

Physical Habitat Simulations Bridging the Gap between Ecology and Engineering

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In the 1970s, there has been controversy over the destruction of fish ecosystem due to upstream small-scale hydro power generation in the US. In order to find the optimal discharge for the downstream fish habitat, Bovee and Milhous (1978) expressed the condition of physical habitat as a function of discharge. This is the first case of carrying out Physical Habitat Simulation (PHS). PHS is a numerical tool that quantifies the quality of physical habitat in terms of habitat variables such as flow depth, velocity, and substrate. In general, PHS consists of hydraulic simulation and habitat simulation. Hydraulic simulation is the first stage to obtain the information on habitat variables for a particular discharge over the study area. The second stage is habitat simulation, where habitat quality is evaluated based on the habitat variables obtained in the first stage. The model used in habitat simulation plays a key role by linking the physics and ecology. Although PHS has been applied successfully to various engineering problems, it has certain weaknesses. The weaknesses of PHS can be grouped into three categories (1) habitat simulation model, (2) selection of target species, and (3) inherent problems. Previously, habitat suitability curves have mainly been used for habitat simulation. However, they are criticized because the results are very susceptible to the subjective opinion of the builder. In addition, the results of PHS may change totally depending on the choice of the target species. Covering unsteady flows and use of habitat variables other than velocity, flow depth, and substrates constitute Inherent problems of PHS. In this presentation, various previous attempts to overcome these weaknesses of PHS will be introduced.

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