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Sources of fine-grained sediment in a large regulated watershed in British Columbia using the sediment fingerprinting technique

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Sediment dynamics in most large river basins are influenced by a variety of different natural and anthropogenic pressures, and disentangling these cumulative effects remains a challenge. This study determined the contemporary sources of fine-grained (<63-μm) sediment in a large, regulated river basin and linked sources to activities in the basin. The river has seen declines in chinook salmon, sockeye salmon and the endangered Nechako white sturgeon populations, and sediment (both fine-grained and sands) has been identified as a potential cause of these declines.
Samples of suspended sediment and potential source materials were collected from numerous sites distributed throughout the upper Nechako River Basin in British Columbia, Canada. Discriminating fingerprint properties were used within the MixSIAR model to apportion sources amongst sub-basins and land use types. Results were compared to records of precipitation and Nechako River discharge trends, and to changes in landscape development.
Contributions from the erosion of channel banks dominated the suspended sediment load at most sites. Changes in sediment sources during the 2015 field season reflected snowmelt and patterns of water release from the Nechako Reservoir that affected the sediment carrying capacity of tributaries and the Nechako River main stem. Spatial variations in 2015 also reflected the distribution of land use (e.g., forested or agricultural land) as well as topography (e.g., slope steepness).
The sediment source fingerprinting technique, in combination with information on the hydrometeorology and the land use and river management in the basin, have provided valuable information with which to understand sediment dynamics in the Nechako River Basin. Such an approach can help to disentangle how large river systems respond to a combination of natural and anthropogenic pressures.