Diagnosing problems of fine sediment delivery and transfer in a lowland catchment (Grabowski & Gurnell 2016) [1]

Fine sediment (here defined as fine sand, silt and clay) is a serious management problem in lowland rivers because of alterations to river channels, floodplains and the wider landscape. The multi-scale, complex and stochastic nature of sediment production, delivery and transport processes complicates the diagnosis of fine sediment sources, pathways and impacts. The hydromorphological assessment framework developed by the REFORM project offers a flexible approach to investigate fine sediment pressures. In this study, the framework was applied to a lowland river impacted by excess fine sediment (River Frome, Dorset, UK) to investigate likely sources and timing of sediment production, the segment-scale capacity of the river to transport sediment, and the reach-scale geomorphological response of the river.

Land use mapping and agricultural census records suggest that intensive cultivation of cereals and high livestock numbers during the second half of the twentieth century are the probable causes of fine sediment production and that a lack of any significant riparian buffer zone facilitates delivery of fine sediment to the river network. Sediment budget modelling indicates that transport capacities for gravel and sand are low along the river, which is supported by field observations of compacted gravel/sand beds covered with algae. Analysis of historical maps reveals that the river has responded to the increase in fine sediment over the last 40–50 years with channel narrowing and an increase in sinuosity, as fine sediment is trapped and stabilised by aquatic vegetation in the channel margins. Interactions between hydrodynamic forces, sediment supply and vegetation are driving progressive adjustment of the River Frome, and are the key to its holistic future management.

Keywords: Siltation, Fluvial geomorphology, Soil erosion, Hydromorphology, Channel change

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