Four distinctly different vertical and lateral progressions of facies are evident in the Marble Falls Group. This progression lends itself to recognition of 4 depositional phases.

The vertical sequence for each phase results from lateral shifts of 1 or 2 facies tracts that are unique to each phase. As a consequence each phase can be described by means of 1 or 2 generalized facies models.

In places where porosity is fabric-selective, the models should allow prediction of reservoir geometry. They also may be useful in predicting target directions, and in locating the updip limits of potential stratigraphic traps.

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DEPOSITIONAL SYSTEMS IN WOODBINE FORMATION (UPPER CRETACEOUS), NORTHEAST TEXAS

The Woodbine Formation is composed largely of terrigenous sediment eroded from Paleozoic sedimentary and weakly metamorphosed sedimentary rocks of the Ouachita Mountains in southern Oklahoma and Arkansas, and subsequently deposited in a complex of nearshore environments along the margins of the broadly subsiding Northeast Texas basin. Three principal depositional systems are recognized in Woodbine rocks—a fluvial system, a high-destructive delta system, and a shelf-strandplain system. Their recognition is based on a regional outcrop and subsurface investigation in which external geometry of framework sandstone was integrated with lithology, sedimentary structures, fossil distribution, and bounding relations.

Two components of the fluvial system, a tributary channel sandstone facies and a meander belt sandstone facies, are developed in the Dexter Member (lower Woodbine) northeast of a line from Dallas to Tyler. On the south and southwest, a high-destructive delta system is persistent throughout the entire Woodbine section. The 3 component facies of the delta system are: progradational channel-mouth bar sands; coastal barrier sands, deposited along shore adjacent to the channel mouth; and prodelta-shelf muds. The Lewisville (upper Woodbine) shelf-strandplain system, developed in the northern third of the basin marginal to principal deltaic facies, is composed of 2 facies: shelf muds and strandplain sands that accumulated along shore.

Near the end of Woodbine deposition, but before transgression by Eagle Ford seas, emergence of the Sabine uplift resulted in erosion of Woodbine sediments, which were subsequently redeposited along margins of the uplift as the Harris sand.

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PENNSYLVANIAN DELTAIC STRATIGRAPHIC TRAPS, WEST TUSCOLA FIELD, TAYLOR COUNTY, TEXAS

Hydrocarbon occurrence in Strawn (Pennsylvanian) sandstones in West Tuscola field, near Abilene in Taylor County, Texas, is the result of stratigraphic entrapment in deltaic sandstones. The origin of the reservoir rock in the field area and the overall geometry and internal character of the deltaic complex were determined from the vertical sequence in numerous cores of the Gray sandstone and associated units and from numerous E-logs of uncored wells.

The vertical succession of deltaic facies consists from base to top of a progradational sequence (prodelta and delta front), an aggradational unit (delta plain–marsh and interdistributary bay), and an overlying "transgressive" shallow-marine interval. Reservoir sandstones are present within the delta-front facies as stream-mouth-bar deposits, known locally as the "Gray sandstone."

The stream-mouth-bar sandstones within the West Tuscola reservoir are lenticular, highly irregular in outline, and have varying trends of porosity; these are characteristics to be anticipated in deltaic deposits. Such features present problems in developing effective secondary-recovery methods and in predicting occurrences of other deltaic sandstones.

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DEPOSITIONAL MODELS OF SANDSTONES

Determination of the depositional environment for sandstone bodies generally improves the accuracy in estimating sandstone reservoir trends. Depositional framework is best understood by comparing the geometric and internal features of each sandstone to those of models, which are sand and sandstone deposits of known depositional environment. The different environments are distinguishable most commonly, not by a unique property, but by diagnostic combinations of the various features, such as trend, width, thickness, nature of contacts, sequence of sedimentary structures, textural sequence, and constituents. These characteristics are catalogued for 18 different environments, ranging from eolian to deep-marine basin floor, and models of alluvial valley, alluvial plain, and deltaic environments are illustrated.

The Pennsylvanian Kisinger Sandstone, which crops out in north-central Texas, was deposited in a deep and narrow valley by a westerly flowing river. Each textural sequence of massive-bedded conglomerate, crossbedded conglomeratic sandstone, and convolute-bedded sandstone represents a genetic unit formed at one position of the river, which was 200–300 ft wide. The fine-grained sandstone and carbonaceous shale in the upper 30 ft of the 150-ft section were deposited under near coastal conditions as the valley filled in response to a continued rise of sea level.

The Pennsylvanian Robinson Sandstone in southern Illinois was deposited by a river flowing west-southwest on an alluvial plain. Unidirectional medium-scale and small-scale crossbedding, upward decrease in grain size, and sharp basal and lateral contacts indicate stream deposition. The absence of allochthonous pebbles suggests deposition on a plain rather than in a valley. The absence of marine indicators suggests alluvial rather than deltaic conditions.

The Davis sand (Yegua) in the Hardin field of southeast Texas was deposited by a deltaic distributary. A width-thickness ratio of approximately 30, and abrupt lower and lateral contacts, together with interstratification and the microfauna of equivalent beds, are suggestive of deposition near the mouth. The narrow width of 1,250 ft suggests further that the sand represents a genetic unit, with insignificant lateral migration.

Most of the Cretaceous Newcastle Sandstone in North Dakota represents deposition on a broad, slowly subsiding deltaic plain which formed as streams advanced west-northwestward from South Dakota, and southward from Saskatchewan. In the deltaic complex Skull Creek prodeltaic clays underlie delta-margin