

Response of gravel-bed rivers to changing sediment supply



Scale model of the channel investigated
(Picture: A. Schlumpf, VAW)



River bed with point bar and scour in the second bend
(Picture: A. Schlumpf, VAW)

Many Swiss rivers are heavily affected by various river engineering measures and exhibit ecological deficits. Sediment input from upstream is limited by hydropower plants, sediment retention basins and other river training measures, resulting in a lack of bed load and morphological degradation. Therefore, nearly 500 hydropower plants and other constructions have to be remediated in Switzerland till 2030, based on the adapted Water Protection Act.

The cantons have to define the restoration objectives for the rivers and the type and extent of measures for the affected structures. One key parameter for bed load restoration is the „required total bed load“. This is the minimum mean annual bed load volume that is required so that an unconfined river can develop near-natural bed forms and associated habitats for different species. While numerous interactions between bed forms and bed load transport have been described in literature, there are no quantitative criteria to determine the required total bed load for practical application.

The VAW was commissioned by FOEN to conduct physical model investigations at a scale of 1:50 to investigate the response of gravel-bed rivers to changing sediment supply. The main goals are to investigate the influence of added sediment on bed forms and on the morphology and to find a relation between sediment input and deposition geometry, namely area, volume, and thickness.

As we are using a hybrid approach, numerical simulations were performed in parallel. The software BASEMENT was used to simulate the development of the river bed.

Keywords: bed load transport, river restoration, sediment replenishment, steady bars

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