Spatial Variations in Trace Metal Concentrations in Stream and Reservoir Sediments Downstream of the Tri-State Mining District, USA[1]

Carlton A. Folz* and Robert W. Nairn[2]

Abstract: Nearly a century of historic lead-zinc mining ceased in the 1970s in the Tri-State Mining District, leaving behind a suite of environmental issues leading to the derelict mining district being home to several EPA Superfund sites. This study aimed to evaluate concentrations of trace metals (Pb, Zn, and Cd) in and downstream of the Tri-State Mining District in northeastern Oklahoma, southeastern Kansas, and southwestern Missouri. Two methods of evaluating spatial contamination of sediments were made: comparison to known sediment metrics and distance moving away from known contamination sources. Stream and reservoir sediment collection occurred in Tar Creek, the Neosho River, the Spring River, and Grand Lake O' the Cherokees[3]. The collected samples were analyzed using inductively coupled plasma-optical emission spectrophotometry for a suite of trace metal concentrations. There was a substantial decrease in the severity of trace metal concentrations moving downstream from the mining district and trace metal concentrations were compared to consensus-based and Tri-State Mining District-specific sediment quality guidelines. A significant decrease ($p<0.05$) in Cd, Pb, and Zn concentration occurred with increasing distance from the mining impaired areas. It was concluded that there were substantial areas of elevated contamination compared to sediment quality guidelines near sources of known mining impaired areas. However, the degree of contamination decreased downstream with increasing distance from the mining district. As trace metals are continually entering the streams and rivers, the degree of contamination may change, warranting further study and potential risk to humans and the environment.

Additional key words: mine drainage, tailings, chat, Tar Creek, Superfund.

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2. Carlton A. Folz, (*presenter), Graduate Research Assistant and Robert W. Nairn, Professor, Center for Restoration of Ecosystems and Watersheds, School of Civil Engineering and Environmental Science, the University of Oklahoma, Norman, OK, 73019.

3. General Study Location: 36°56'00N - 94°51'00"W.