

INVESTIGATION OF TIME TRENDS IN BIOAVAILABLE METALS IN THE TRI-STATE MINING DISTRICT THROUGH ANALYSES OF METALS CONCENTRATIONS IN TREE RINGS¹

W.J. Andrews² and R.W. Nairn³

Abstract: The Tri-state mining district of southwestern Missouri, southeastern Kansas, and northeastern Oklahoma was a major site for mining of sulfide ores of lead and zinc from the mid-1800s to the 1940s. During that period, an estimated 11.7 million tons of zinc and 2.9 million tons of lead were produced. The legacy of the mining is that more than 100 square miles of land in the district remains covered by mine tailings or contaminated by metals-laden dust blown off or washed off of accumulated materials. Relatively little environmental monitoring was conducted in the district until the late 1970s, when mine water started to seep to local streams from mine workings in the Oklahoma portion of the district and parts of the district subsequently were designated as Superfund sites. The hypothesis of this research is that as metals in mine tailings and soils in the district form oxide, hydroxide, sulfide, sulfate, and carbonate compounds, the metals will become progressively less bioavailable with time. To evaluate trends in metals bioavailability, cores of wood from 40 trees and adjacent soil samples were collected throughout the district. Current bioavailability of zinc, iron, cadmium, and lead were determined through Tessier extraction of soil samples and subsequent analyses of extracted metals by ICP-OES. Trends in bioavailability of those metals with time were estimated from Laser Ablation-ICP-MS analyses of 4.3-mm cores extracted from a variety of tree species at the 40 sites.

Additional Key Words: Dendrochemistry, bioavailability, mining, lead, zinc, cadmium

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²William J. Andrews, PhD Student, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK, 73019, e-mail: William.J.Andrews-1@ou.edu

³Robert W. Nairn, Associate Professor, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK, 73019, email: nairn@ou.edu