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Accreting complexity onto the simple point bar: The legacy of Derald Smith

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Classically and conceptually, point bars are lobate side-attached sandy accumulations that grow along an accreting bar surface. This model argues for a somewhat uniform reservoir with convex continuous accretion surfaces binding sandy traction-load deposits. This model has a long history of service to reservoir modeling and indeed occurs in both modern and ancient examples. This model is not unique, however, and may not even prove the norm. At least three additional models may define point-bar growth and architecture that are mapped in the work of Derald Smith. Smith defines and maps counter point bars in both modern and ancient settings. Counter-point-bar accretion occurs by forced decoupling of the cut-bank flow shear and accretion along the cut-bank face. This produces concave accretion surfaces in strata typically much muddier and more heterogeneous than classic convex-accretion bars. Abundant muddy strata in the bars may inhibit internal flow of fluids and hamper reservoir drainage. In addition, point bars may grow producing relatively continuous and convex internally truncated accretion surfaces that bind lithologies comparably heterogeneous to those observed in counter point bars. Fragmentary bar accretion results from high-frequency deposition of small unit bars over only limited areas of the wetted bar surface, commonly followed by dissection and erosional reshaping of the bar surface with local draping. This results in a bar deposit formed of highly fragmented reservoir units lacking through-going accretion sets and prone to unpredictable heterogeneity. Smith mapped each of these three bar accretion processes in the Cretaceous Belly River Group of Dinosaur Provincial Park. This range of bar-formation processes adds to a growing range of possible reservoir architectures for modern and ancient point bars and yields a wider range of explanations for flow processes than the original simple lateral accretion models.