Fluvial Architecture the Morrison Formation, Bullfrog Area, Utah, USA*

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Abstract

A 60 km cliff exposure along the edge of the Waterpocket fold in the Bullfrog area of central Utah provides an exceptional view of the fluvial architecture within the Morrison Formation. A photomosaic spanning 45 km of the Tidwell and Salt Wash Members shot from a helicopter provides a continuous strike cross section, five sedimentologic logs through this interval record vertical facies trends, and more detailed mapping of channel belt internal bedding and facies variations along more accessible side canyon exposures and across extensive bedding planes adjunct to the main cliff document vertical and lateral changes in fluvial depositional style. The 170-220 m thick Tidwell – Salt Wash interval can be divided into two successions defined by upward increases in channel belt proportion and mean channel belt thickness and grain size. Lower within a succession channel belts are thin and narrow (4-6 m thick and 100m to few 100m wide), and internal beds show little evidence for lateral channel migration. Higher within a succession the channel belts are larger (5-15 m thick and 100m to km wide), and they are commonly amalgamated. Individual storeys thicken from horizontally bedded cross-stratified sandstone near its initiation margin to thicker deposits with steeper (15 degrees) downstream dipping beds toward their downstream ends. The channel abandonment fills are generally only slightly finer grained cross-stratified sandstone. Both major successions are capped by a ten-meter thick interval in which channel belts are dominated by gravel (in contrast to the dominantly sandy channel belts lower within each succession). Although both major successions can be easily traced across the 10 km study area, the lower one in particular exhibits some lateral fining (perhaps showing increasing lateral distance from the depositional axis). Superimposed on the two regional successions are smaller-scale fluvial complexes defined by clusters of connected channel belts separated by intervals with abundant overbank deposits. These smaller scale complexes are not gravel capped and can be traced laterally over only km to 10 km before they lose distinct definition. The larger successions are interpreted to record regional progradational units, whereas the smaller complexes probably reflect the influenced of more localized channel belt avulsion patterns.