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Mobilisation and deposition of metal contaminated sediments in the River Swale, North Yorkshire, UK.

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The catchment of the River Swale, northeast UK, has been subject to metal mining for nearly 2,000 years which has led to intensive and extensive metal contamination of the terrestrial and fluvial environment. Contemporary overbank sediments deposited during three consecutive flood events were investigated to evaluate the degree of contamination transferred to the floodplain. Pb and Zn concentrations within overbank sediments exceeded 26,000 mg kg^{-1} and 3,700 mg kg^{-1} respectively. Many of the floodplain sites along the river were inundated with sediment which contained Pb concentrations that exceed DEFRA's Soil Guideline Values (SGVs) for domestic and allotment landuse. The highest peaks in metal concentrations are predominantly found within the upper 40 km of the catchment, with much reduced levels found in the lower reaches. The spatial variability in metal concentrations is consistent both between individual metals and the three flood events investigated. This suggests that the metals are derived from the same sources regardless of the magnitude of the flood event. The largest peaks in metal levels corresponded with inputs from tributaries that drain areas which contain the now redundant mines, smelting mills and waste tips. Smaller peaks in metal concentrations in the lower reaches of the catchment suggest some degree of remobilisation from secondary floodplain sources; indicating the transient storage of sediment-associated metals. The extremely high levels of sediment-associated metals deposited onto the floodplain have severe environmental implications in terms of the potential uptake by plants, ingestion by grazing cattle or remobilisation back into the water column. The identification of the sources of these metal contaminants is integral to determining appropriate management and remediation strategies.