



Towards Landscape Ecohydrology: linking historical landscape patterns and ecosystem services provision in Bolivian sub-Andean region

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Landscape ecology, namely the set of relationships between landscapes spatial patterns and ecological processes, affects and is affected by the heterogeneity of ecological and social processes occurring across a range of scales. At the watershed scale, landscapes influence the attributes (e.g. quantity, quality, spatial and temporal variability) of the water that passes through it, determining the ecohydrological process that can be then converted to ecosystem services available for the society, according to its needs. Watershed management largely affects landscape and determines the type of water ecosystem services (WES) that are provided and the extent to which trade-offs and synergies might arise. Thus, the spatial explicit evaluation of the coupling between eco-hydrological processes and WES provision, namely Landscape Ecohydrology, can open new perspectives in watershed management and land planning. The aim of this work is to assess the potential of a Landscape Ecohydrology framework for the analysis of the degraded watershed of Rio Pirai, in the sub-Andean region of Santa Cruz, Bolivia. Rio Pirai watershed represents the main source of Ecosystem Services for the urban area of the city of Santa Cruz de la Sierra, but it has been affected by severe anthropic land degradation in the last 50 years whose effects need to be determined. Four historical land use maps have been obtained from Landsat Imagery for Rio Pirai watershed, and landscape patterns have been assessed through landscape metrics. SWAT (Soil and Water Assessment Tool) has been utilised for the spatial explicit modelling of hydrological processes and ecosystem services provision for each land use setting. Landscape metrics have then been associated with ecosystem services value, evaluating the shifts of the WES hotspots and their spatial correlation. The developed frameworks give insights on the relationship between landscape spatial patterns and ecosystem services flows, identifying the multiple effects of decision making in the area. Results show the advantages of introducing the use of landscape-based ecohydrological indicator for watershed management planning and representing a sound base of knowledge for reversing the degradation trend in Rio Pirai watershed.

Keywords: Water Ecosystem Services (WES), Land use change, Rio Pirai, SWAT, landscape ecology