

ABSTRACT

UPPER STRAWN AND CANYON (PENNSYLVANIAN)
DEPOSITIONAL SYSTEMS, SURFACE AND
SUBSURFACE, NORTH-CENTRAL TEXAS

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Terrigenous clastic and carbonate facies involving the upper half of the Strawn Group and the complete Canyon Group were deposited within the Fort Worth Foreland Basin and on the adjacent Concho Platform of North-Central Texas. Twelve cycles of deltaic progradation and marine transgression have been identified employing data obtained from 4,100 wells and 75 measured sections. For the Strawn, subsurface isolith maps indicate the presence of four deltaic depocenters, two carbonate banks, one carbonate platform, and an embayment-strandplain complex. Higher, with the Canyon Group, there are two deltaic depocenters, two carbonate banks, a carbonate platform, and a shelf edge-slope depositional system. Variations in the rate of subsidence for the foreland basin, Knox-Baylor Trough, Concho Platform, and the Red River Uplift, as well as the initiation of subsidence to form the Midland Basin, determined the lateral distribution and lithofacies geometry for individual depositional systems.

When rapid tectonic subsidence ended in the central part of the Fort Worth Basin during the Middle Desmoinesian, Strawn deltas prograded across the filled basin and out onto the stable, gradually subsiding Concho Platform. Major deltaic facies laid down on the platform comprise thin (minimum sandstone isolith thickness per genetic interval less than 140 feet), multilateral, lobate and elongate high-constructural systems. For the lowest two cycles of deltation, progradation reached to the western margin of the platform. Carbonate bank deposition of the Anson System subsequently became established on the distal ends of these oldest deltaic sandstone units; deltaic progradation was less extensive for later Desmoinesian cycles. A strandplain-embayment system composed of mudflats, chenier sandstone bodies, and thin, bayhead deltas developed between the Eastland and Perrin deltaic depocenters on the platform. With Missourian Canyon deposition, the Perrin Delta System comprised the major cratonic depocenter for coarse-grained terrigenous clastic rocks and sedimentation in the Eastland System terminated.

During the Desmoinesian Epoch the Midland Basin was a poorly defined, gradually deepening depression beyond the western limb of the Concho Platform. No true Desmoinesian shelf-edge or slope systems have been identified in this area. With the beginning of the Missourian, evidence from the two highest Strawn depositional cycles suggests the inception of Knox Slope System in the Knox-Baylor Trough (northwestern border of the platform). Further to the south, accelerated subsidence in the Midland Basin brought about the formation of a distinct hinge line along which the vertical accretion of an outer Palo Pinto-Winchell-Home Creek Carbonate Bank occurred. Roughly thirty miles updip along the same trend, a second, interior carbonate bank first appeared with Palo Pinto deposition and persisted to the end of the Missourian Epoch. Gradual subsidence of fault blocks associated with the Red River Uplift provided a stable setting where shallow water platform carbonates accumulated through all of the Middle and Late Pennsylvanian.

High-constructional delta systems attributable to the Dobbs Valley (Cycle 2) and Brazos River (Cycle 4) Strawn intervals involve accumulations in excess of 200 feet net sandstone per unit in the Haskell depocenter of the Knox-Baylor Trough and in the Bowie depocenter of the northwestern rim of the Fort Worth Basin. These thicker deltaic complexes contain linear, multistoried sandstone bodies whose geometries resemble barfinger sand of the modern Mississippi delta. Sedimentation in the Haskell Delta ended with Strawn Cycle 4, but Bowie deltaic and fan-deltaic deposition is seen in all of the Upper Strawn and Canyon cycles.

Distal deltaic facies of the Henrietta Fan Delta first appear in northeastern Clay County beginning with Strawn Cycle 5 near the end of the Desmoinesian. Extensive southwesterly progradation of this highly conglomeratic fan delta system is noted with the three upper cycles of the Canyon Group. The arkosic Henrietta Fan Delta, along with the Bowie and Haskell delta systems received its sediment from the Wichita and Arbuckle Mountains of Oklahoma. The Ouachita Fold Belt supplied the chert-rich detritus for the Eastland and Perrin systems of the Concho Platform.