A width-based approach to estimate environmental flow for data scarce areas

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A new hydraulic method is proposed to determine environmental flow based on the two motives to provide a simple threshold for water managers and to establish an approach with relatively low data requirements for ungauged basins. On a purely analytical frame the method seeks environmental flow based on observed data of water surface width, water depth, river bed roughness and the surface slope. By applying the method in the donating rivers of the South-to-North Water Transfer project, the result of environmental flow is close to the result by Tennant method (10%) and wetted perimeter method and less than the result of Tennant method (20%). With low data requirements, the method is helpful to provide the information of the spatial distribution of environmental flow along the rivers. With sensitivity analysis, it is obvious that the larger the change of roughness, the larger the change of environmental flow. The change of environmental flow is not sensitive to the change of slope. The method is deduced based on simple triangular cross-section channels, which is popularly found in the head water of the river. Being independent of discharge data, the method is useful in finding applications in ungauged basins.