

Distribution and characteristics of uranium and rare earth elements in southeast Utah, USA

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Uranium is well studied in rocks, sediments, and water on the Colorado Plateau, physiographic province dominated by Mesozoic strata which covers a large area within the states of Colorado, New Mexico, Arizona, and Utah in the United States. Rare earth elements in the region are less understood. Several recent studies in southeast Utah indicated elevated concentrations of uranium and rare earth elements in surface water and sediments from generally ephemeral channels in the region. These channels flow into the San Juan River, an important water source in southeast Utah. Uranium concentrations in unfiltered waters collected during monsoonal rains range from 0.02 to 163 µg/L with the highest concentration from Comb Wash, Utah. Concentrations of individual rare earth elements in unfiltered water samples collected during monsoonal rains range from less than 1 µg/L to 46,500 µg/L. The highest concentrations were measured in Chinle Creek (Ce= 46,500 µg/L; La= 25,000 µg/L). Scanning electron microscopy analysis of sediments from southeast Utah indicate that rare earth elements in this region are associated with the mineral monazite ((Ce, La, Nd, Th)PO₄) and that uranium may be associated with iron oxides. There are two locations that may contribute to the observed rare earth element concentrations. The White Mesa mill, south of Blanding, Utah, primarily a uranium mill, has been used to process monazites and near the Avalanche Mine, northwest of Blanding, Utah, filtered water was identified with elevated Nd. The distribution and geochemical characteristics of uranium and rare earth elements found in southeast Utah will be presented.