Formation along the outcrop belt from Cachana Spring north to Cuba suggests that additional uranium deposits may exist at the boundaries of oxidized and unoxidized sandstone in the subsurface along the eastern margin of the San Juan basin.

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Application of Solution-Mineral Equilibrium Chemistry to Solution Mining of Uranium Ores

Modern methods of solution mining are typically accompanied by gains and losses of mass via reagent consumption by rock-forming minerals and subsequent clay-mineral formation. A systematic approach to alleviation of such problems involves the application of leach solutions which are in equilibrium with the host-rock minerals but in disequilibrium with the ore-forming minerals. This steady state can be achieved by solution composition adjustments within the systems K_2O-Al_2O_3-SiO_2-H_2O and Na_2O-Al_2O_3-SiO_2-H_2O. Uranium ores from the Grants mineral belt of New Mexico containing 0.15 to 1.0% U_3O_8 were collected for investigation. Small-scale (≤ 1 kg) column leaching experiments have been conducted to compare results of conventional leaching systematics with those obtained with solutions in equilibrium with the matrix minerals. Application of these principles will have considerable bearing on future in-situ leaching of uranium ores.

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Mount Taylor Uranium Deposit, San Mateo, New Mexico

The Mount Taylor uranium deposit is located at the extreme eastern end of the Ambrosia Lake district in the Grants mineral belt of New Mexico. Ores are confined to the Westwater Canyon Member of the Jurassic Morrison Formation and are spatially related to meanders in the paleochannels which deposited the arkosic sands of this member. The shape of the deposit roughly resembles the roll fronts of the Wyoming Tertiary basins.

This deposit resembles the deposits of the Wyoming basins chemically as well. Arsenic, selenium, molybdenum, and several other less commonly analyzed trace elements occur in zones across the orebody, parallel with the direction of dip and indicative of a redox cell.

Mineralogically, however, the Mount Taylor deposit differs significantly from those in the Wyoming basins and, surprisingly, from most of the other deposits in the Ambrosia Lake district. It does not reside at an iron redox interface nor is it very pyritiferous. It does have concentrations of calcite along its downdip and bottom edges. Montmorillonite, chlorite, and kaolinite show a regular zonation from the unaltered downdip sediments, through the ore zone, and into the updip altered sediments. No primary uranium-bearing minerals have been identified.

The deposit shows a complex relation to organic materials in the sediments, indicating two periods of organic enrichment of the sediments. The nature of this relation implies that organic transport mechanisms may have been as important in ore genesis as inorganic mechanisms.

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SEM Investigation of Paragenesis of Uranium Deposits, Grants Mineral Belt, New Mexico

Scanning electron microscopy (SEM) study of authigenic minerals in the Westwater Canyon Member of the Morrison Formation (Late Jurassic) indicates that mineral compositions vary within and adjacent to sandstone-type uranium deposits. Montmorillonite is the dominant clay mineral in the reduced ground downdip of the orebody; chlorite is enriched in the ore zones; and kaolinite and altered montmorillonite dominate in the "oxidized" ground updip of the ore. Our data also suggest that clay minerals, not pyrite or hematite, may locally be the iron-bearing species of importance.

Although it is not possible to make positive identification of organic materials in SEM photomicrographs, materials deduced to be organic in nature postdate the beginning of authigenic clay formation. This implies that these materials may be carriers of uranium in the groundwater system from which the ore deposits precipitated.

Identification of these patterns of clay-mineral alteration and the role that organic materials may play as transporting media may significantly alter our exploration techniques. These patterns may be especially useful tools in areas where the orebodies are known to be removed from the iron species redox interface.

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Geology of Eastern Smith Lake Ore Trend

The ore trend explored by Western Nuclear, Inc. at Smith Lake, lies in approximately six sections in T15N, R13W of McKinley County, New Mexico. All of the orebodies lie within the Brushy Basin Member of the Jurassic Morrison Formation which contains essentially three distinct sandstone units at this location. For exploration purposes this breakdown is adequate, although the sandstones do become exceedingly complex on a small scale.

The Smith Lake ore lies along the southern margin of the Chaco slope. The regional dip is quite uniform at about 2° north-northeast. North of the deposits running subparallel to the east-west ore trend is the Mariano Lake anticline. At the west end, the anticline dies out at the Pinedale monocline and does not extend to the Bluewater fault zone on the east. The Bluewater fault is a normal, high-angle fault, downthrown to the east, and essentially forms the eastern boundary of the area.