

FLOODSEARCH I – Annular flume investigations of contaminated and remobilised sediments under flood conditions - combined hydrodynamic and ecotoxicological approaches to assess their erosion and environmental impact

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Introduction: Sediments in rivers are transported as bed load or as suspended load in the water head. Depending on the flow velocity sediments get eroded or settle down in slow flow sections of rivers, in reservoirs, and in harbor basins. Industrialized regions and reservoirs usually contain a great amount of old cohesive sediments being partly polluted with toxic agents. Thus, the deposited material becomes a potential danger for the environment due to their ability to bind contaminants. The behavior of such contaminated material during exceptional hydraulic events, such as severe floods, dredging, or reservoir draining, is of particular interest because the toxic parts of the eroded and newly suspended material can be dissolved again. As previously particle-bounded contaminants become bio-available again, the remobilization of sediments has a major impact on the aquatic biotope.

The complex interactions between contaminated sediments and aquatic organisms require an interdisciplinary approach. In the new joint research project FLOODSEARCH the disciplines hydraulic engineering and ecotoxicology combine their expertise to set up an innovative experimental apparatus to investigate the mentioned processes under laboratory conditions.

Methods: Experiments were performed in the annular flume (Fig. 1) at the Institute of Hydraulic Research and Water Resources Management (IWW), RWTH Aachen University. It consists of a circular channel with a top lid (inner diameter 3.0 m) and is particularly suitable for sediment research.



Figure 1: Annular Flume at IWW, RWTH Aachen University

The channel and the top lid may be rotated separately in opposite directions to achieve endless, uniform, manageable, natural-like flow conditions.

An artificial sediment was composed of sand (75%), kaolinite (20%) and peat (5%) according to the OECD guideline no. 218. Rainbow trouts (*Onchorhynchus mykiss*) (Fig. 2) have been exposed in the flume under instationary flood conditions. The research program consists of the following tests:

- Flood, sediments
- Flood, sediments, rainbow trouts
- Flood, sediments, contaminants
- Flood, sediments, contaminants, rainbow trouts

This test program was set-up to investigate systematically the influence of sediment-bound contaminants (stressor) under flood wave conditions on fishes in the context of a feasibility study.

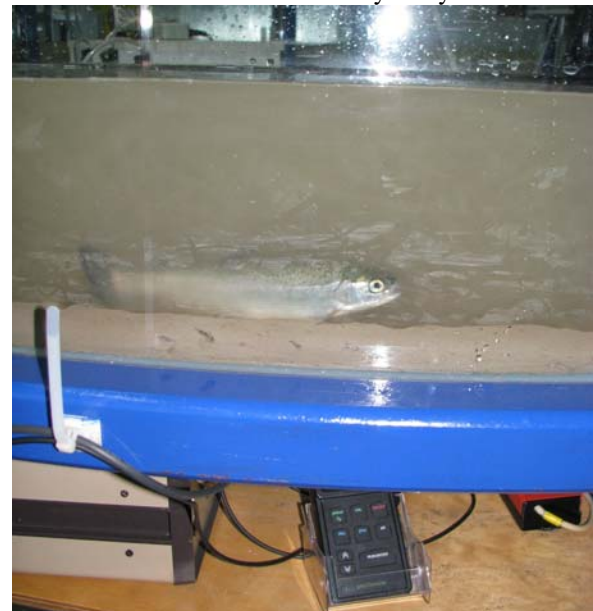


Figure 2: Rainbow trout in the annular flume at IWW

The analysis of the tests will yield more information on the effects of sediment-bound contaminants on the aquatic biotope. Current results of the analysis will be shown during the oral presentation.

References: Wölz et al. (2009) In search for the ecological and toxicological relevance of sediment re-mobilisation and transport during flood events. *J Soils Sediments*