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Aridity drives woody plant functional spaces across land-use gradients in the Dry Chaco Forest

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Abstract

The Dry Chaco Forest, a critical yet understudied deforestation hotspot, is undergoing rapid land-use change, with deforestation and agricultural expansion threatening its ecological integrity. Woody plant functional traits are key indicators of ecosystem function and resilience, but their variation across environmental and anthropogenic gradients in this region remains poorly understood. This study aims to assess how functional trait diversity and functional spaces of woody plants vary along a 400 km aridity gradient, across land-use categories, and between protected and unprotected areas in the Dry Chaco. We sampled 58 woody species at 5 sites (spaced 80 km apart) and 3 protected areas, with 400 sqm plots established in forest strips, forest borders (0–200 m), and forest interiors (>200 m). For each species, we measured a set of functional traits: maximum height, wood density, stable isotopes (δ^{13}C, δ^{15}N) in wood and leaves, C:N ratios, dry matter leaf content, and specific leaf area. Community-weighted means (CWM) and multidimensional functional spaces were calculated to characterise trait variation. Preliminary analyses explore whether functional spaces differ among land-use categories, protection status, and sites along the aridity gradient. By identifying the relative influence of aridity, land use, and protection on functional trait diversity, this study seeks to contribute to the development of evidence-based conservation strategies for the Dry Chaco. Understanding these patterns is essential for prioritising areas for protection and restoration, particularly in the face of increasing aridity and anthropogenic pressure. This study provides a foundation for integrating functional ecology into conservation planning, offering insights into how woody plant communities may respond to environmental and land-use changes in one of the world's most vulnerable dry forests.

Keywords: Aridity gradient, Dry Chaco forest, functional diversity, land-use change

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