

# Evaluation of Risk Posed by Trace Metals in Soils of a Mining-Impacted Agricultural Watershed

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Abstract: The Elm Creek watershed, located in Ottawa County in northeastern Oklahoma, is situated to the west and south of the Tar Creek Superfund Site, part of the historic Tri-State Lead-Zinc Mining District. Trace metals contamination has been documented in Elm Creek. However, questions remain about broader impacts in the Elm Creek watershed. Elm Creek watershed properties purchased by the Grand River Dam Authority (GRDA), a public power provider, are designated to be used as offsite mitigation for fish and wildlife impacts under the Pensacola Dam hydropower license under the Federal Energy Regulatory Commission. Surface soil samples were taken from the site to evaluate lead, zinc, cadmium, and other metals concentrations to allow estimation of ecotoxic risk. Samples were obtained from Elm Creek stream terraces and upland environments. Moisture content, loss-on-ignition, and particle size for each sample were determined. Three metals analysis protocols were compared. A handheld field portable x-ray fluorescence (XRF) spectrometer was used *in-situ* for analysis of metals concentrations (USEPA Method 6200). Collected samples were homogenized and pulverized in the laboratory and re-tested using the field portable XRF. Samples were also analyzed for metals via microwave-assisted hot HNO<sub>3</sub> digestion (EPA 3051) followed by inductively coupled plasma-optical emission spectrometry (ICP-OES) analyses (EPA 6010). The results of this study will influence long-term land use in the watershed.

Additional Key Words: XRF, ICP-OES, wetlands development, bottomland hardwood forests

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