

Regional importance of organic-rich sediments to uranium mobility in the upper Colorado River Basin

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The long-term persistence of uranium (U) plumes in groundwater at legacy DOE former processing sites is a problem throughout the upper Colorado River Basin (CRB) [1]. Fine-grained, organic-rich, naturally-reduced sediment zones (NRZs) are relatively common in the uranium-contaminated floodplain at the Rifle, Colorado, DOE field research site. Many are sulfidic and substantially enriched in uranium [2]. NRZs are believed to be common sedimentary features of floodplains in the upper CRB, leading to the expectation that they are regionally important features of uranium-contaminated aquifers within this region. We hypothesize that NRZs are important to uranium mobility throughout the upper CRB.

We are addressing this central hypothesis by systematically characterizing NRZ and uranium occurrence in contaminated floodplains across and peripheral to the upper CRB. We are accomplishing this project by combining bulk U, S, and C chemical analyses of the sediments (XRF and TOC measurements) with U, Fe, and S edge X-ray absorption spectroscopy (XAS) to characterize speciation, and chemical analyses of the pore-waters. In the past year, we have investigated NRZs at Grand Junction, Naturita, and Rifle, CO, Riverton, WY, and Shiprock, NM. New sediments cores extracted from contaminated floodplains show the presence of U in NRZs, corroborating our initial hypothesis. Knowledge from this work will help to establish the role of organic-rich reduced sediments in controlling uranium mobility and plume persistence regionally within the upper CRB and will provide insights critical to understanding uranium-contaminated sites.

[1] Hazen T et al. (2011) Complexity of groundwater contaminants at DOE sites. (Lawrence Berkeley National Laboratory), p 58; [2] Qafoku NP et al. (2014) *Applied Geochemistry*, **42**, 77-85.