# Analysis of the 2005 flood event in Switzerland

The flood event in August 2005 caused enormous damages over wide parts of Switzerland. In many streams the observed run-off, bedload and driftwood transport reached levels never observed before. After this event, the Swiss Federal Office for the Environment (BAFU) assigned an analysis to various research institutions including the VAW. The aim of this analysis is to learn from this event in order to find optimized solutions for future flood events and to prevent or reduce potential damage.

Particular assignments to the VAW cover the following:
- analysis of processes related to driftwood
- assessment of the effectiveness of river engineering measures related to the retention of bedload and driftwood, river widenings and block ramps in the case of extreme floods

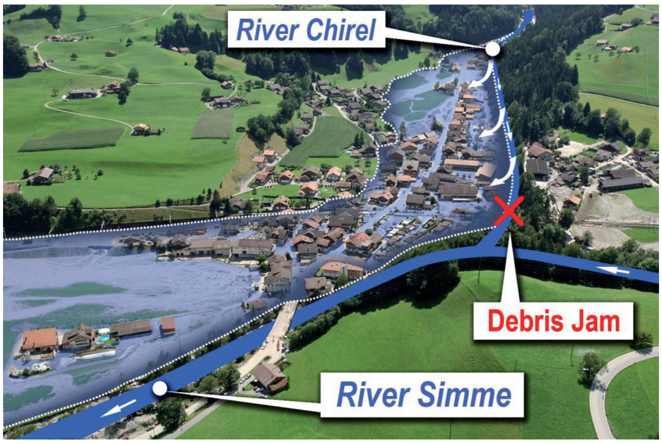


Fig. 1: Debris Jam at a bridge near the Chirel-Simme confluence during the 2005 flood event.

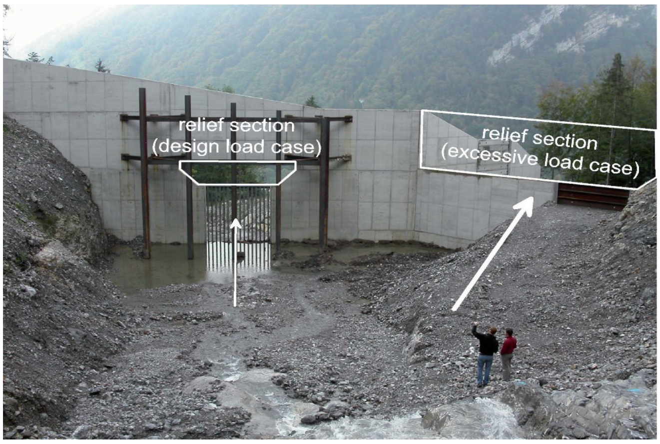


Fig. 2: Retention structure of the bedload retention basin at the Humligenbach. The design concept of this structure considers the excessive load case exemplary.

During the August 2005 flood event driftwood was mostly affecting mountain streams. Lateral erosion and slope failure represented the most dominant source of driftwood. Approximately 40 % of the investigated bridges were affected by driftwood debris jams. This led in several cases to flooding, lateral erosion, undermining and damages to buildings and infrastructure (Fig. 1).

It could be shown that most of the analyzed sediment and driftwood retention structures proved their functionality during the August 2005 event. However, in 10 out of 17 cases the design load was reached or exceeded. This shows that the inclusion of an excessive load case is crucial for the design of retention measures. A positive example is the retention basin at the Humligenbach (Fig. 2), were the material exceeding the design load has been diverted from the stream via a relief structure and deposited in an area of low risk potential.

River widening is an effective measure to enhance the ecological quality of a stream. Furthermore, it is hoped that these widenings can reduce vertical erosion and enhance the level of flood protection. While the ecological benefits of river widenings are beyond question, no clear trend can be observed for the bed morphology. Within most widened river sections, the bed level rose during the flood event of 2005, thereby stabilizing these river sections. In the upstream and downstream parts however, sections with aggradation as well as degradation could be observed. A comparison of measured and simulated bed levels, which has been part of this analysis, showed that 2-dimensional morphological simulations can be a good predictor of bed level changes, if an appropriate calibration is done.

The assessment of block ramps showed that ramps, which are not connected to a drop structure and feature an upstream buffer zone, do not suddenly collapse when the design discharge is exceeded. Rather, these detached ramps adjust to extreme discharges by gradually reducing their slope.

Keywords: flood, driftwood, bedload retention, driftwood retention, river widening, block ramp
Commissioned by: Federal Office for the Environment BAFU

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