Predicting Heterogeneity in Meandering River Deposits: The Point Bar to Counter Point Bar Transition

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Point bar deposits comprise significant reservoirs globally, with facies models providing a framework within which to predict both pathways and barriers to fluid flow in the subsurface. Through analysis of modern, and ancient seismically imaged river systems, significant downstream fining around individual point bars is documented. In the examples studied, this fining is associated with the transition from point bar to counter point bar. Morphologically, this transition is delineated across an inflection point that separates convex downstream scroll bars (point bars) to concave downstream scroll bars (counter point bars).

Based on cores from six point bar-counter point bar transects, the downstream shift in grain size is quantified. Two point bars were analyzed on the modern Peace River in northern Alberta. Where studied, the average width of the river is 500 m, with an average decrease in net:gross of 77% (0.88 to 0.11) recorded along 890 to 2785 m long segments of the river. Three tidally influenced fluvial point bars from southwestern Washington State were also included in the study. River widths averaged 180 m and net:gross decreased 42% (0.88 to 0.46) over 600 m. Subsurface reservoir strata imaged seismically and penetrated by dozens of drill cores from the Cretaceous McMurray Formation of Alberta was also assessed. The channel width in the system is 400-600 m and the shift from point bar to counter point bar corresponds to a decrease in net:gross of 61% (0.98 to 0.37). This facies shift would have an impact on hydrocarbon recovery from portions of the reservoir. Based on the dataset collected, the shift from sand-dominant to silt-dominant facies along the point bar to counter point bar transition is predictable. It likely impacts numerous reservoirs and should be more frequently considered in the application of fluvial facies models to development strategies.