Turbidites in the Western Interior Cretaceous Seaway: The Known and the Possible

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For the last 25+ years, the only widely recognized turbidite deposits in the Western Interior Cretaceous Seaway (WICS) of the Utah-Wyoming foreland have been those of the Lewis Shale (Maastricthian) in the Great Divide, Washakie, and Sand Wash basins of south-central Wyoming and north-central Colorado. Lewis Shale deposits consist of a high diversity of non-reservoir, thin-bedded, very-fine grained sandstone, and mudrock facies in addition to fine-grained, high net-gross (>90%) reservoir sandstone facies associated with channel-lobe elements. Non-reservoir facies form the highly aggradational-progradational Lewis shelf-slope margin. Sediment-delivery mechanisms for these facies include (but are not limited to) waning-flow turbidity currents that yield classic Bouma sequences and flood-derived (hyperpycnal) waning-waxing density flows.

The non-reservoir facies of the Lewis shed light on the origins of older (Turonian-Campanian) offshore successions in the WICS, such as the Prairie Canyon Member (PCM) of the Mancos Shale and distal Ferron-Frontier deposits in the Uinta basin of Utah. Sandy mud-rich units in these successions are similar: fine-grained sandstone dominated by combined and current ripple lamination alternating with laminated and ungraded to graded mudrocks. These characteristics suggest similarity of sediment-delivery processes, modified by storms. In more sand-rich, yet low net-gross (<75%), portions of the older successions, fine-grained sandstone facies in-clude a preponderance of plane-parallel alternating with ripple lamination and also are commonly storm-modified. These more amalgamated facies range from 10 to 60 miles seaward of the nearest coeval delta fronts, much like Lewis reservoir facies. The lack of widespread Lewis-style, high net-gross, amalgamated sand-rich channel-lobe elements in the older units is likely a function of hinterland and delta-front paleogeography.