SEASONAL VARIATIONS IN THE MORPHOLOGY AND SEDIMENTOLOGY OF A POINT BAR ON THE BRAZOS RIVER OF CENTRAL TEXAS

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ABSTRACT

A point bar at Boxley Bend on the Brazos River was examined over an extended period of time in order to determine the various processes that control its morphology and the products of sedimentation during flood and non-flood periods.

The study began in the summer of 1985, following a prolonged period of low discharge and water level (2.1 to 3.4 feet) in the Brazos River. At this time, the point bar exhibited a morphology that was characterized by lower and upper tiers that were separated at the upstream and downstream ends by a high-sloping scarp and linked in the mid-stream portion by a gently-dipping ramp. The stratigraphic sequence that was exposed in trenches in the lower tier consisted of (from base to surface): a) massive to poorly-bedded graveliferous sand; b) graded co-sets of trough cross-bedded fine-medium sand, ripple-laminated fine sand, and wavy-bedded mud; and c) a surficial mud drape with mud cracks, algal mats, and animal traces. The stratigraphic sequence exposed in trenches in the upper tier consisted of: a) high-angle (up to 15 degrees) foresets of fine sand; b) horizontally-laminated sand and mud; and c) massive to ripple-laminated wind-blown sand and deflation lag at the surface.

In late November and December of 1985, the Brazos River flooded and its water level reached a maximum of 28 feet. When the waters receded, the two-tier morphology was completely buried beneath a series of transverse bars with crest heights up to 6 feet, crest wavelengths up to 50 feet, and large scour pools at the toe of the lee side. Trenches showed the surface of the point bar had not been eroded to any great extend, but had instead been overlain by the sediments of the transverse bars. Trenches through the transverse bars revealed high-angle foresets of fine sand that were greater than 5 feet thick and which were interbedded with backflow-ripped sand and wavy-bedded mud that were deposited at the toe of the foresets in the scour pools.

From January to April of 1986, the transverse bars were partially to completely eroded by a series of lower-level floods and constant wind action, and the two-tier morphology re-emerged. The lower-level floods completely eroded the sand of the transverse bars from the lower tier and deposited ripple-laminated sand with a mud drape in its place; these lower-level floods also eroded laterally into the transverse bars, thus re-forming the scarp that separates the lower and upper tier. The surface of the upper tier was leveled by wind erosion of the crests of the transverse bars and deposition of wind-blown sand within scour pools. However, remnants of the crests of the transverse bars were still exposed in some places.

The dynamic nature of point bars and the cyclic movement of sediment in a river channel are clearly reflected in the seasonal variations in the morphology and sedimentology of the Boxley Bend point bar. This point bar appears to be the product of a series of depositional and erosional events that vary seasonally in intensity and duration. In this case, we have observed that rare, short-lived, high-discharge events result in the transport of sand from the channel to the point bar, and the instantaneous deposition of massive amounts of sediment in the form of transverse bars. More common lower-discharge events result in the vertical and lateral erosion of the transverse bars which gradually re-establishes the low-discharge morphology of the point bar. Constant eolian action on the unvegetated upper surface of the transverse bars slowly results in the erosion of the transverse bars, the deposition of sand in the scour pools, the return of some sand to the channel, and the ultimate plantation of the upper surface of the point bar and its return to its low-discharge configuration.

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