Depositional Environments and Stratigraphy of Valley- Fill Deposits in the Lower Cretaceous D Sandstone (Cenomanian), Denver Basin, Colorado

Steven M. Goolsby
Vecta Oil & Gas, Ltd., Lakewood, CO.

Valley-fill deposits constitute an important producing reservoir for the lower Cretaceous D Sandstone in the Denver Basin of Colorado. These deposits are typically one-half to a mile or more in width and tens of miles long in plan view. Barrier and shoreline-associated “marine bar” deposits are often located sub-perpendicular to these valley-fill deposits. The resulting depositional patterns led to early interpretations of fluvial or distributary channel depositional environments for the valleyfill deposits. Recent studies have demonstrated that the valleys are actually filled with complex estuarine facies. Abundant tidal and biogenic sedimentary structures that are not indicative of fluvial sedimentation can be identified in cores for this interval. Bay-head delta, proximal bay fill, distal bay fill, and estuary mouth facies can be identified in cores. Estuarine deposits in Kouchibouguac Bay, New Brunswick, Canada, serve as a modern analog to the D Sandstone valley-fill deposits. A depositional sequence in which low-relief valley topography was back-filled during an overall marine transgression is proposed for the D Sandstone “channel” system. Within the overall transgression, back-stepping due to lower-order sea level fluctuations resulted in complex stacking patterns in the valley fill, often juxtaposing proximal bay-head and distal bay-mouth deposits next to each other. For example, proximal classtic-rich bay head delta deposits may be stacked over outer bay-mouth bioturbated shale-rich deposits locally. The complex stratigraphy that results from this stacking pattern adds considerable risk to oil and gas exploration for the D Sandstone valley-fill reservoirs.