How to Build Digital Rivers to Benefit Real Ecosystems

Creating digital river terrains (Fig. 1) combined with hydrodynamic simulations and habitat analysis is a powerful but still novel approach for eco-hydro-geomorphic analysis at hypothetical study sites or those lacking high-resolution topo-bathymetry. Such approaches can be applied to many river engineering applications including setting ecologically protective instream flow requirements below dams and water diversion structures, sediment transport modeling, and flood inundation modeling. However, for more complex river geometry it remains challenging to generate synthetic river corridor terrains that sufficiently represent relevant morphological features.
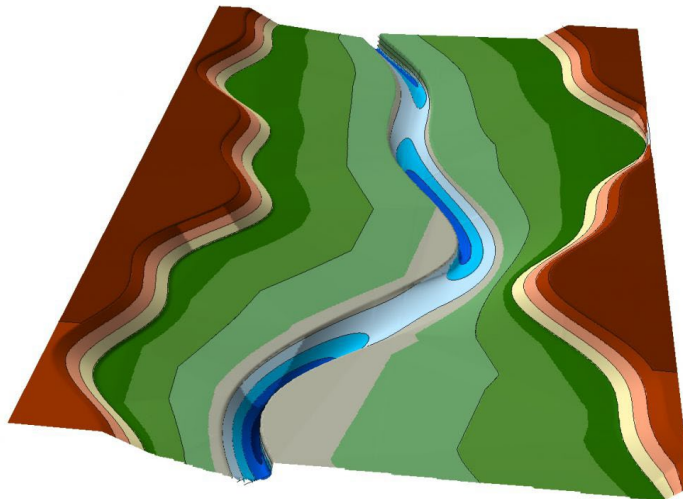

Fig. 1: Digital River terrain created with River Builder (source: G. Pasternak)

In a first step, the impact of nested sub-reach scale variability patterns (such as longitudinal channel bed elevation and width undulations) at different scales on river eco-hydraulics will be assessed. Second, an integrated topo-hydraulic-ecological study of river channel morphologies available from laboratory experiments will be carried out and compared with generated terrains to assess similarities and thus the potential of the new approach. To create the digital rivers the River Builder software will be used, while the BASEMENT software will be applied for 2D hydrodynamic modelling .

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Remarks: Research-oriented thesis, can only be distributed once;
Skills in numerical modelling and scripting with Python required;
External co-supervision by Prof. Belize Lane from Utah State University and
Utah Water Research Laboratory;
Thesis should be written in English