



Laboratório de Estudos e Projetos em Manejo
Florestal - LEMAF

Modeling the distribution of seasonal forests in the Cerrado Biome using climatic envelope

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Introduction



Caatinga



Cerrado



Mata Atlântica

Biomes in Minas Gerais, Brazil (IBGE, 2004)

- There are several classification proposals concerning Brazilian Biomes – ex [IBGE \(2004\)](#)
- Classifying a certain Biome is easier when representative areas of different formations are used ([core areas](#))
- Transitional areas among vegetation formations or associations must be modeled with the aid of research about local flora or with the use of indicator species

- **Indicator species:** presence or abundance indicate specific environmental conditions

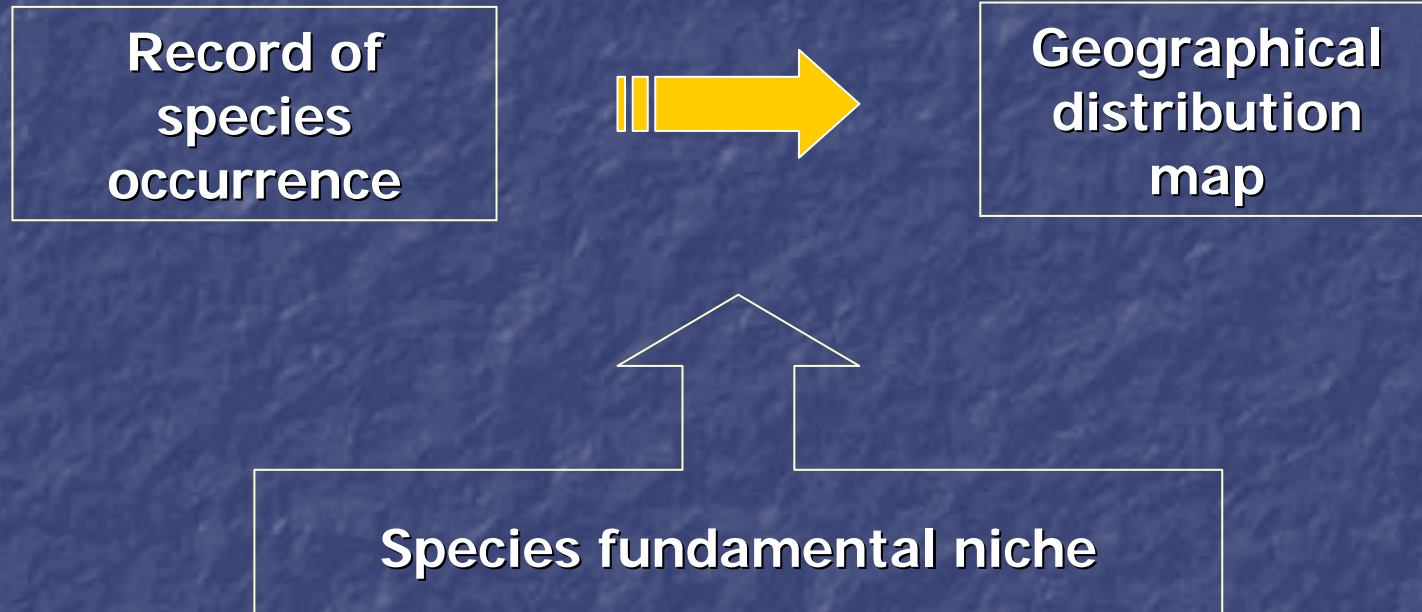


Mountain forests - Candea
(*Eremanthus erythropappus*)



Wet soil – Guanandi (*Calophyllum
brasiliense*)

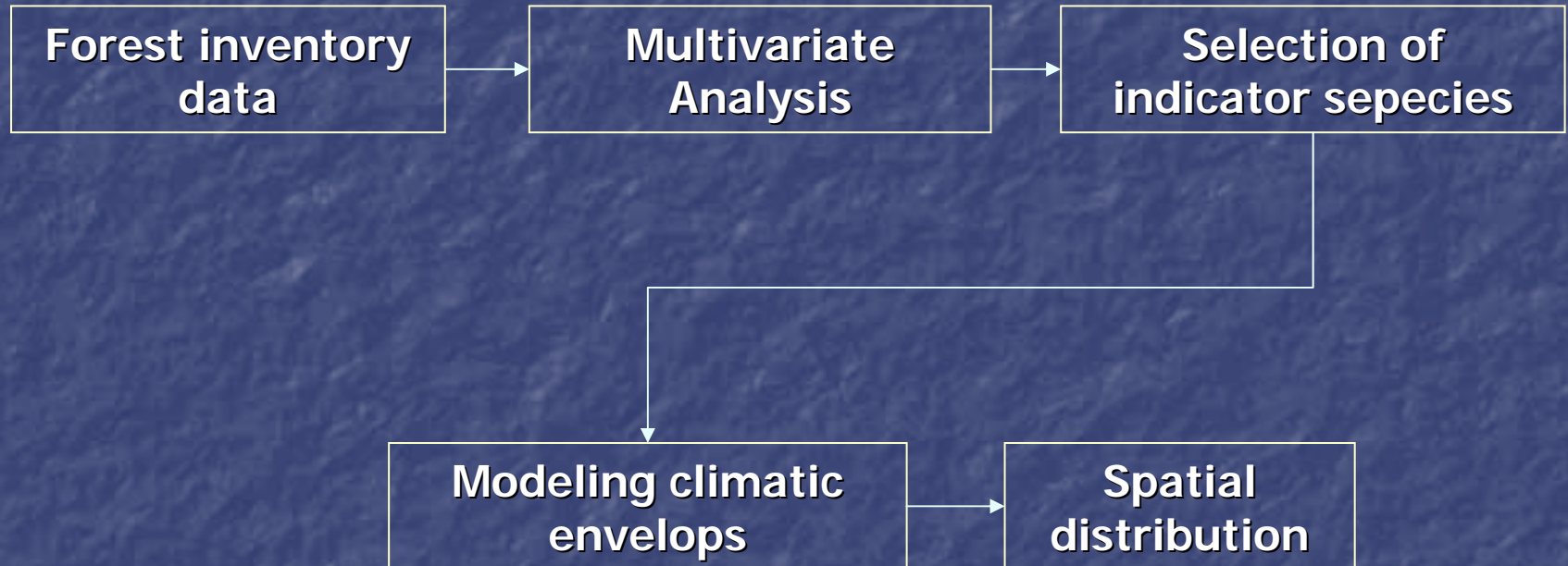
Spatial Modeling of Species Distribution



General objective

To map the potential distribution of seasonal forests of Cerrado in Minas Gerais, Brazil, through species distribution modeling using climatic envelopes of its indicator species

Material and Methods



Database

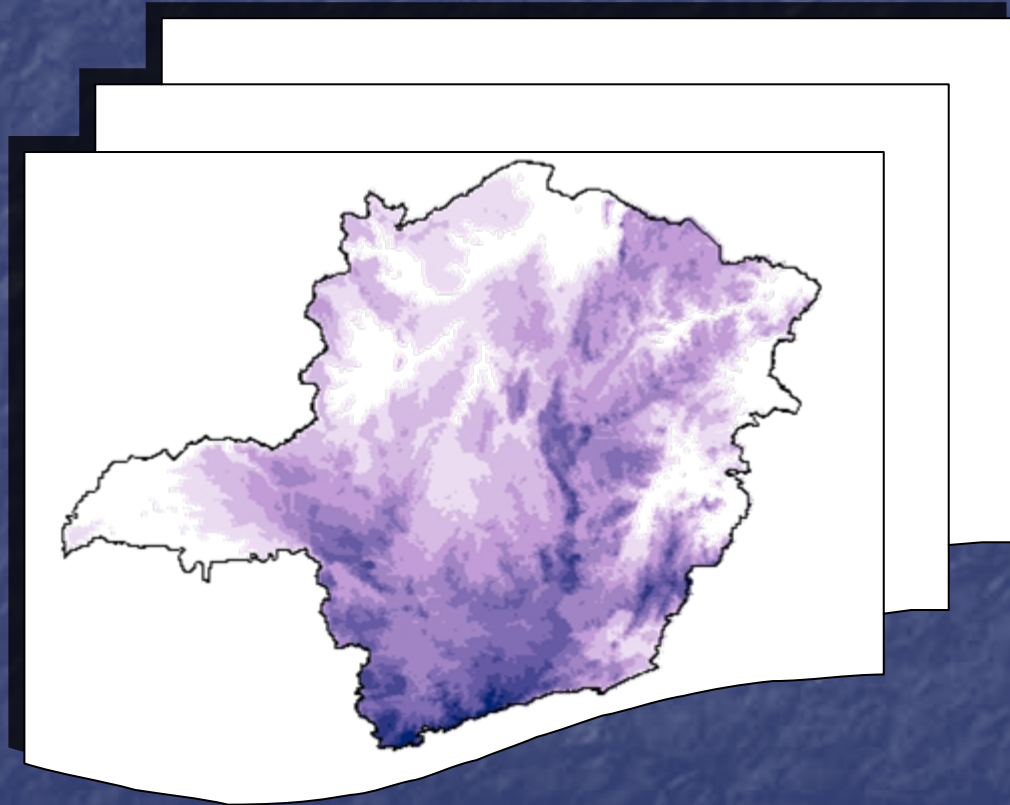
- Record of tree species of 50 forests fragments of the Cerrado Biome recovered from the database TreeAtlas



Seasonal forest fragments

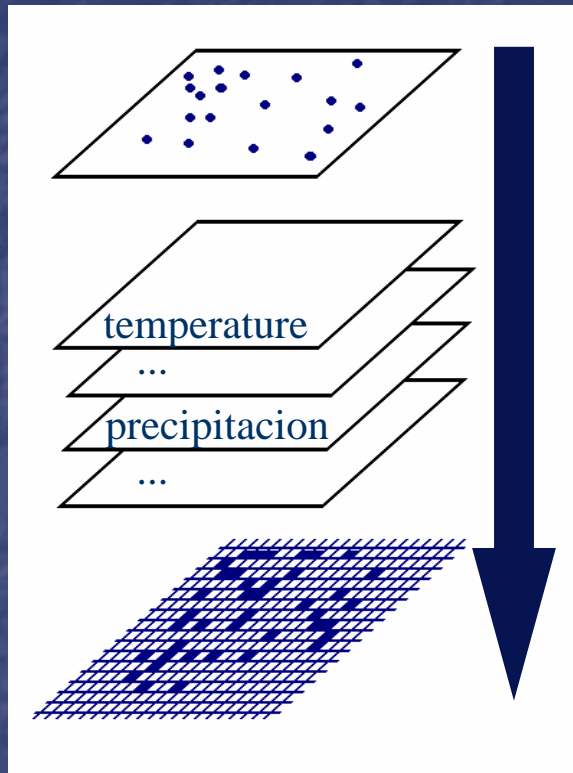
Database

- **Environmental variables:** Bio 19 - Worldclim – Spatial resolution $2,5^{\circ} \times 2,5^{\circ}$



Selection of Indicator Species

- **ISA** – Indicative Species Analysis: This index measures concentration of species abundance or occurrence within the target site group, weighted by the relative frequency of species occurrence within this group
- Target site group - Categorical environmental variables :
Domain
- The statistical significance of the species indicator values is evaluated via Monte Carlo test



Occurrence points

Environmental
variables

Predicted
distribution

- BIOCLIM True/False (Nix et al, 1986): All areas that are within the envelope described by the data points, cut off beyond a certain user defined percentile, are mapped as "true" (1); all other areas are mapped as "false" (0)

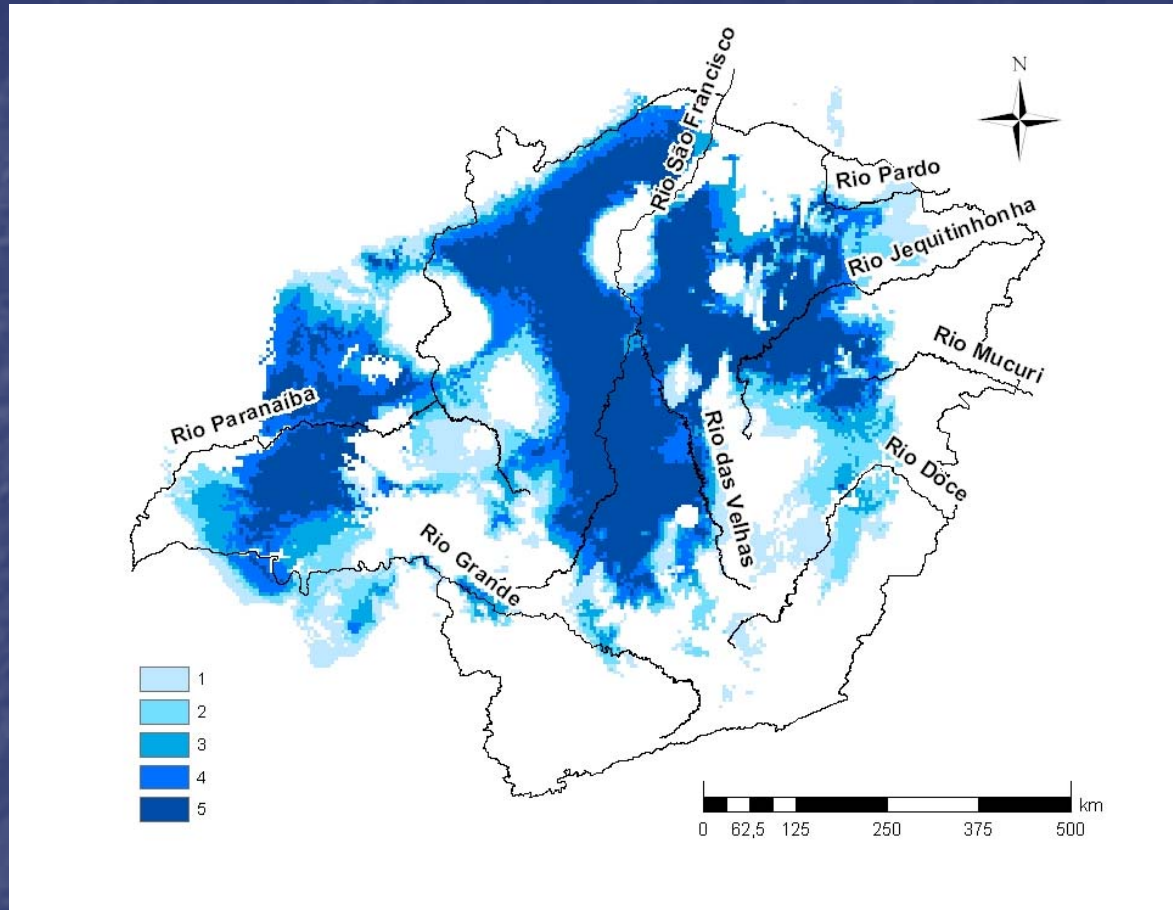
Evaluating overall accuracy

- Receiver Operating Characteristic (ROC) Plot – Fraction of true positives (1- omission error) against false negatives (commission error).
- Area Under the Curve (AUC) – performance measure for models

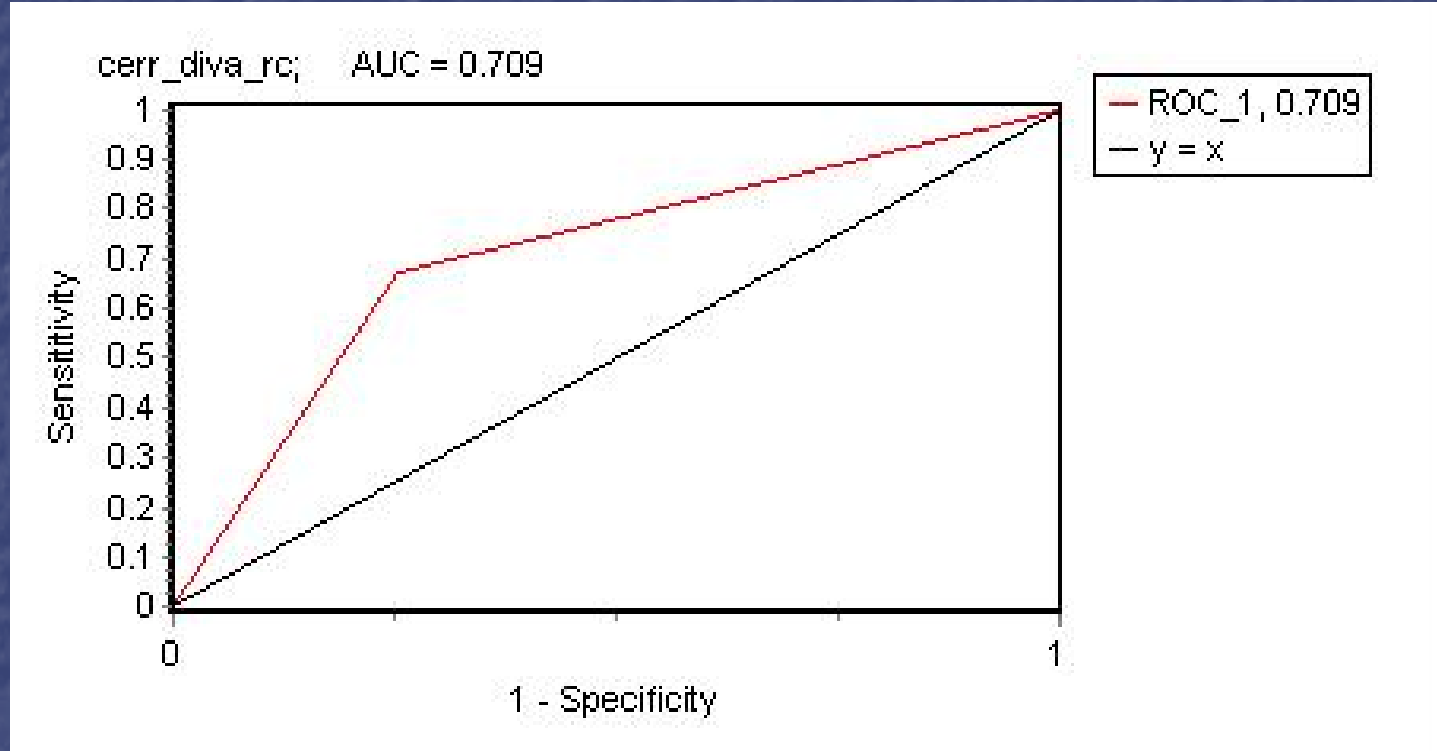
Indicator species of seasonal forests within the Cerrado Biome.

Species	ISA	p*
<i>Myracrodruon urundeuva</i>	63,2	0,001
<i>Dilodendron bipinnatum</i>	49,2	0,005
<i>Tabebuia roseoalba</i>	48,4	0,002
<i>Aspidosperma subincanum</i>	47,5	0,003
<i>Tabebuia impetiginosa</i>	45,1	0,010

Preliminary Results



Map of potential distribution of 5 indicator species of Cerrado seasonal forests according to BioClim predictions



ROC plot for the species distribution model generated in the present study. The area under the curve (AUC) is a measure of the model accuracy.

Ongoing Research

- Inclusion of other Biomes
- The use of other empirical models (viz. genetic algorithms and decision trees)
- More complete inventory dataset
- Enhanced input variables (viz. elevation, aspect, soil, geology, VIs)

Final Remarks

- The forest inventory of Minas Gerais might be used to differentiate Biomes and Phytogeographic Domains across the State,
- According to this preliminary analysis, empirical modeling appears to be a promising strategy to predict the distribution of seasonal forests of the Cerrado Biome, and
- Indicator species might be used as a robust surrogate of the Cerrado spatial distribution.

Thank you!

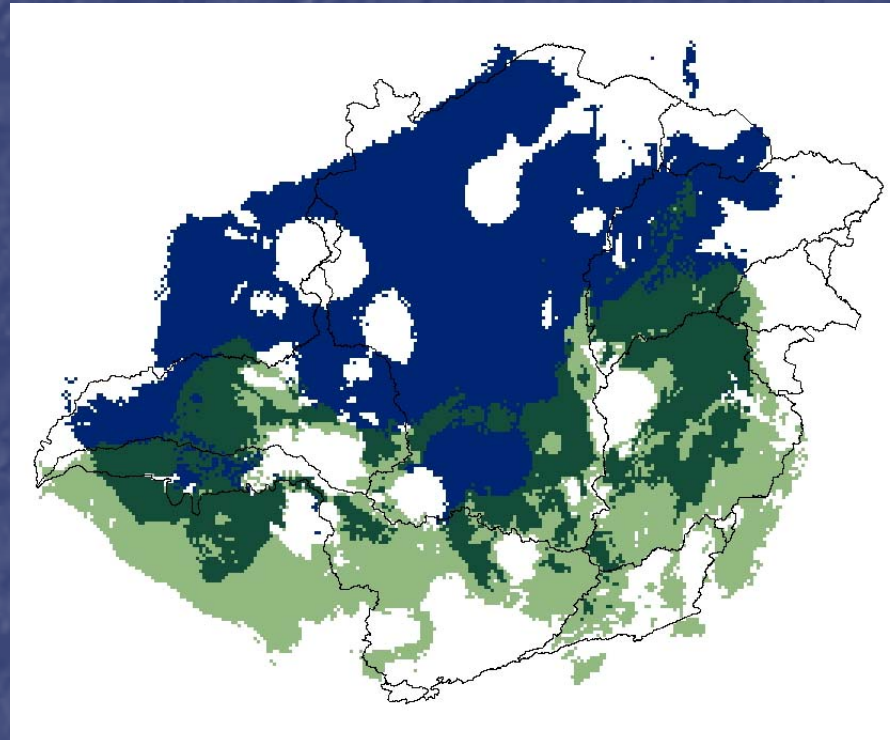


FIGURE 6: Potential distribution of seasonal forests of the Atlantic forest Biome X Potential distribution of seasonal forests of the Cerrado Biome

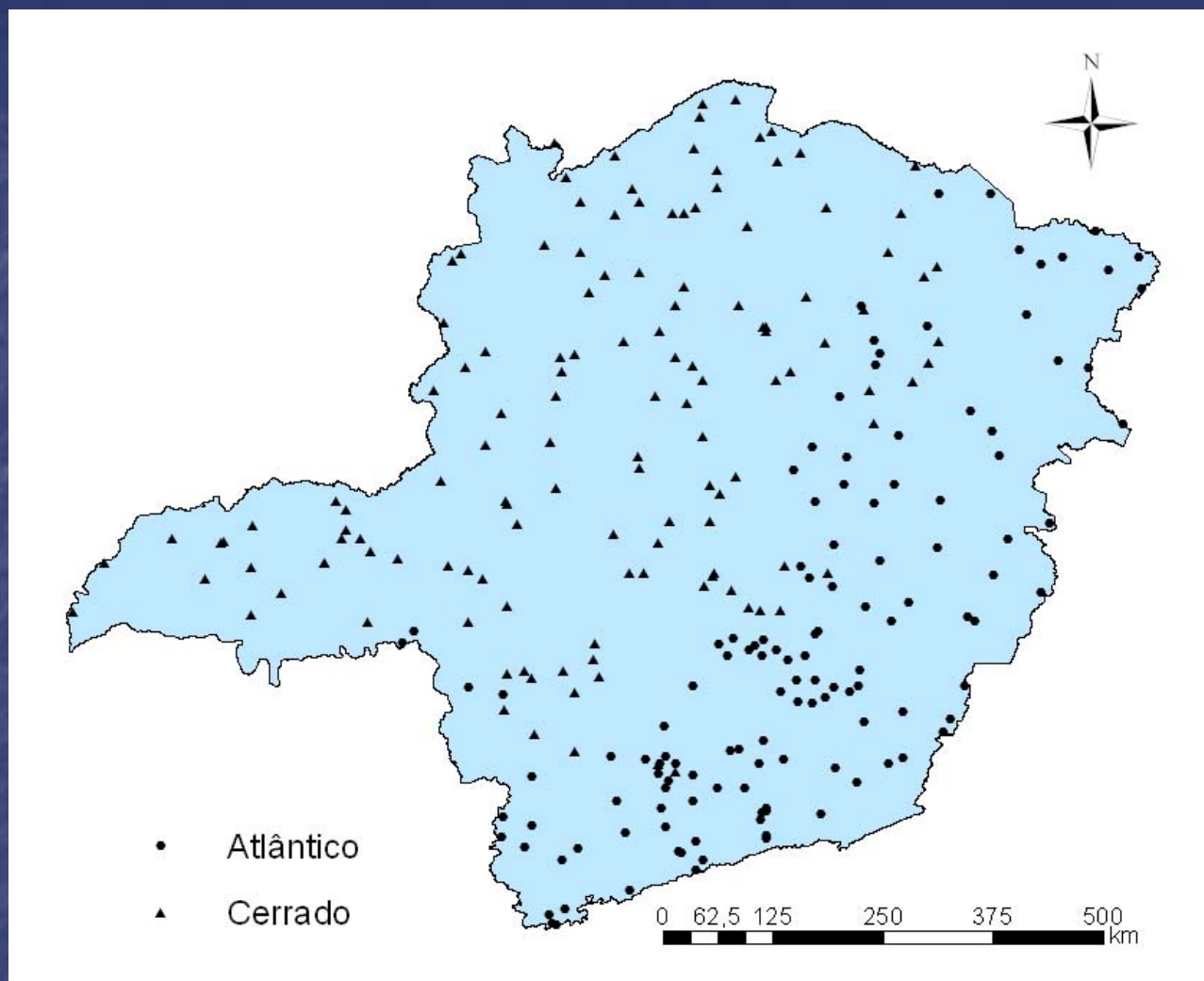


FIGURE 8: Recently updated TreeAtlas database – 262 sample areas in Minas Gerais.