SEDIMENTOLOGY OF COAL-BEARING BEARPAW AND HORSESHOE CANYON FORMATIONS (UPPER CRETACEOUS), DRUMHELLER AREA, ALBERTA

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A detailed sedimentological analysis of the Bearpaw and Horseshoe Canyon Formations (Upper Cretaceous) has revealed that a 220 m thick coal-bearing sequence was deposited in marginal-marine, delta plain and fluvial environments.

The lower 40 m thick subsurface sequence, comprising the Bearpaw Formation, was deposited in offshore, shoreface, foreshore, lagoon, swamp and tidal channel environments. Barrier islands display a coarsening-upward sequence and represent a progradational system.

The lower 80 m thick strata of the Horseshoe Canyon Formation represent delta plain facies which were deposited in meandering channel, levee, bay, crevasse channel-crevasse splay and swamp environments. The upper 100 m thick strata of the Horseshoe Canyon Formation represent a fluvial succession which was deposited in environments of meandering channel, levee, floodbasin, crevasse channel-crevasse splay, oxbow lake and swamp. Markov chain analysis of the Horseshoe Canyon Formation suggests that sedimentation was cyclic.

Coal deposition occurred in three environments: (i) channel margin swamps, (ii) channel-fill swamps and (iii) back-barrier swamps. Channel margin is the most important depositional environment and coal swamps developed in inter-channel areas proximal or distal to the contemporaneous channel. Lateral variations in coal seam continuity and thickness were caused by crevasse splays and post-depositional channel erosion.