

## **Anthropogenically induced fine sediment deposition in streams – a severe and widely underestimated threat to benthic invertebrate communities**

Sediment dynamics and composition in streams are key factors affecting stream habitat quality. Under natural conditions, the process of erosion and sedimentation creates a diversity of sediment patches in the stream bed that provide natural habitat diversity for the complex environmental needs of the biota. This sensitive balance can be disturbed by development activities in the watershed area such as agriculture, deforestation and forestry, as well as impacts of hydropower plants in the form of impoundments, reservoir flushing, hydropeaking or residual flow, which affect the quantity and quality of fine sediments and their transport and storage regime by altering the natural timing. The embedding and covering of coarse stony habitats with fine sediments not only impairs habitat structure, but also reduces oxygen concentration in the clogged hyporheic interstices and restricts the vertical connectivity. In addition, the nutritional value of periphyton in fine substrates is limited, especially when there is permanent fine sediment transport due to hydraulic stress, which further promotes macroinvertebrate drift. Consequently, these impacts result in a significant change in macroinvertebrate community structure in streams, manifested by an overall decline in species diversity and biomass, a dominance of tolerant taxa, and a decline in sensitive taxa such as Ephemeroptera, Plecoptera and Trichoptera, which in turn leads to shifts in the composition of functional feeding types. The anthropogenic deposition of fine sediments in stream beds has therefore become an increasing stress factor for rivers around the world, exacerbated by climate change phenomena like droughts or severe floods. Depending on geology and river-type, the critical grain-sizes causing these severe impacts on the biota range from fine silt and clay in lowland rivers to sand and fine gravel in mountainous streams. This inconspicuous but steady process poses a critical threat to biodiversity and masks serious ecological impairments, especially since national ecological status assessment methods compliant with the EU Water Framework Directive usually do not indicate the relevant consequences. The extent of fine sediment deposition and associated effects on the biota depend strongly on the hydro-morphological condition of a stream and its riparian environment. Organic structures in the riparian zone, such as roots, fallen wood or grasses, can offset the loss of diversity by providing alternative refugia for many species.

The presentation highlights different fine sediment sources and the corresponding processes in different rivers types and will provide recommendations for appropriate assessment methods and small-scale restoration measures in the form of anthropogenically initiated river type specific stable structural elements such as large stones or wood, which can serve to some extent as refugial habitats and lead to a significant improvement in macroinvertebrate diversity and composition.