

## Research Project

Methodologies to measure and characterise fine sediment input to alpine rivers and their effects on health and reproduction of gravel spawning brown trout (*Salmo trutta*)

### Third-party funded project

**Project title** Methodologies to measure and characterise fine sediment input to alpine rivers and their effects on health and reproduction of gravel spawning brown trout (*Salmo trutta*)

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**Organisation / Research unit**

Departement Umweltwissenschaften / Umweltgeowissenschaften (Alewell)

Departement Umweltwissenschaften / Aquatische Ökologie (Holm)

**Department**

**Project start** 01.09.2011

**Probable end** 31.08.2012

**Status** Completed

Alpine and sub-alpine rivers are threatened by global climate as well as by land use change which both can lead to increased erosion and hence sediment supply to rivers. Increasing fine sediment loads have been worldwide recognized as one potential threat to aquatic ecosystems health, including salmonid fish. Increasing fine sediment loads in Swiss rivers have been identified as one possible contributor to the considerable catch declines of native brown trout reported over the last decades. Effects of fine sediment particles on salmonid fish differ between developmental stages. Suspended fine sediment particles can directly impact free swimming fish, while fine sediment deposition in the gravel bed can affect embryo survival during the over winter incubation in the redd. Data on the effects of fine sediment deposition on brown trout embryo survival are necessary to assess the risk of increasing fine sediments on aquatic ecosystems. During the previous funding period (SNF K-32K1-120486/1) we I) established and/or applied methods to measure fine sediment (<2mm) transported as suspension and as bedload as well as fine sediment infiltration and accumulation in the riverbed, II) investigated in parallel the effects of fine sediment deposition on brown trout embryo survival, in a typical Swiss pre-alpine river and III) studied the effects of small sized mineral particles on juvenile salmonid fish in the laboratory. With this proposal we apply for funding to perform the final analyses needed to publish our results in international journals. The field part of our project will then provide detailed data of the hydrological and hydraulic dynamics as well as the fine sediment budget of a typical Swiss pre-alpine river. The publications from this project part will cover methodological aspects, real world investigations on the temporal and spatial dynamics of regional and local hydrological and fine sediment dynamics. In addition, a synthesis publication will explicitly link these investigations to brown trout embryo survival in artificial redds. Thereby, we provide detailed scientific contributions on fine sediment dynamics in small rivers and its effects on brown trout embryo development. The laboratory part of this project investigates the impact of small sized mineral particles (i.e. nm to  $\mu\text{m}$  range) on juvenile salmonid fish. These particles can cross the gill epithelium and can accumulate in inner organs of fish. Accordingly, we applied a broad body systems approach to contribute to a mechanistic understanding of mineral particle effects in salmonid fish on multiple organisational levels (i.e. whole fish, histopathology, physiology/haematology and biochemistry). These results will be complemented by the first analyses of gene-expression patterns in response to mineral particles to provide insight into the mechanisms that determine their effects in salmonid fish. The collaboration and the scientific expertise of the various disciplines involved in this project (Fish Ecology/Aquatic Ecology;

Environmental Geosciences and Applied & Environmental Geology; Hydrology and Hydrogeology) will contribute to several peer reviewed publications with authors from different disciplines.

**Keywords** Global change – agriculture - erosion – hydrology - sediment– salmonid – fish – reproduction – health - physiology– alpine region

**Financed by**

Swiss National Science Foundation (SNSF)

**Follow-up project of** [6230 Methodologies to measure and characterise fine sediment input to rivers and their effects on health and reproduction of gravel spawning brown trout \(Salmo trutta\)](#)

**Add publication**

**Add documents**

**Specify cooperation partners**

ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
2356670	Holm, Patricia	Schindler Wildhaber, Yael, Dr.	Eawag, Dübendorf, Switzerland	01.01.2013	31.12.2014
2356676	Holm, Patricia	Schmidt-Posthaus, Heike, Dr.	University of Bern, Switzer- land	01.01.2013	31.12.2014