



## Lowstand Deltas and Incised Valleys of the Tannehill Sandstone (Cisco Group) of the Southern Eastern Shelf of the Permian Basin, West Texas

Tucker F. Hentz and William A. Ambrose

Bureau of Economic Geology, University of Texas at Austin,  
University Station, Box X, Austin, Texas 78713

### ABSTRACT

Depositional cycles of Permo-Pennsylvanian (Virgilian and Wolfcampian) Cisco Group strata of the Eastern Shelf of the Permian Basin are dominantly transgressive limestones interstratified with highstand fluvial-deltaic and lowstand incised-valley-fill sandstones and mudrocks. Alternating, thickened transgressive shelf-edge limestone systems and lowstand shelf-edge deltaic deposits, equivalent to valley-fill systems, were deposited along the margin of the deepening basin. This study focuses on the lower Wolfcampian Tannehill sandstone as an example of the areal and shelf-to-basin stratigraphic expression of one of these valley-fill/lowstand delta systems.

The Tannehill sandstone occurs in two areal configurations in Nolan, Taylor, Coke, and Runnels counties: (1) narrow, slightly curvilinear belts that extend southwestward and east-west across this study area and (2) local, digitate depositional trends. The first configuration represents lowstand valley-fill systems that locally incise the Saddle Creek Limestone. These facies are 20-50 ft (6-15 m) thick, have blocky to upward fining wireline-log responses characterized by consistently low resistivity values, high spontaneous potential (SP), and low gamma ray (GR) values, and are restricted to on-shelf areas. Downdip equivalents of these sandstones with digitate areal configurations are marked by similar well-log values but in contrast are 60-100 ft (18-30 m) thick and have upward-coarsening, blocky, and digitate wireline-log responses. Moreover, they partially overlap and extend 8-12 mi (13-19 km) basinward of the Saddle Creek shelf edge and record deposition of lowstand shelf-edge deltas fed by incised-valley systems. Digitate areal facies were also deposited in the on-shelf area, are primarily upward coarsening, and represent thinner (10-30 ft [3-9 m] thick)

highstand deltas. Incised-valley-fill, lowstand-delta, and highstand-delta sandstone facies are significant hydrocarbon producers in the Eastern Shelf.

Mapping of shelf-edge lowstand deltas of the Tannehill and other Cisco Group sandstones record an aspect of the shelf-edge evolution of the Eastern Shelf. These deltas formed depositional platforms over which the next younger limestone (in this case, the Stockwether Limestone) transgressed across the shelf. As a result, the western (basinward) limit of the lowstand-delta platforms marks the shelf edge of these overlying limestones.

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