# Origin and Sedimentology of Sand Bars in Grand Canyon

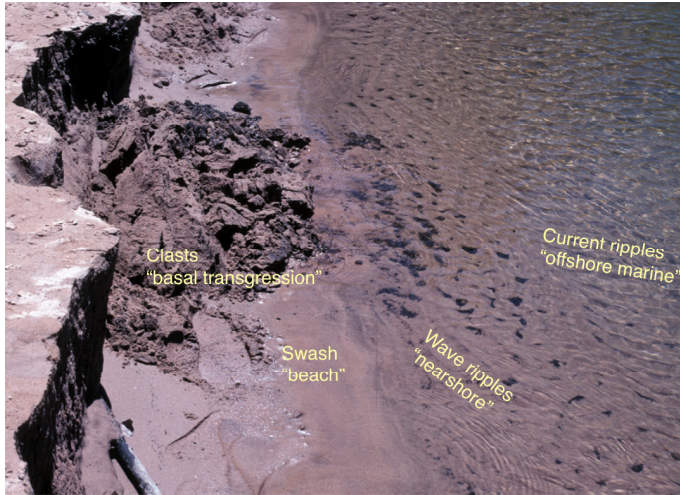David M. Rubin, US Geological Survey, Santa Cruz, CA 95060

Much of the depositional history of Grand Canyon sand bars is preserved by sedimentary structures within the bars; knowing how to interpret these structures reveals that history. This talk reviews fundamental principles of sedimentology specifically directed at how to recognize and interpret most common types of sediment deposited on Grand Canyon sand bars: ripples deposited by river currents, water waves, eddy pulsations, and wind; beach wave swash; deposition during floods; and daily cycles deposited by changes in discharge. Many of these structures will be illustrated using illustrations, computer models, and animations that are also available online (http://walrus.wr.usgs.gov/seds/bedforms/index.html). A few examples are shown below.
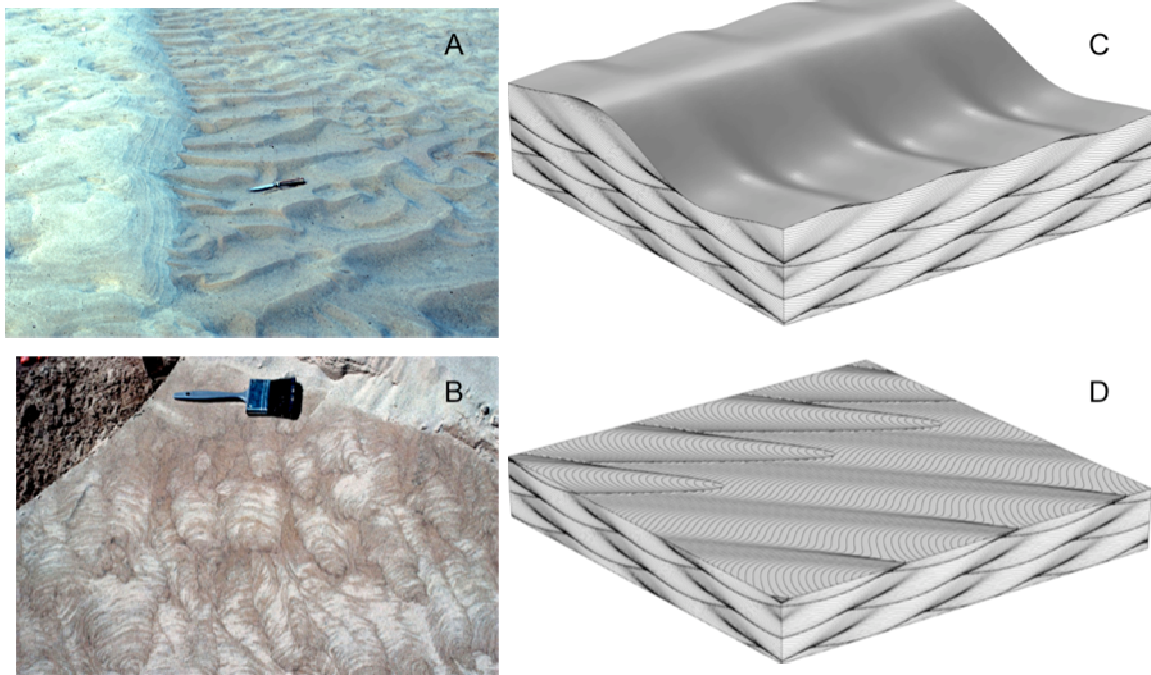
Rubin and Carter, 2006, *Cross-Bedding and Bedforms in Animation, SEPM Atlas Series.*

Figure 1. Structures formed by intersecting underwater ripples and dunes migrating across the surface of a Grand Canyon sand bar. (A) Bar surface with dune and ripples formed underwater. (B) Sedimentary structures observed by troweling into bar surface. (C) Computer model of A, but shown at different orientation. (D) Internal structure of C (resembles B).
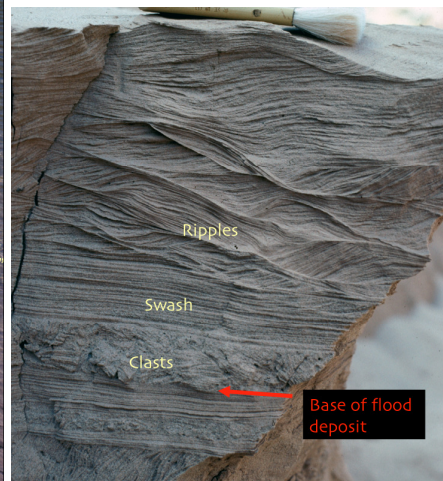
Figure 2. Common sedimentologic and geomorphologic features on sand bars. (A) Bar surface showing (from left to right): beach scarp, sand clasts formed by waves undercutting scarp, beach swash formed by water waves, wave ripples, and current ripples. (B) Cross section through deposits of 1993 natural flood on Little Colorado River, showing sedimentary structures deposited by surface features in A: sand clasts, beach-swash layers, and cross-laimination deposited by ripples.
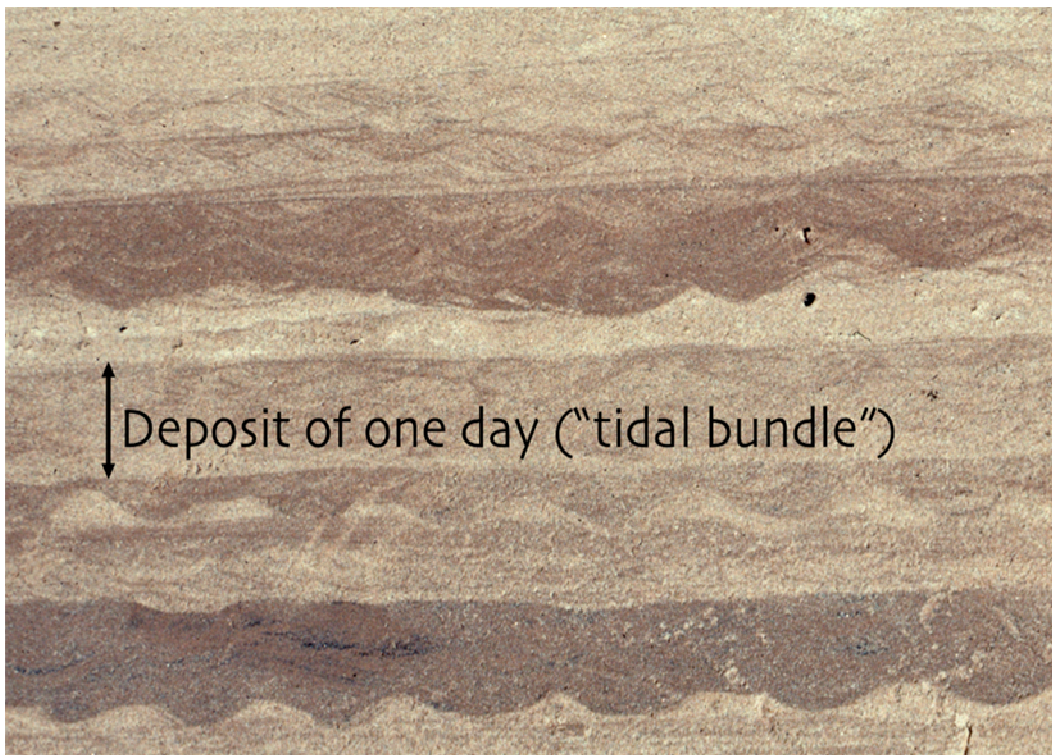

Figure 3. Cross section through cyclic stratification produced by alternations of beach swash (flat layers) and wave ripples (wavy layers). Each pair of structures is the result of one day's rise and fall in river discharge.