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**STATISTICAL APPROACHES TO UNDERSTANDING IMPACTS
OF STORMWATER MANAGEMENT AT THE WATERSHED SCALE**

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ABSTRACT: The Shepherd Creek (Cincinnati OH) stormwater management study leverages long-term research towards the effectiveness of economic incentives insofar as placing green infrastructure on private property, and whether this management intervention offers social, economic, and environmental benefits. We address this challenge in the context of a catchment-scale hydrologic study involving retrofitting suburban residential parcels with green infrastructures to reduce stormwater quantity. We elicited participation in the study using a reverse-auction in which property owners bid on minimum payments to permit installation of 75 gallon rain barrels or 16 m² rain gardens on their land. Two auctions were held, resulting in the installation of 165 rain barrels and 85 rain gardens, modifying flows on approximately 1/3 of the impervious area in the watershed, or about 4 % of the total land area within the watershed. ANOVA based on the standard before-after-control-intervention (BACI) experimental design for this type of study was unable to discern treatment effects. Effects were discernable, however, using an integrated autoregressive, moving-average (ARIMA) model combining the discharge and precipitation data and allowing temporal offsets between them. This outcome illustrates the utility of improved statistical methods in reducing the footprint and expense of proof-of-concept sustainability experiments in urban environments.

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