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Field protocol and GIS analysis of connectivity in semiarid headwaters: metrics and evidences from Carcavo Basin (SE Spain)

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Soil erosion and land degradation are severe problems in headwaters of ephemeral streams in semiarid Mediterranean regions, particularly in marginal upland areas over erodible parent material. Field-based information is required about the main pathways of sediment movement, the identification of sources and sinks and the influence of relevant factors. The EU-funded project RECONDES approached this reality by monitoring connectivity pathways of water and sediment movement in the landscape with the aim of identifying hotspots that could then be strategically targeted to reduce soil erosion and off-site effects. A protocol including field work and GIS analysis was developed and applied to a set of microcatchments in Carcavo Basin (Spain). The philosophy of the protocol was based on the repeated mapping after rainfall events so that frequency of activity of pathways could be evaluated. Connectivity was evaluated for each site and event using specific metrics: maximum mapped connectivity (corresponding to the largest recorded event), density of connected pathway links (m/ha) and frequency of activity (times active/total). Repeated connectivity mapping allowed identifying hotspots of erosion. The effect of structural and functional factors on connectivity was investigated. Field data is also valuable for validating future connectivity models in semiarid landscapes under highly variable and unpredictable conditions.