

## **Long-term channel adjustment and geomorphic feature creation by vegetation in a lowland, low energy river**

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Physical habitat restoration is increasingly being used to improve the ecological status of rivers. This is particularly true for lowland streams which are perceived to lack sufficient energy to create new features or to flush out fine sediment derived from agricultural and urban sources. However, this study has found that even in low-energy, base-flow dominated chalk streams, physical habitat improvement can happen naturally without direct human intervention. Furthermore this positive change is achieved by components of the river that are often regarded as management problems: in-stream macrophytes (i.e. weed), riparian trees, woody debris, and most importantly fine sediment.

This project investigated the long-term changes in channel planform for the River Frome (Dorset, UK) over the last 120 years and the role of aquatic and riparian vegetation in driving this change. Agricultural census data, historical maps, recent aerial images and field observations were analysed within a process-based, hierarchical framework for hydromorphological assessment, developed in the EU FP7 REFORM project, to investigate the source and timing of fine sediment production in the catchment, to quantify the reach-scale geomorphic response, and to identify vegetation-related bedforms that could be responsible for the adjustment.

The analysis reveals that the channel has narrowed and become more sinuous in the last 50-60 years. The timing of this planform adjustment correlates with substantial changes in land use and agricultural practices (post-World War II) that are known to increase soil erosion and sediment connectivity. The field observations and recent aerial images suggest that the increased delivery of fine sediment to the channel has been translated into geomorphic adjustment and diversification through the interactions between vegetation, water flow and sediment. Emergent aquatic macrophytes are retaining fine sediment, leading to the development of submerged shelves that aggrade over time to form bars, berms and benches. This process drives the extension of the river bank into the channel, narrowing it and increasing sinuosity. In reaches with well-developed woody riparian vegetation, the geomorphic changes are more complex, with fine sediment being absorbed into a diverse mosaic of geomorphic features initiated by living trees and large wood. This study underlines the importance of vegetation for the geomorphic adjustment and diversification of lowland rivers and as a component of sustainable river management.