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Large, Prograding Fluvial Megafan Complexes: Influence of Climate Cyclicity on Reservoir Architecture

Ephemeral streams are typical of arid to semi-arid climates where climate fluctuation affecting lake-level, discharge, and sediment supply can significantly effect the morphology of the resultant fluvial architecture.

Downstream-accreting bars are the principal building blocks of braided ephemeral rivers and stack compensationally. Bars are confined within channels of varying widths and sinuosities. Channel geometry changes away from the sediment source terrain as discharge decreases due to transmission losses. In ancient systems, the channels are very broad proximally, containing bars forming overlapping sheets of sandstone. Farther downdip, channels are narrower, more separated, containing bars forming more isolated sandstone bodies. At the terminal end of the system, channels are narrow and isolated, dying out onto the floodplain or feeding into lakes where they form thin terminal splays. Lowstand delta reservoirs are generally absent.

The Salt Wash Member of the Upper Jurassic Morrison Formation (Utah and Colorado) is a suitable outcrop analog for many moderate to low net-to-gross ephemeral braided reservoirs. The Salt Wash is the deposit of an areally extensive prograding fluvial megafan, comprised of prograding, basinward bifurcating upward-coarsening lobes of sandstone up to 60 ft thick. These lobes are interpreted as climatically driven lowstand deposits. They are underlain by regional erosional surfaces (sequence boundaries) and rest in many places on lacustrine and palustrine deposits. In these ephemeral fluvial successions, sandstone-prone lowstands alternate with muddier floodplain deposits of the transgressive and highstand systems tracts. Basinward-directed shingling patterns are common at several scales in the lobes, representing progradation of the fluvial systems.