Finding the "Just Right" Tools for Environmental Geochemistry Research at the Tar Creek Superfund Site Ottawa County, OK

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Abstract

How do formal and informal land use changes have the potential to create unique, and potentially synergistic, risks to communities? Traditionally environmental geochemists privilege certain analytical approaches to evaluate the risk in a system, but when using a participatory approach, the emphasis is instead placed on using the "just right" tools co-discovered with members of the community. In this study we partnered with the LEAD Agency, an environmental advocacy group with a long history of co-designing research agendas to address community concerns to study trace legacy metals in floodplain soils at the Tar Creek Superfund Site in Ottawa County, Oklahoma. At Tar Creek, large mine waste (chat) piles and acid mine seepage have contaminated surrounding communities with zinc, lead, and cadmium. Heavy metal contamination of floodplains at mining sites like Tar Creek involve a complex set of biogeochemical interactions that are controlled by land use patterns (e.g. reworking chat piles and downstream dams), transport pathways, and changing climate making it difficult to prioritize interventions aimed at reducing exposure. Using a participatory research approach, this study integrates (1) community initiated geochemical investigation of wind transportable Pb, (2) monitoring of nutrient loading to assess potential for eutrophication, which would increase metal transport and mobility in Tar Creek, and (3) examines the connections between social and political issues at Tar Creek and how these affect both scientific research and what remediation strategies are tenable. Our action based research aims to support our community partners in their goals:(1) to establish the Rights of Tar Creek through LEAD's Clean Water Protection Ordinance, which would establish the right to clean water and legally recognize the rights of Tar Creek to exist, regenerate, and flourish, and (2) to expand the EPA's definition of OU5, which would increase funding for remediation in Ottawa County.

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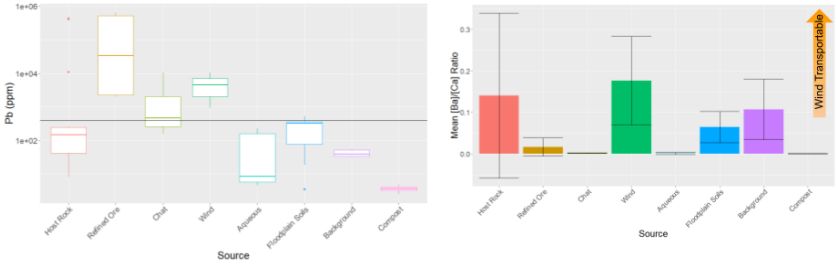
Case Study for Finding the “Just Right” Tool to Investigate Metals in the Floodplain, Ottawa County, OK



Broader Public Health Implications for Metals on the Floodplain (left) Lead Concentrations Across Sources with a horizontal line at 400 µg/g or the EPA action level for Pb in soils, (right) Mean [Ba]/[Ca] ratios to determine Aqueous vs Wind Transportable Lead in Tar Creek, OK.

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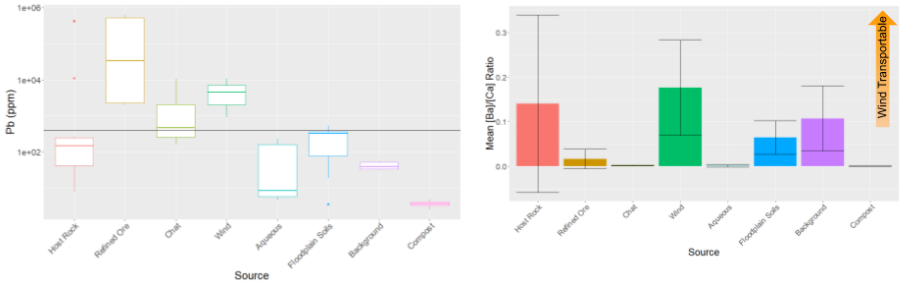

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Virtual Poster

Often environmental problems are "wicked" due to the complex ways different scientific disciplines (such as biology, chemistry, geology, and public health) interact with each other in the real world. While this presents a unique opportunity to do scientific research that reaches across traditional disciplinary boundaries, it also has the potential to allow researchers to default to traditional research methods and techniques. This approach typically emphasizes highly precise results, often at significant cost. By contrast, we propose that finding the "just right" analytical technique, rather than the highest precision or most costly, can be just as, if not more valuable to community members in making positive environmental change.