Environmental flow assessment: Case studies at three hydropower plants in Austria

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Water abstraction for hydropower use is one of the most common impacts in Austrian rivers. Most of the hydropower plants build in the first half of the 20ies century have led to dry river beds, modern plants are now obliged to release residual flows. However, precise standards for environmental flows have not been set in Austria so far. With the new EU-Water Framework Directive (WFD) member states are now forced to improve the ecological situation in residual flow stretches failing the WFD objectives.

The case studies are located in different geological regions (limestone, silicate) at small salmonid streams. Quantitative electro-fishing was carried out in stretches affected by diversion as well as in reference sections up- and alternatively downstream the water extractions. Additionally, hydromorphological parameters, e.g. water depth, flow velocity, channel width, substrate, mesohabitats type were measured at different flow rates. Environmental flow requirements were analysed by (1) applying different hydraulic modelling approaches (2) testing response of fish ecological metrics, e.g. species occurrence, guild composition, density, age structure to obtain an adequate ecological status within the residual flow stretch and (3) assessing environmental flows with biotic indices that are in compliance with the WFD, e.g. European Fish Index. The results show that not only the minimum flow but also other factors, e.g. type of original fish assemblage, morphological conditions, length of water abstraction and spill water flow determine the ecological status in streams affected by residual flow. Consequently, an integrated assessment schema is necessary to account for all effects on the fish fauna and to develop management measures in accordance with the WFD.