

# **SEDIMENT TRANSPORT OF ZINC IN A CONTAMINATED STREAM, TRAVELERS REST, SOUTH CAROLINA**

[PARSONS, Louise](#)<sup>1</sup>, SHAVER, Leslie<sup>2</sup>, ANDERSEN, C. Brannon<sup>2</sup>, and SARGENT, Kenneth A.<sup>2</sup>, (1) Dept. of Chemistry, Furman Univ, Greenville, SC 29613, [louise.parsons@furman.edu](mailto:louise.parsons@furman.edu), (2) Dept. of Earth and Environmental Science, Furman Univ, Greenville, SC 29613

The Upper Enoree River watershed in Greenville County, South Carolina has been contaminated with heavy metals. In 1985 a ruptured impoundment tank for spent hydrochloric acid associated with a galvanizing company began discharging zinc and other heavy metals in high concentrations into the watershed at the head of the Enoree River system. A previous study of the stream showed zinc concentrations as high as 15 mg/L, a concentration several orders of magnitude higher than in pristine surface waters. Natural attenuation occurred downstream, in part because of dilution by tributary streams. In this study, the natural attenuation of zinc by sorption and precipitation on sediment and subsequent transport is examined. The <63 micron size fraction of eight sediment samples downstream of the zinc source were analyzed by a modified Tessier sequential extraction method. The six extraction phases were cation exchange, carbonate bound, easily reducible, moderately reducible, organic bound, and the residual fraction. ICP-AES was used to determine the zinc concentrations in each extraction fraction. Overall, the easily reducible and moderately reducible fractions had the highest zinc. The reducible fractions are thought to be associated with iron and manganese hydroxides and oxyhydroxides. Zinc concentrations did not decrease smoothly downstream, which may reflect the addition of fresh sediment from tributary streams, bank collapse, or flood pulses. The concentrations in the analyzed sites were much higher than a sediment sample from a nearby uncontaminated stream that also drains schists and amphibolites. The total zinc concentration for the uncontaminated site was approximately 20% of the lowest amount of total zinc from any of the contaminated sites. In the uncontaminated site the greatest concentrations of zinc were found in the exchangeable, moderately reduced, and residual fractions. The results show that a significant amount of zinc is being transported downstream by sediment, and that precipitation or sorption processes naturally attenuate zinc. The zinc is most likely transported on iron hydroxide coatings of silt grains.

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