Environmental flow regime prescription transfer along a river basin

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State-of-the-art methods for the delineation of environmental flow regimes involve the computation of the ecohydraulic requirements of instream and riparian species based on flow-ecology relationships. The actual paradigm is to perform an ecohydraulic study in each local, often effort- and time consuming, where a hydraulic structure is planned. Nevertheless, an environmental flow regime proposed for a specific river stretch should be valid for the entire downstream reach with similar stream order, under penalty of the prescribed flow regime be an additional anthropic disturbance rather than a sustainable benefit to the riverine ecosystem. This should also be confirmed before putting into practice any environmental flow regime prescription. Furthermore, being able to transfer an environmental flow regime prescription along the river basin without recurring to additional ecohydraulic studies may become a valuable prompt and cost-effective measure for additional hydraulic structures planed to the same river basin. We analyzed the ecohydraulic requirements of fish and riparian vegetation in three different study sites along the same river basin to compare the biota response to the same environmental flow regime, transferred between sites by a discharge ratio taking into account the proportional watershed area and precipitation difference between the study sites’ specific watersheds. Fish requirements were determined seasonally (autumn/winter, spring and summer) for three different native cyprinid species (Iberian barbel Luciobarbus bocagei, Iberian nase Pseudochondrostoma polylepis, and the Iberian cyprinid complex Squalius alburnoides), in different development stages (adult and juvenile), using hydrodynamic modeling with River2D and CASiMiR-fish. Riparian vegetation requirements were established in a multiannual fashion by means of CASiMiR-vegetation modeling, considering the local existing riparian ecological succession landscape in natural flow circumstances as reference. Our analyses show that fish habitat suitability curves are site-specific due to the hydrogeomorphic setting of each local. Notwithstanding, a prescribed environmental flow regime for a particular location in the river basin seems to be suitable for other locations in the basin itself when transferred by this method. The riparian maintenance flows are easier to transfer and confirm its feasibility as they are already prescribed as river floods with specific recurrence intervals. Initial results indicate that this method could be viable for both instream and riparian biota and that, after being functional for a river basin, could be used to transfer environmental flow prescriptions throughout the river basin. Confirming this outcome will bring not only a greater plainness to environmental flow regime prescription but also an increased confidence on the role of environmental flow regimes in the sustainable management of regulated rivers.