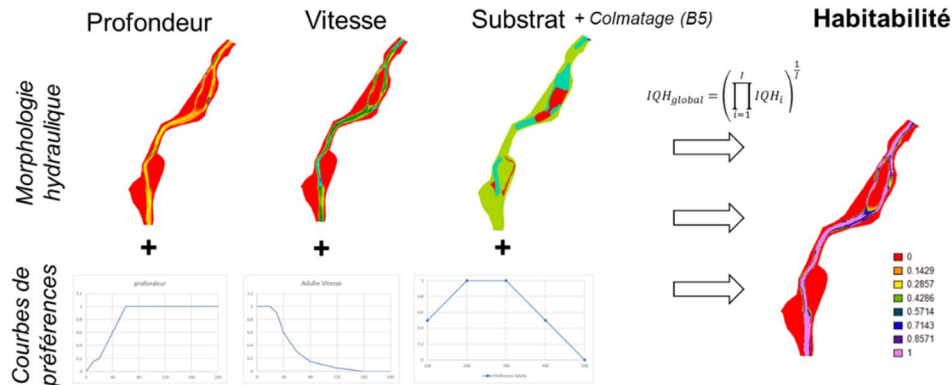


I. Samora / T. Meile / K. Essyad
BASEMENT User Meeting 2023



Following the Swiss Federal Law on Water Protection (LEaux) in 2011, hydropower plant owners must study and adopt measures to reduce the negative impacts of dam exploitation. This includes restoring the bedload regime, enabling fish migration and mitigate the harmful effects of hydropeaking. The present study concerns the hydropeaking mitigation study for the Lessoc Dam, belonging to Groupe e, located on the Sarine River, in the Fribourg Canton.

Diagnostic

The current state and its degree of deviation from the natural state are characterized by means of indicators defined by the Federal Office for the Environment. Four of these indicators are concerning the habitability for fish, spawning and macrozoobenthos and Basement 2D modelling was necessary for their quantification.

Five river-sections in the study perimeter were identified to characterize the current state. The first one, upstream from the Lessoc Lake, is in a natural state and is used as reference. The following four have a diversity of geometries and morphologies which represent well the river downstream from the dam. Five models were assembled, covering a total of 4.6 km: 206 000 elements and 104 365 nodes. The models include a fine modeling of the riverbed and gravel banks granulometry. The results of pure hydraulic modellings were interpreted and combined to generate raster coverages, which were transformed with the Deltares's HABITAT software in habitability indicators. They were calibrated according to water level and point velocity measurements for several flows conditions and also by checking the consistency with in-situ biological observations (spawning ground distribution).

The same modelisation chain was used to prognose the efficiency of several hydropeaking mitigation measures.

Synergy with bedload restoration

One of the downstream river-sections was additionally used to predict the result of bedload regime restoration measures. A simulation with using Basement 2D with mobile bed and restored sediment influx on this section of the Sarine allowed to verify the effect of the bedload mitigation measures and to predict the future grain class coverage of the riverbed.

This prediction of future grain classes and riverbed can be used with new purely hydraulic simulations considering a fully restored state (hydropeaking and bedload measures implemented). The habitability indicators can then be re-assessed and the synergy of implementing both mitigation measures simultaneously will be demonstrated: the improvement of the habitability will be superior if the bedload regime is also restored.