Assessing riparian vegetation structure and the influence of land use using landscape metrics and geostatistical tools

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AIMS
Identification of potential landscape metrics that best describe and quantify the riparian structure and evaluate its response to land use pressure.

METHODS
1. Study area

2. Riparian vegetation mapping

3. Proximal and distal land use

4. Landscape metrics (Patch Analyst – vector format (ArcGis 9))

5. Spatial component assessment

1 - a) Are the riparian vegetation patterns cluster or random?
1 - b) Are there local patterns of spatial dependence?

A: Global Morans’ I with 3 configurations of distance matrix

2 - What is the distance between sample units that ensure the spatial independence of the data?

A: Variogram function

6. Land use influence – Statistical analysis

1 - Does the proximal land use variables more the riparian vegetation structure than the distal land use?

A: Constrained ordination procedures – redundancy analysis (RDA)

1st approach
Incorporating the spatial component of the data
Matrix combinations (N=330)

i) Solely land use variables (30m and 200m buffer)
ii) Spatial component as covariable (local Moran’s I)
iii) Spatial component + land use (joint effect)

2nd approach
Removing the autocorrelation
Sub sampling of spatial independent Sample Units
(N=28, 9 combinations)

2 - Which are the land use variables that most influences the riparian vegetation patterns?

3 - How does the riparian vegetation structure respond to the increase of land use pressure?

A: Multiple linear regression

RESULTS

1. Riparian structure through landscape metrics

Tree cover:
- Most abundant class
- Largest patches
- Higher connectivity patterns
- Higher variability of the patch size
- Higher values for the metric forms associated with complex shapes

2. Spatial component assessment

- Presence of Spatial Autocorrelation (SAC) in the riparian structure
- Local spatial behaviors
- Higher spatial dependence for the tree cover class
- Distance of spatial independence:
  2395 < variogram range < 2963m

3. Influence of land use variables in tree cover class

Conclusions

- Complementary landscape metrics can consistently describe and quantify the riparian vegetation structure, specially in the tree cover class
- The proximal land use presented a higher influence on the biological variability than the distal land use
- The explained variance of the land use variables increases drastically with spatial independent Sample Units.
- Disturbed riparian woods due to major land use pressure, such as agriculture, presented a low number of small patches (low NP and MPS values) with simple and homogenous shapes (low MSI, MPFD and PSCV values), reduced patch connectivity (high MNN values and low MPI values), and a non interspersed patch distribution (low IJI values).