The potential of a hydraulic method to estimate minimum ecological instream flow for data scarce basins

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Abstract By deducing a general expression between discharge and each of such hydraulic variables as wetted perimeter, mean cross-sectional depth of flow, mean cross-sectional flow velocity, cross-sectional area, channel width, and hydraulic radius for a channel, a simple hydraulic method to analytically estimate minimum ecological instream flow requirements (MEIFR) is proposed. The method can quickly give an estimate of MEIFR based only on observed data of mean cross-sectional depth of flow and channel width, so has potential for applications in ungauged basins. By applying the method to the rivers in Western Route South-to-North Water Transfer project in China, where data for MEIFR are scarce, the MEIFR values derived by the new method are shown to be in agreement with those by popular, conventional and well-developed MEIFR techniques, such as the Tennant method and wetted perimeter method, with small gaps in between.

Key words ecological instream flow requirements; hydraulic variable, ungauged basins; Western Route South-to-North Water Transfer Project in China