Ecologically effective colmation by fine sediment input and its measurement

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Introduction: An essential ecosystem service of streams and rivers is the self-purification of biodegradable substances. These degradation processes take place through organisms and biofilms on and in the river bed, the hyporheic zone. This is the water-filled, pore-rich sediment gap system that serves microorganisms, small living organisms and fish as a habitat. Also for a successful implementation of the Water Framework Directive (WFD) the sediment bodies in the stream beds are of outstanding ecological importance.

Fine sediment inputs and colmation: For several years now, in connection with the monitoring of the WFD, a clogging of the gap systems of flowing water sediments with fine sediments has been detected in many European waters. The consequence is the loss of the ecological functionality of watercourses. The data from numerous research projects indicate that colmation massively degenerates the biocoenoses of flowing waters. It leads to the reduction of hyporheic water fluxes, the impoverishment of both macro- and meiofauna and to the loss of self-purification [1]. Colmation is mostly caused by the input of fine sediments from the catchment area, mainly from soil erosion (diffuse sources) and urban drainage (point sources).

Consequences for ecosystem services: The management of the implementation of the WFD is thus faced with a problem that has hardly been taken into account to date, namely that in many places the cost-intensive efforts to create a "good ecological state" are being cancelled out. The colmation processes caused by fine sediments are therefore of fundamental importance for the achievement of the Water Framework Directive (WFD) and for the ecosystem service of self-purification.

State of knowledge: The level of colmation is only known for very few running waters from isolated investigations. There are still few reliable findings on the ecological effects and influence of colmation on ecosystem services. Two major reasons for this knowledge gap are the complexity and the costs of existing quantitative methods to detect colmation. Simpler mapping methods do not provide quantitative results and lack of precision and reliability.

New measurement method: To solve this problem, the speakers developed a measuring device that determine the flowability of water sediments defining the degree of colmation - the Kolmameter®. This device allows for measuring the compaction of the bottom of water bodies by fine sediments.

Summary: The talk deals with the problem of the ecological effectiveness of fine sediment inputs and summarizes the results of a research project funded by the German Federal Foundation for the Environment (DBU) to test this mobile field device. The Kolmameter® was used in different types of water bodies in places with a noticeably significant degradation of the biocoenosis [2].

References:

[1] Zumbroich, Th., Hahn, H.J. (2018): Feinsedimenteinträge in Gewässer und deren Messung - Kolmation als bedeutsamer Faktor bei der Umsetzung der EG-WRRL, *Forum für Hydrologie und Wasserbewirtschaftung Heft 39.18, Dresden.*

[2] Zumbroich, Th. et al. : (2018): Labor- und Feldversuche an porösen Medien zur Interpretation von Kolmametermessungen, *Tagungsbericht 2017 der Deutschen Gesellschaft für Limnologie (DGL).*