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Pathways of sediment-associated contaminant movement in a large watershed following a major mine spill.

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On 4 August 2014, the tailings storage facility at the Mount Polley gold-copper mine in British Columbia, Canada, failed releasing ∼25 M cubic meters of contaminated water, tailings and scoured overburden into the local watershed (∼11,500 km2), which is an important habitat for salmonids and other aquatic and terrestrial species. Most of this material was discharged into Quesnel Lake, one of the largest (262 km2) and deepest (>500 m) lakes in British Columbia. The Mount Polley Mine spill represents one of the worst mining disasters in Canadian history.

Immediately after the spill, profiles of the water column were obtained at several locations using a modified CTD. Results show that while the coarsest material was deposited on the bottom of the lake, the finest material (mean d50 of ∼1 μm) remained in suspension for several months and moved both up and down-lake due to seiching and overturn. A layer of this finer-grained sediment also settled to the lake bottom during ice cover during winter of 2015. Repeat CTD surveys have shown resuspension of the unconsolidated bottom sediment causing increased turbidity in the hypolimnion, several years after the spill. Year-round sampling of bulk suspended sediment discharged from the lake via Quesnel River has been undertaken since fall of 2014. In each of the years sampled (up to 2018) concentrations of Cu, exceeding national sediment quality guidelines for the protection of aquatic ecosystems, and other sediment-associated contaminants are discharged from the lake during periods of overturn. Sediment deposited on the bottom of the lake, post-spill, were collected using a Slo-Corer in 2016. Cores examined from the spill-exposed zone have a visibly unconsolidated surface and were determined to be highly contaminated with metals such as Cu and other metals. P. Continuing research efforts on the physical, chemical and biological effects of these sediment-associated metals will contribute to an assessment of the medium and long term impact of this spill on the aquatic ecosystem.