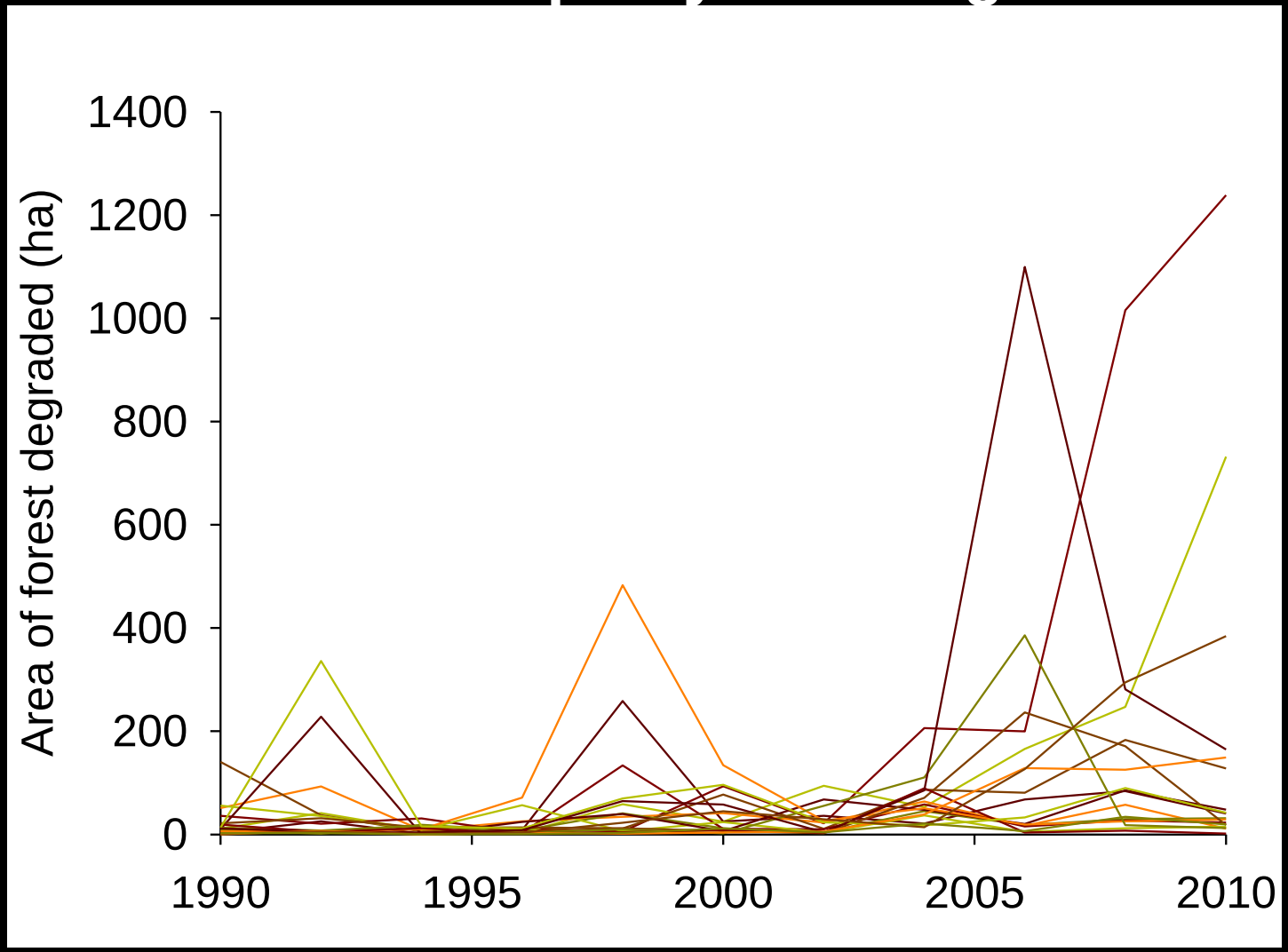
Fires likely to become more important in the Amazon





Barlow and Peres 2008 Phil Trans Roy Soc B

Increasing fire degradation in 18 catchments in the municipality of Paragominas



Gardner et al. in prep

Examining the longer-term consequences of wildfires across Amazonia

Ilha de Maracá, Roraima

RESEX Tapajos-Arapiuns, Pará

RESEX Chico Mendes, Acre

Querencia, Mato Grosso

Fire reduction could be a win-win-win scenario under UN REDD+ programme…

The critical importance of considering fire in REDD+ programs

Jos Barlow [a,*], Luke Parry [a], Toby A. Gardner [a,b], Joice Ferreira [c], Luiz E.O.C. Aragão [d], Rachel Carmenta [a], Erika Berenguer [a], Ima C.G. Vieira [e], Carlos Souza [f], Mark A. Cochrane [g]

[a] Lancaster Environment Centre, Lancaster University, Lancaster LA1 4YQ, UK
[b] Department of Zoology, University of Cambridge, Cambridge CB2 3EJ, UK
[c] Embrapa Amazônia Oriental, Trav. Dr. Enéas Pinheiro s/n, Caixa Postal, 48 Belém, PA CEP 66095-100, Brazil
[d] College of Life and Environmental Sciences, University of Exeter, Exeter EX4 4RJ, UK
[e] Museu Paraense Emílio Goeldi, C.P. 399, Belém, PA CEP 66040-170, Brazil
[f] Imazon – Amazon Institute of People and the Environment, Belém, PA, Brazil
[g] Geographic Information Science Center of Excellence, South Dakota State University, Brookings, SD 57007, USA

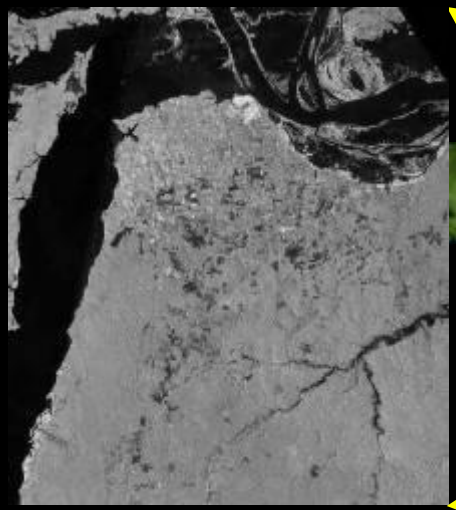
Barlow et al. 2012 Biological conservation

Carbon

Biodiversity

Rural livelihoods

2. Landscape scale



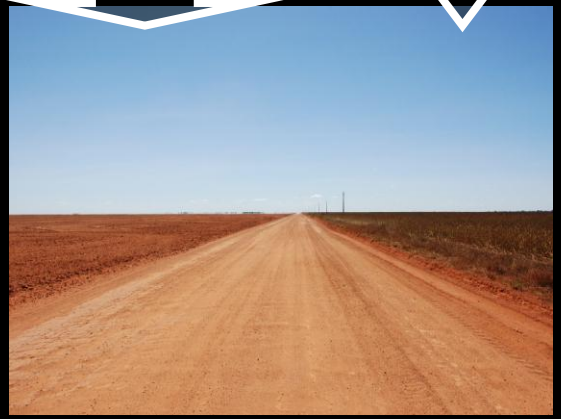
Santarém-Belterra

Paragominas

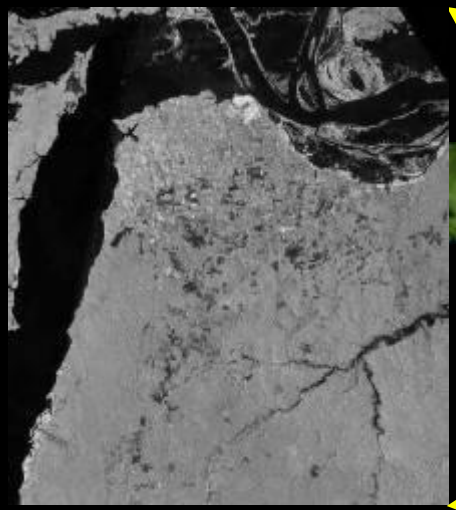
Regeneration

Intensification

Degradation



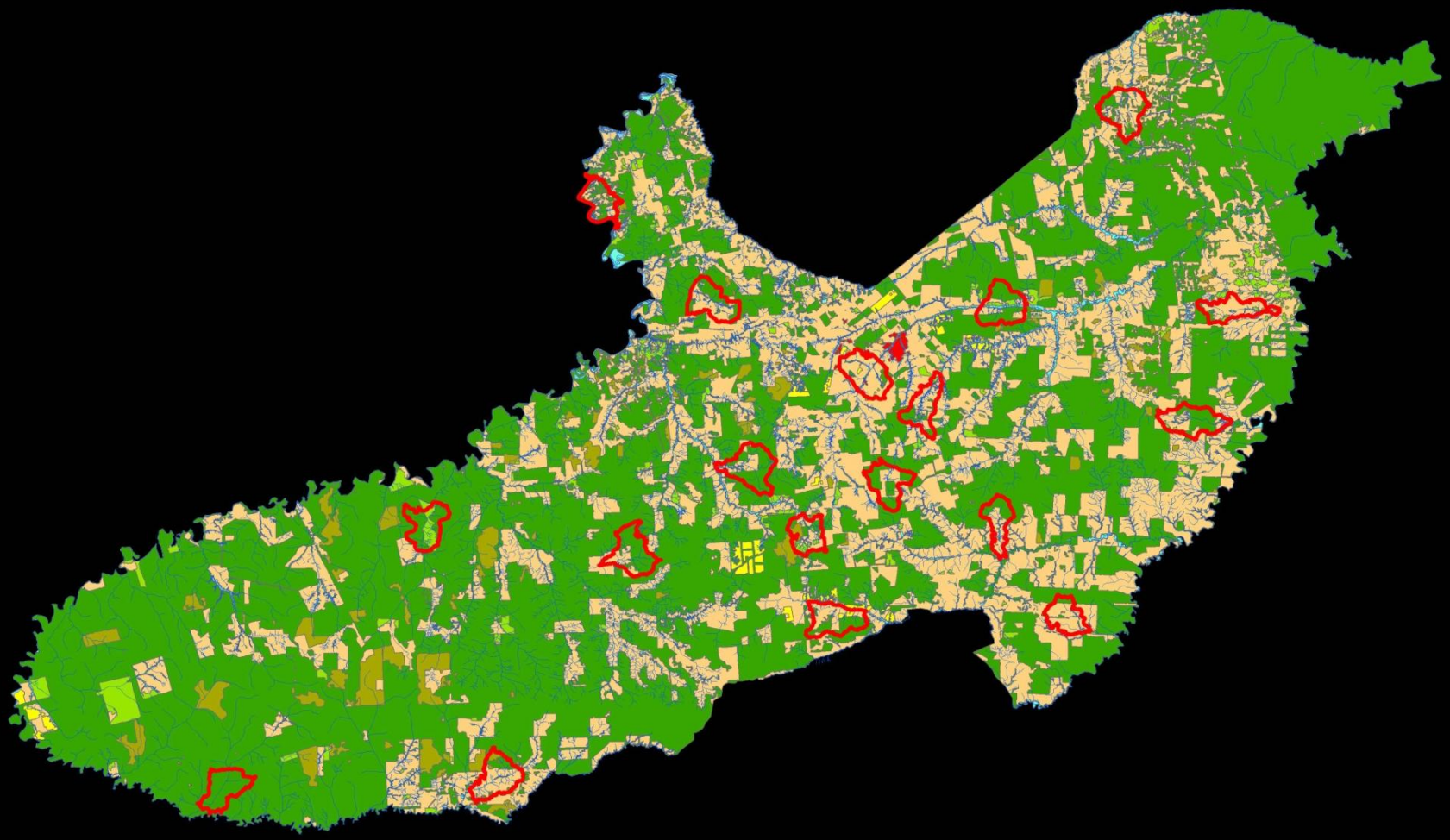
2. Landscape scale



Santarém-Belterra

Paragominas

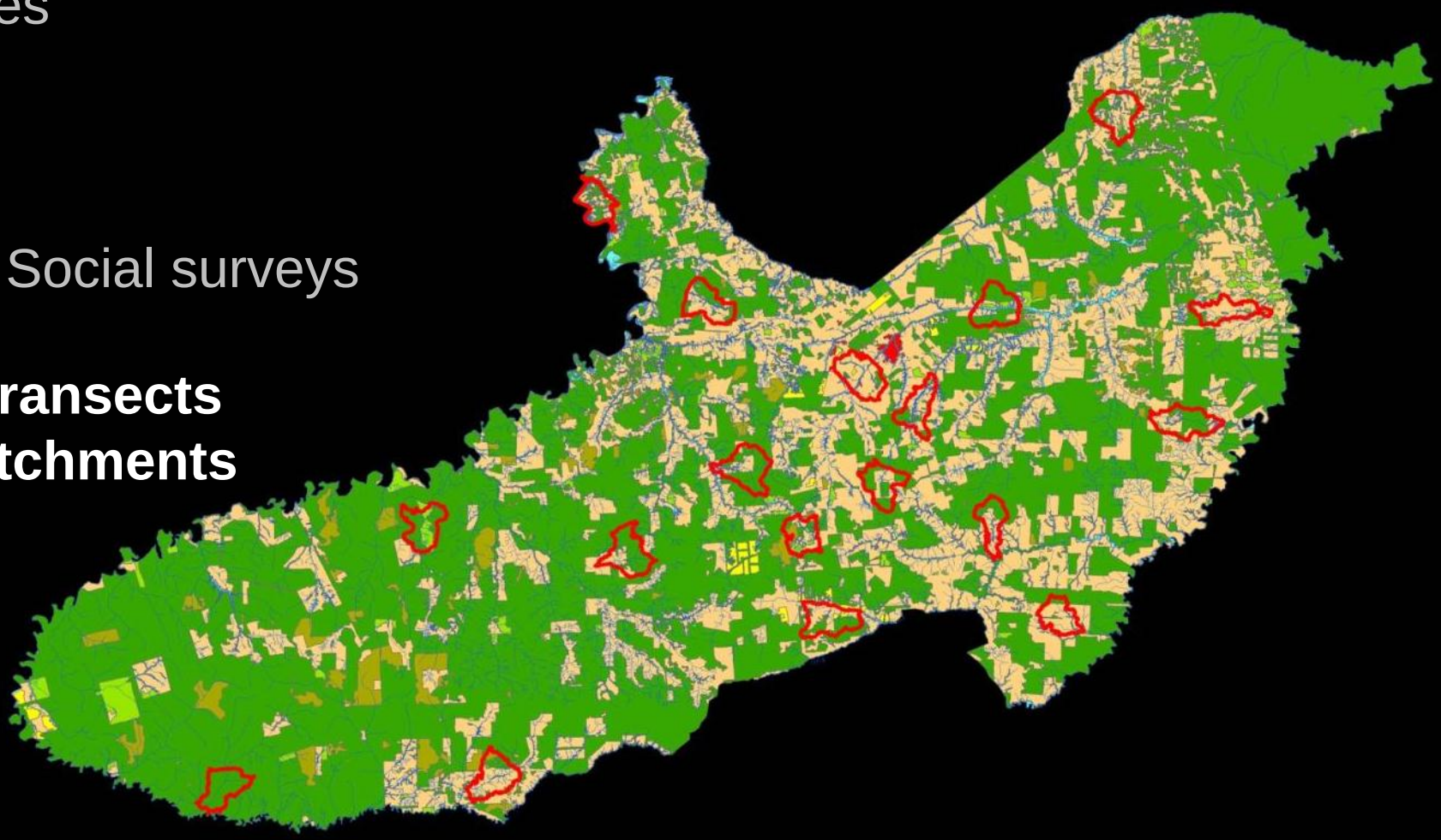
Study catchments



Biodiversity Data

Vegetation (trees, lianas, palms)
Birds
Beetles
Ants
Bees
Soil
300+ Social surveys

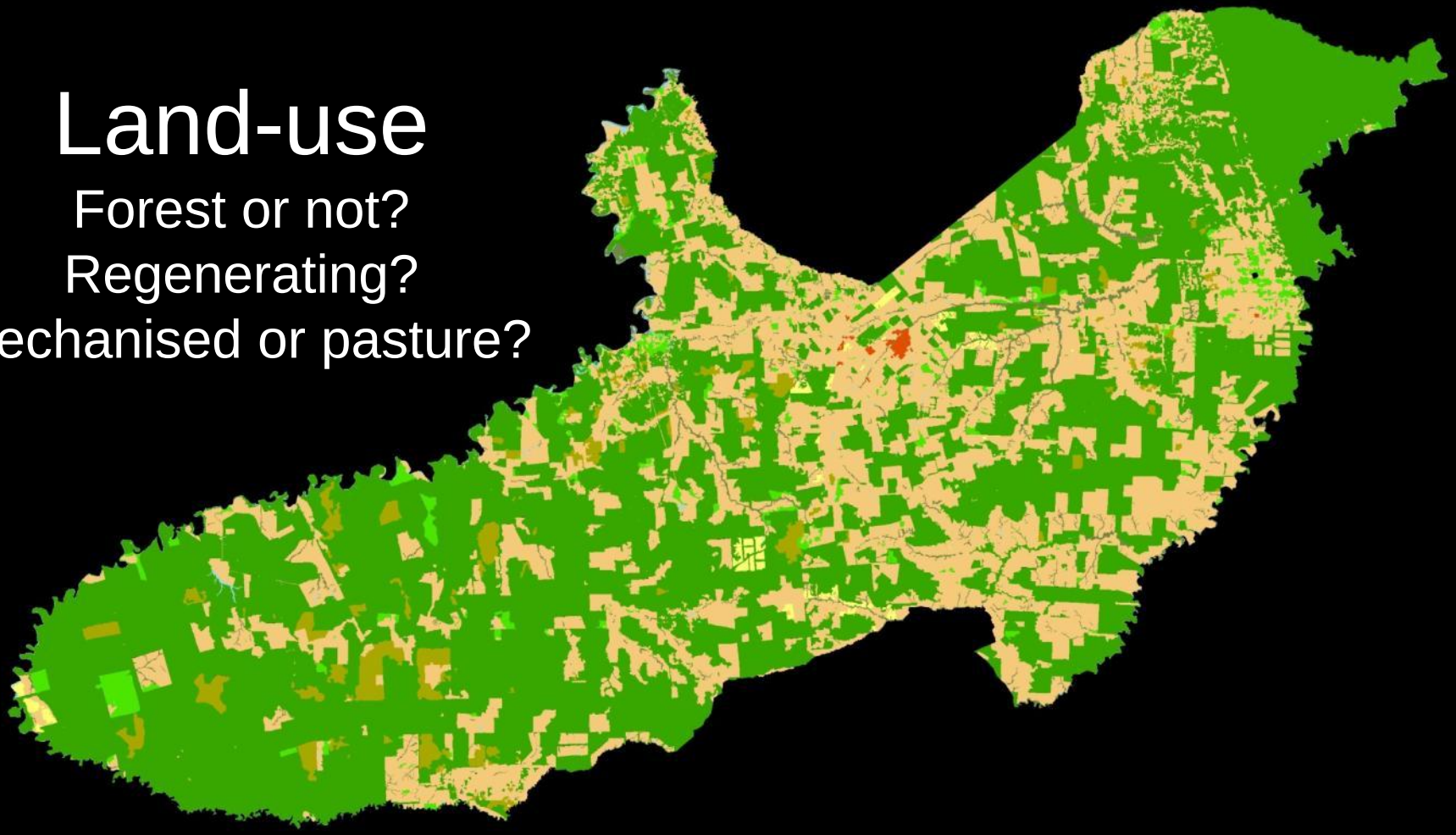
208 transects
18 catchments



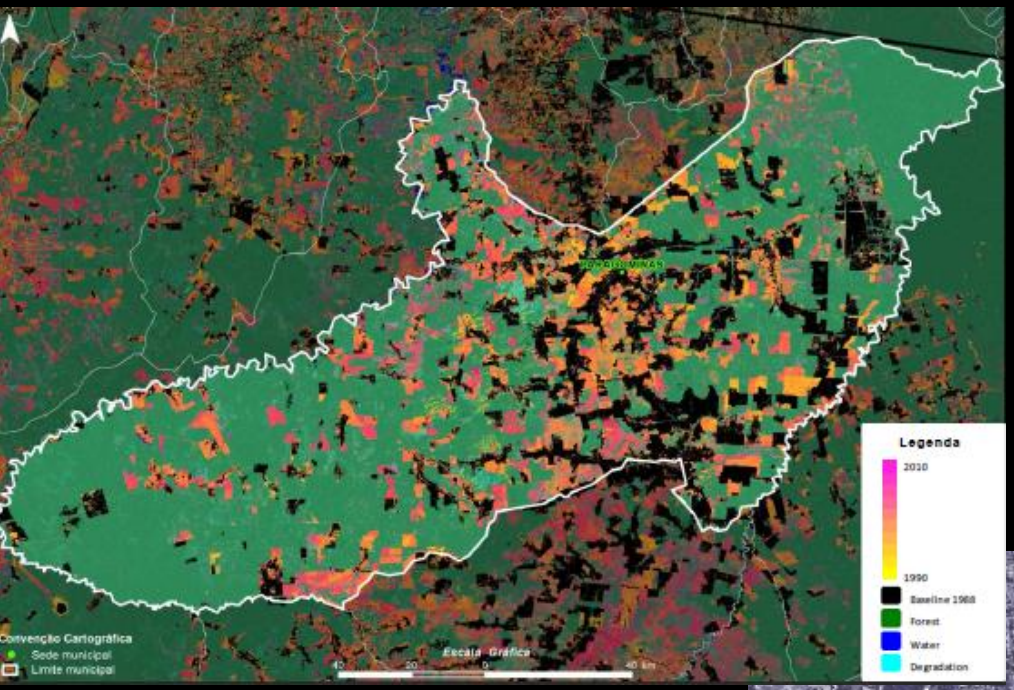
Spatial Data

Land-use

Forest or not?
Regenerating?
Mechanised or pasture?

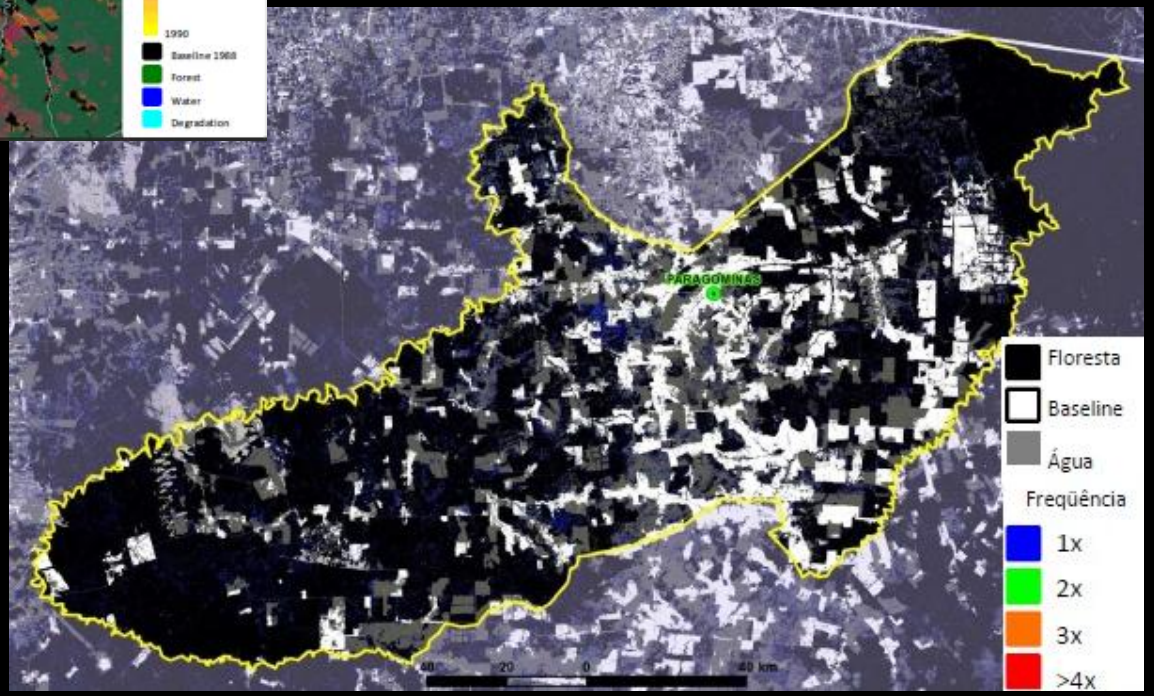


Spatial Data

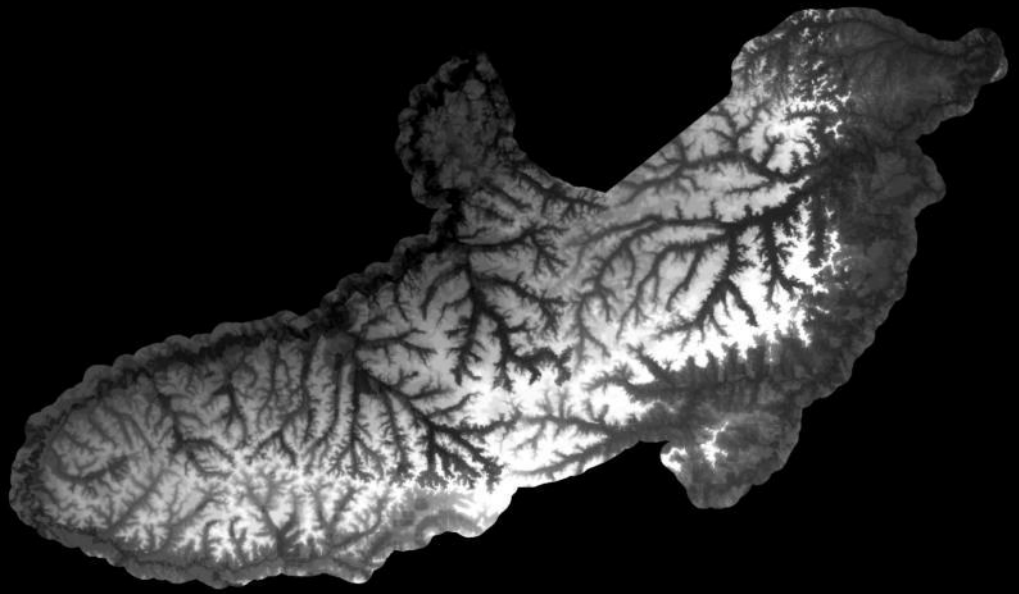


Landscape history

Time since deforestation
Age of regeneration
Frequency of degradation
Frequency of regeneration



Spatial Data

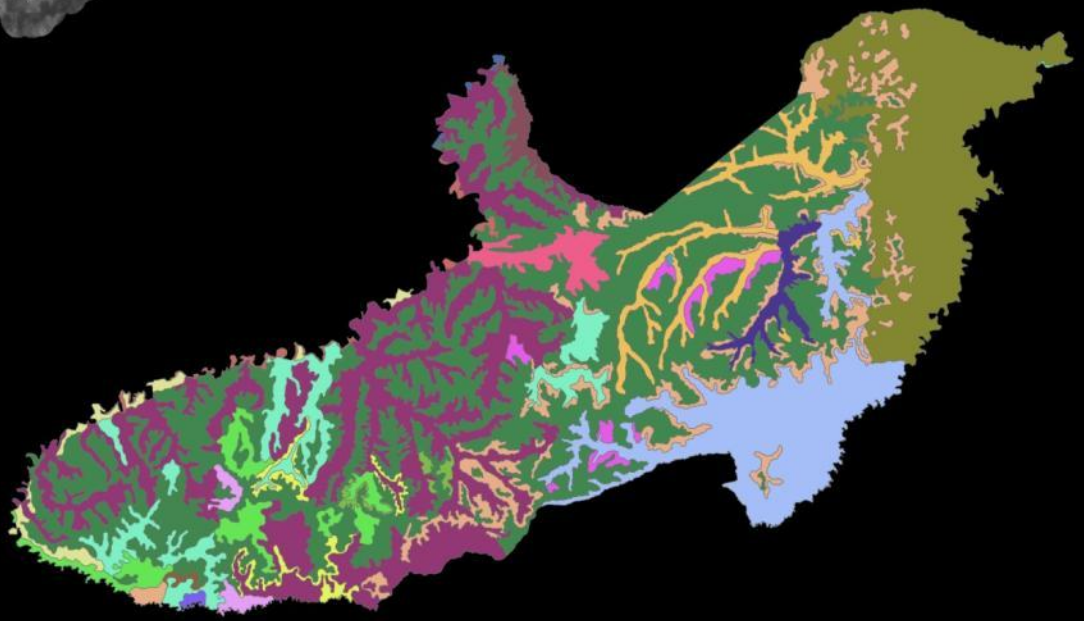


Topography

Elevation

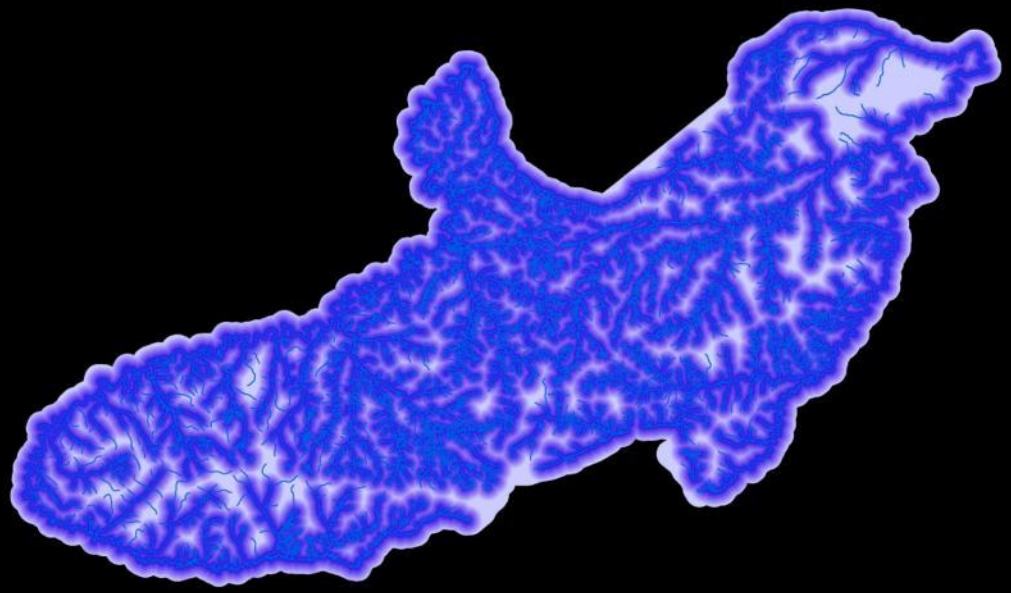
Slope

Aspect



Soils

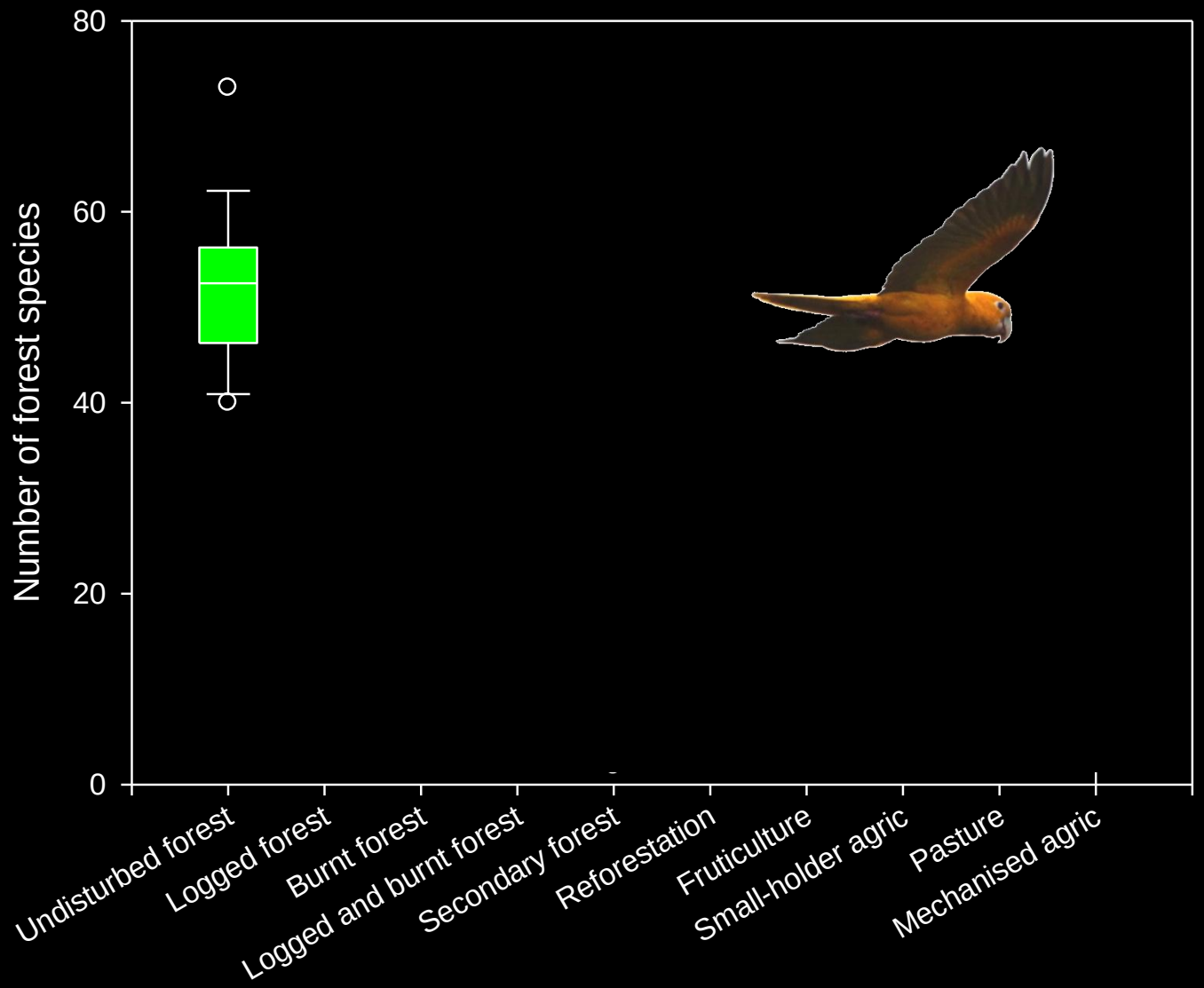
Spatial Data



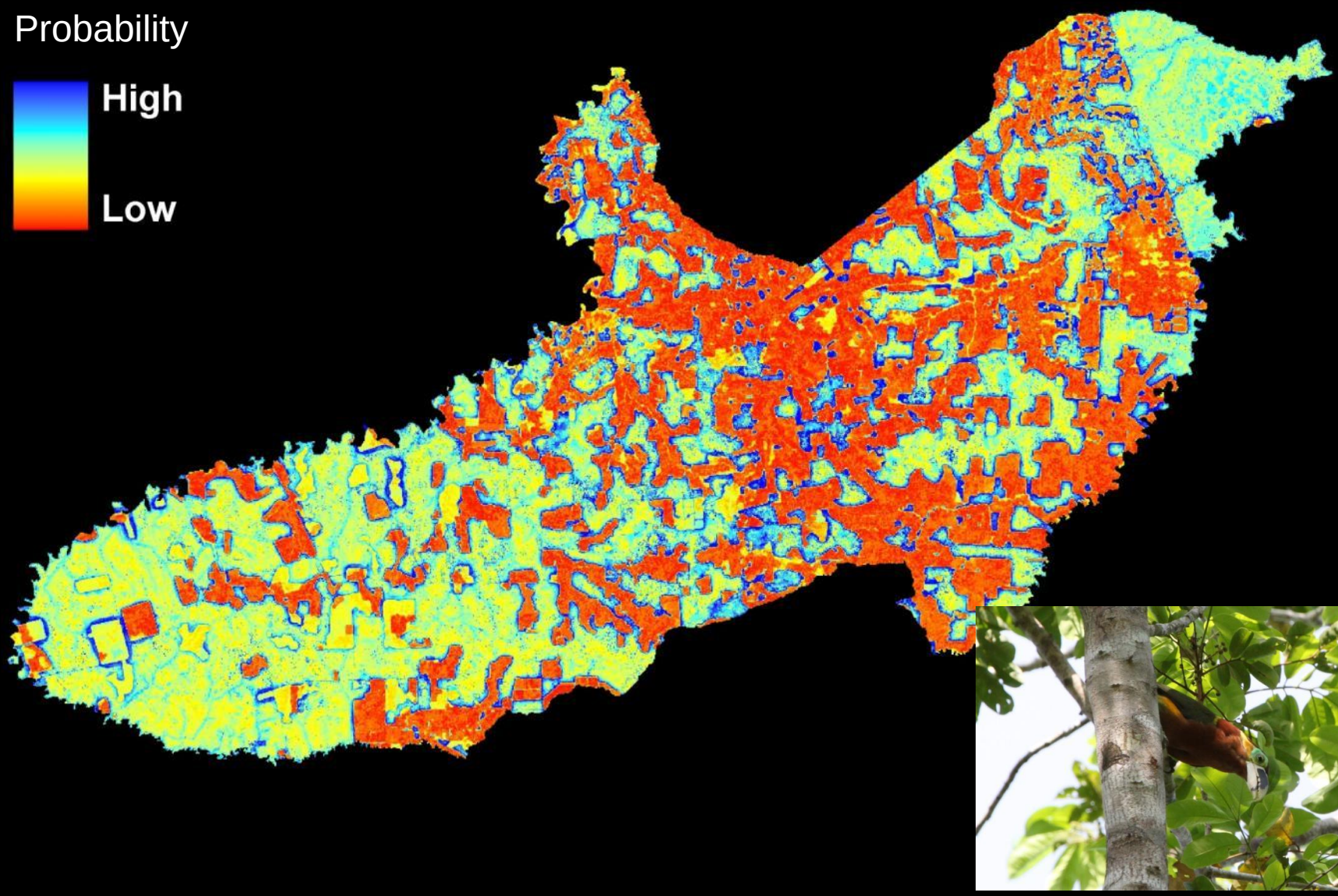
Distance to river

Distance to road

Results – e.g. Land-use and biodiversity change



Building municipality-wide models of biodiversity and carbon stocks



3. Experimental manipulation of BEF relationships at a local scale

- Links between *biodiversity loss* and *ecosystem resilience* are crucial.
- How does forest resilience to drought and fire change along degradation gradients?
- What are the consequences for emissions of biogenic particles?

Conclusions

- Landscape-scale biodiversity surveys could be used as basis to examine atmospheric consequences of deforestation and degradation
- Fire should be considered one of the most important forest-atmpsphere links
- Links between *biodiversity loss* and *ecosystem resilience* are crucial, and require experimental approaches at local scale

Obrigado!

FUNDING

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