



Multiple-method approaches for quantifying fine sediment dynamics in river catchments over contemporary timescales

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Understanding the patterns and processes of contemporary fine sediment dynamics in river catchments constitutes a key research challenge for catchment scientists. Such knowledge has considerable value for the targeting of management resources to reduce excess fine sediment supply and its impacts on water resources and aquatic ecosystems. Many past studies tended to focus on a single compartment of the fine sediment cascade and utilised a limited range of research methods. For more holistic understanding, the use of multiple-method approaches is required to provide data on the sources, transfer, storage, and transit times of fine sediment in river catchments. Such approaches would allow scientists to better conceptualise catchment processes controlling the movement of fine sediment across a range of spatial scales. It may also enhance the scientific quality of catchment-scale studies through the acquisition of multiple lines of evidence concerning a particular research problem. The specific combination of fine sediment tracing and fingerprinting procedures with catchment sediment flux measurements and sediment budget modelling has considerable potential to enhance our knowledge of contemporary sediment dynamics. This combination of techniques offers complementary information and the opportunity to compare datasets, such as estimates of catchment sediment source contributions obtained using sediment tracers with direct measurements of sediment fluxes or catchment model outputs. This contribution explores the potential for such combinations of methods to yield distinctive insights not otherwise available from the use of only one of these techniques. It draws on published examples of multiple-method studies by the author from small agricultural and wildfire-affected forest catchments (1-2 km²) in south-east Australia and from larger agricultural river catchments (38-920 km²) in south-west England. It will also identify possible directions for catchment research based on multiple-method approaches to address future challenges for the research community interested in contemporary river catchment sediment dynamics.