Wash Member of Morrison Formation (Upper Jurassic), Carrizo Mountains, Arizona and New Mexico

Uranium deposits in the Salt Wash Member of the Morrison Formation in the Carrizo Mountains area appear to be closely related to depositional facies. In the vicinity of the Eastside mines, southeastern Carrizo Mountains, the Salt Wash consists of a lower part, 10 to 15 m thick, and an upper part, 55 to 60 m thick. The lower part contains mudstone and silty sandstone interpreted as overbank and partially abandoned channel-fill deposits. It also contains a few large lenticular channel sandstones deposited by meandering and possibly braided streams. Uranium deposits are uncommon in the lower part.

The upper part of the Salt Wash contains a much greater percentage of braided-stream-deposited channel sandstones, many of which coalesce to form prominent continuous ledges. The finer grained low-energy deposits are very limited in extent, commonly being less than 200 m long, 20 m wide, and 2 m thick. They have a lenticular cross section and a scour base. They consist of interbedded mudstones, claystones, and sandstones and are interpreted as abandoned and partially abandoned channel fills. Subsequent scouring of these beds has resulted in clay-clast conglomerates which were incorporated as lag deposits in the bases of overlying channel sandstones. Detrital organic debris is uncommon but is present in some channel-lag deposits as well as in some of the bedded mudstones. Uranium deposits in the Carrizo Mountains area are associated with abandoned and partially abandoned channel fill and with clay-clast lag conglomerates adjacent to major channel sandstone systems in the upper part of the Salt Wash.

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Depositional Environment of Poison Canyon Sandstone in Gulf Mariano Lake Mine

A study of the depositional environment of the Poison Canyon Sandstone (Brushy Basin Member of the Upper Jurassic Morrison Formation) in the Mariano mine was undertaken to determine the relation of uranium occurrence to the depositional environment. An analysis of the sedimentary structures, paleocurrent measurements, isopach data, and electric-log shapes has led to the interpretation that the Poison Canyon Sandstone in the Mariano Lake mine vicinity is a sequence of bed-load deposits of a fluvial system. Paleocurrent measurements taken in the mine and at three outcrops of the Poison Canyon confirm findings from earlier work that indicated eastward current flow. The dominance of tabular cross-beds, channel scours, and trough cross-beds, the geometry of the Poison Canyon sandstones, and the chaotic sedimentary structures corroborate deposition in a braided-stream environment.

The Poison Canyon sandstones may be subdivided into two lithofacies. A cross-bedded unit is characterized by large-scale tabular cross-beds, scour surfaces, medium to coarse grain size, poor sorting, angular to subangular grains, an abundance of feldspar grains, and clay rip-up clasts. A second unit is dominated by laminar bedding, fine grain size, moderate sorting, subrounded grains, and an abundance of quartz. The source area for the sands had been dominated by plutonic rocks. These facies cannot be separated on the basis of electric-log shape. Uranium ore occurs in both facies but is more abundant in the cross-bedded unit.

The complexities of the braided-stream system greatly complicate any study of the interrelation of the uranium and the depositional environment. Obvious conclusions are that the grain size does not greatly influence the emplacement of the uranium, that the orebody at the Mariano mine is epigenetic, and that the sheetlike nature of the Poison Canyon sandstones suggests that the limiting factors on the ore boundaries are geochemical rather than stratigraphic.

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Effects of Uranium Mining on Groundwater in Ambrosia Lake Area, New Mexico

The principal ore-bearing zone in the Ambrosia Lake area of the Grants uranium district is the Westwater Canyon Member of the Morrison Formation of Jurasic age. This is also one of the major artesian aquifers in the region. Significant declines in the potentiometric head within the aquifer have been recorded, and digital modeling shows that declines may locally approach 3,000 ft (900 m) in the vicinity of a mine. Loss of potentiometric head in the Westwater Canyon Member has resulted in the interformational migration of groundwater along fault zones from overlying aquifers of Cretaceous age. This has resulted in local deterioration in chemical quality of the groundwater.

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Stratigraphic Control of Uranium Deposits

The restricted stratigraphic distribution of economic uranium deposits is one of their most consistent characteristics. Even the occurrence of uraniferous pegmatites in Saskatchewan and Ontario appears to have been stratigraphically controlled. Quartz-pebble conglomerate deposits are placers, but other deposits in sediments are chemical precipitates, characterized by thorium-free primary uranium minerals with vanadium and selenium. In marine sediments these minerals form low-grade, disseminated, widespread deposits that are obviously syngenetic. In terrestrial sediments, chiefly fluvial sandstones and associated vein deposits, the concentration of uranium varies widely, the high-grade portions constituting ore.

Genesis is important in deciding how rigorously to limit exploration to certain stratigraphic situations. Genetic processes can only be inferred, but if deposits in diverse situations are compared, then features held in common are likely to be critical and others incidental. Thus vein deposits in Saskatchewan and Australia have common structural, mineralogic, and stratigraphic features, but differ in their basement host rocks. Their mineral assemblages, lack of zoning, and association with fluvial sandstones are also common to the Colorado-