Characterizing Upper Colorado River Basin Sediments
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Background

More than 35 million people in the western United States depend on the Colorado River as a resource for drinking water, irrigation systems, and hydropower. Recent climate change reports predict average water levels within the Colorado River Basin will decrease throughout the next century. Decreased river flow may have major impacts within the subsurface that are two-fold: 1) decreased water flowing may result in greater issues of water quality due to accumulation and concentration of some elements within the subsurface, and 2) a lower water stage may significantly alter the redox cycling within the subsurface and affect major biogeochemical elemental cycles. Therefore, a greater understanding of current subsurface elemental distributions throughout the Upper Colorado River Basin is needed.

Methods

334 samples from five DOE-LM sites of the Upper Colorado River Basin were characterized by:

Homogenization → Elemental Analysis (EA) → X-Ray Fluorescence (XRF) → Water Extraction → Refractometer

UV-Vis Spectrophotometry → Discrete Analyzer (DA) → pH Meter → Filtration → Centrifuge

Results

Characteristics of the 334 samples were identified using the following methods:

- EA: C%, N%, C/N
- XRF: K, Ca, Mn, Co, U, Cu, V, S, P, Fe, Ni
- Refractometer: Salinity (psu)
- pH probe/meter: pH
- DA: NO₃⁻, NO₂⁻
- UV-Vis: N₂H₄

Conclusion

- Elements that show elevated peaks corresponding to uranium concentrations are: nitrogen, vanadium, iron, copper, nickel, sulfur, and phosphorus.
- Overall, the C:N ratio ranged from 0.7-1.4.
- Salinity values, excluding Rifle, ranged from 0-17 psu; Riverton having the highest salinity.
- Our samples had an average pH of 8.2, a maximum of 9.0 and a minimum of 6.7.

This study enhances greater knowledge of elemental distributions throughout the Upper Colorado River Basin, and may help DOE-LM develop regional and site-specific management strategies for future climate scenarios.

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