THE IMPACT OF HISTORICAL METAL MINING ON THE RIVER SWALE CATCHMENT, NORTH YORKSHIRE, U.K.

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ABSTRACT

This investigation examines the impact of historical metal mining on the River Swale catchment, North Yorkshire, U.K. Approximately 550,000 tonnes of Pb were extracted from mines in the Swale catchment during the eighteenth and nineteenth centuries. Mining and processing operations were relatively inefficient, leading to the discharge of large quantities of metal-rich sediment into the fluvial system. The primary aim of this thesis is to assess the physical and chemical impacts of the discharge of metals from historical mining activities on the River Swale catchment as a whole. The dispersal, storage and transfer of metal-rich sediment in formerly mined tributaries, floodplain and flood sediments are evaluated, and the environmental consequences of mining are assessed.

A detailed geochemical survey of the River Swale catchment indicates that channel and floodplain sediments within formerly mined tributaries exhibit extremely high concentrations of Pb, Zn and Cd. Similar enrichment is observed in floodplain sediments from throughout the catchment, suggesting that large volumes of material have been transported from the tributaries and deposited on the Swale floodplain. Evidence from contemporary flood sediments suggests that considerable quantities of metal-rich sediment continue to be cycled through the system almost 100 years after the cessation of mining operations. Sediment budgeting suggests that 32,000 tonnes of Pb remain stored in formerly mined tributaries, with a further 123,000 tonnes stored in the Swale floodplain. Combined storage represents more than half of the total Pb that is likely to have been released during mining operations, suggesting that the impacts of metal mining are extremely long-lasting. Concentrations of Pb, Zn and Cd in tributary, floodplain and flood sediments greatly exceed current U.K. environmental quality guidelines and catchment-specific background values. Metal enrichment as a result of historical mining operations could therefore pose a serious and long-term threat to plant and animal health in the Swale catchment.

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