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Floodplain vegetation controls on cohesive sediment transport: two-stage channel approach for improving water quality

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Two-stage (compound) channels consisting of a vegetated floodplain along the main channel have been proposed as an environmentally preferable alternative for drainage and flood management in small catchments. However, there is little knowledge on the potential of two-stage channels for net retention of suspended sediment and nutrients. The poster examines 1) how the properties of floodplain vegetation control the net erosion and deposition of particulate matter and 2) the potential of the two-stage approach for water quality improvements. A 3-year investigation was conducted in the cohesive Ritobäcken Brook (Sipoo, Finland) with a two-stage profile constructed in 2010.

We identified three key factors that influenced the net deposition and erosion of cohesive sediment on the floodplain. A multiple regression model was constructed to describe the effects of these factors under vegetative conditions ranging from almost bare soil to sparse willows and dense grasses. The identified factors (cross-sectional vegetative blockage, flow velocity within vegetation, and the distance from the sediment replenishment point) were expected to govern deposition in other relatively straight compound channels as well. Suspended sediment concentration was strongly correlated with total phosphorus concentration, and thus part of the transported phosphorus was likely retained on the floodplain.

This poster provides guidance on how floodplain vegetation can be maintained to improve water quality through controlling erosion and deposition. The results suggested that retention of particulate matter can be enhanced by cutting floodplain vegetation from short, regularly-spaced sub-reaches along the channel while maintaining high vegetation elsewhere. We believe that active vegetation maintenance offers further benefits for managing water quality. Consequently, our future studies at two-stage channel field sites and in the new indoor Environmental Hydraulics Flow Channel will be directed towards determining the potential in controlling the fate of nutrients in water courses.