Plant Functional Types Identification in the Lower Paraná River Floodplain, Argentina

Natalia S. Morandeira¹, M. Marta Borro¹, Gabriela González Trilla¹, M. Mercedes Salvia², Nora Madanes³ and Patricia Kandus¹

Framework and Aims

Large wetlands of temperate South American floodplains are mostly covered by herbaceous plants, which are expected to be adapted to a wide range of water availability and hydroperiods. While few species usually dominate at any particular location, at landscape and regional scales there is a large number of plant species, probably with functional redundancy.

Plant Functional Types (PFT) relying on a shared set of key structural and functional traits, promise to be a tool to assess wetland environmental conditions. Besides traditional vegetation surveys and phytosociological descriptions, this approach may synthesize the complexity of wetland plant communities with less emphasis on taxonomy.

Aims

a) To identify PFTs within the herbaceous plant communities of the Lower Paraná floodplain, a freshwater temperate wetland dominated by emergent macrophytes.

b) To evaluate the association between dominant PFTs and environmental conditions determined by geomorphic setting, topographical position and soil features.

Methodology

47 study sites at the Lower Paraná River Floodplain, stratified at the geomorphic settings: Delta de la Plata, coastal barrens, transgressive levees, Loxaean and crevasse plays of the main channel, floodplain, islands of the main channel, beach ridges.

Traits measurement

1) Maximum basal stem diameter (cm)
2) Photosynthetic stems (binary)
3) Hollow stems (binary)
4) Plant height (cm)
5) Maximum basal stem diameter (mm)
6) Number of leaves
7) Number of stems
8) Mean leaf thickness (mm)
9) Mean SPAD Chlorophyll Meter units
10) Leaf area (cm²)
11) Leaf perimeter (mm)
12) Leaf dissection index (Per/Area)
13) Specific leaf area (mm²/g)
14) Foliage length (mm)
15) Foliage Perimeter/Length
16) Foliage Length/width
17) Total foliar area (mm²)
18) Foliage Nitrogen (%N of dry weight)
19) Foliage Phosphorus (%P of dry weight)

Traits that better discriminated PFTs were: Plant height, Number of leaves and Leaf nitrogen content. These were also correlated with Leaf chlorophyll content (SPAD units), Leaf P content and several structural variables that indicate elongated graminoid leaves.

Final remarks

Contrary to our expectations, PFTs distribution was not related to geomorphic settings. However, some PFTs dominated only when flooding frequency was low, and some PFTs were related to particular soil features. In this way, PFTs may serve as biological indicators of soil and flooding features.

Although other authors suggest that belonging to a PFT is a species’ feature, we found that populations of the same species may not be assigned to the same PFT (e.g. Echinolchla crusgalli in PFTs 3 and 6; or Polygonum lapathifolium and P. aff. hydroperoides both in PFTs 5 and 8). We suggest that different populations of the same species may vary on their traits’ values following environmental features.

This work is the first attempt for identifying PFTs for the Lower Paraná River Floodplain, and is one of the few PFTs examples in temperate freshwater wetlands.

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References

The 53 dominant populations (35 species of 10 families, mainly Poaceae, Asteraceae and Polygonaceae) where assigned to 10 Plant Functional Types.