

## **Why did watermills not have a dramatic effect on the Anthropocene sediment record of the Zwalm River, Belgium?**

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Different studies demonstrated the dramatic effects of watermills on fluvial geomorphology in the Eastern US. Damming of floodplains and milldam lakes increased sediment deposition. Several authors attribute most of the so called post settlement legacy sediment to those milldam lakes. In Europe the role of milldams in the anthropogenic increased floodplain deposition rates during the last 1000 to 2000 years has gotten little attention until now. Therefore we studied the influence of watermills on Holocene floodplain deposition in the Zwalm catchment, Belgium.

The Zwalm River is located in western part of the Belgian loess belt in an undulating landscape that had intensive agriculture for most of the last 2000 years. In total 9 watermills were present along the 17 km long main channel during the 19th century, while many were also present on tributaries. Historical records date several of the mills to the 10th century AD, although they might be older, and most of them remain to some degree active today. The influence of watermills on floodplain deposits was tested through coring transects of the Holocene deposits. Detailed transects were performed pairwise upstream and downstream 5 watermills. Samples were taken for grain size analysis using laser diffraction. A possible influence on floodplain topography was tested on a 5 m resolution DTM.

Holocene floodplain architecture is similar to other floodplains in the region: a basal early to mid-Holocene peat and gyttja layer is covered by a fine grained sediment layer of more than 5 m thickness. The change between both can be attributed to increased soil erosion due to human land use, and can be considered to be the local legacy sediment. Comparison of transects upstream and downstream mills shows no significant difference in total Holocene or legacy sediment thickness. Texture analysis indicates that floodplain sediments are significant coarser downstream the mills. Floodplains are not significantly steeper around mills, and a step related to possible damming cannot be detected.

These results show that the influence of milldams on legacy sediment deposition in the Zwalm catchment is very limited. We argue that this is due to different human management of the floodplains and mills. Most studies in the eastern US demonstrate the influence of milldams, which dam a major part of the floodplain. In contrast, floodplains in the Zwalm are not dammed at mill sites, but mills are fed by a system of anthropogenic run channels or by re-alignment of the original channel. Dams are limited to the run or river channel. We conclude that for this catchment the legacy sediment is not related to milling practice, but can only be attributed to the supply of large amounts of sediment related to deforestation.