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Assessing the impacts of payment schemes for ecosystem services on the hydrology of a Costa Rican headwater catchment – A modelling approach.

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In 1997 Payment schemes for Ecosystem Services (PES) were legally introduced in Costa Rica with a view to protecting Costa Rica's natural forests and encouraging reforestation. The scheme sought to guarantee hydrological function, along with other ecosystem services and thus provide wider societal benefit. This paper reports insights from a pre and post-PES split sample modeling exercise conducted to examine whether a change in hydrodynamics of a 76 km2 tropical headwater catchment could be detected using long-term (> 30 years) flow data. Prior to the PES scheme land management was characterized by land use conversion from primary rainforest to pasture, however, since 1997, this trend has been reversed with increasing reforestation and protection of rainforests. The semi-distributed and conceptual model HBV was adapted to represent the dominant hydrological processes of the study area based on observational field studies and was then calibrated using multi-criteria objective functions. Results showed that changes in parameter sensitivities before and after the implementation of PES could be associated with land use change indicating, in particular, different low flow dynamics. The study demonstrates the potential for using of modeling exercises in a learning framework to improving our understanding of hydrology of sparely monitored tropical catchments where increasing development pressures are often accelerating land use change which may have deleterious impacts on ecosystem services.