Surface to Subsurface Correlation of the Claiborne and Jackson Groups, Colorado River to Trinity River

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Extended Abstract

Detailed correlation of dip and strike sections discloses the stratigraphic architecture of the Claiborne and Jackson Groups, long studied in surface outcrop because of well-exposed fossiliferous horizons. Carrying sections updip to within a few miles of outcrop allows the detailed surface stratigraphic work to be carried into the subsurface and compared with names and ideas used in petroleum and natural gas exploration.

The stratigraphic sequence is analyzed and divided by recognition of flooding surfaces (Galloway, 1989). These surfaces can commonly be recognized on electrical logs and objectively correlated. Sequence boundaries can in some cases be recognized between flooding surfaces but are commonly cryptic and inferred. Major flooding surfaces (MFS) with underlying thick transgressive deposits (greensandstone, marl, and thin reworked sandstones) divide the succession into four major genetic stratigraphic units (see Fig. 1).

The Queen City genetic unit begins at the MFS at the top of the Wilcox, marked by the top of a persistent marly zone equivalent to the Newby Member of the Reklaw Formation in outcrop. The Queen City is usually represented by two units formed by major sand deposition near the present outcrop, grading to equivalent silts and shales downdip. At its top is a thin unit of reworked and transgressive deposits, equivalent to part of the Weches Formation of outcrop.

The Sparta genetic unit begins at a low-resistivity shale within the Weches. A basal progradational shale is succeeded by a thick, sharp-based sandstone. The upper part of the unit consists of a thick transgressive deposit correlative with the Stone City Beds of Stenzel (1938; Stenzel et al., 1957), which is usually placed as the basal member of the Cook Mountain (equivalent to Crockett) Formation in outcrop. Both Queen City and Sparta cycles show little evidence of internal sequence boundaries, such as incised channels, lowstand delta complexes, or slope fans.

The Yegua genetic unit begins at the clearly defined top of the Stone City transgressive deposits. The unit is internally complex, with 10 regional flooding surfaces. The lowest internal cycle (equivalent to Yegua 90 in the Wharton County nomenclature [see Ewing, 1994]) includes the entire outcrop of the Cook Mountain Formation. Downdip this sequence is represented by about 200 ft of shelfal siltstone and shale; insertion of a silty or limy unit on a scoured surface yields a distinctive marker, which can be traced widely in a downdip position. Overlying this cycle are nine cycles that are either eroded toward the basin margin or pass landward into deltaic and nonmarine phases. Six of these packages (all above Yegua 70) appear to contain sequence boundaries, as evidenced by incised channels and downdip shelf-edge lowstand systems tracts. All of this complexity is represented in outcrop only by the nonmarine sandstone and lignitic shale of the Yegua Formation. The top of the Yegua genetic unit is a thin transgressive deposit, which is correlative to the Moodys Branch marl of the eastern Gulf Coast Basin. This unit, although distinctive in the subsurface, is not noted from surface exposures in Texas.

The Fayette genetic unit (Fayette is used instead of Jackson to avoid homonymy of stage/group and genetic units) begins at the top of the Moodys Branch. Marine shales at the base (Caddell Formation of outcrop) grade upward into marginal marine sandstones (the Wellborn Sand of outcrop) and landward into lignite-bearing nonmarine deposits of the Manning Formation. Locally, a basinward-shifted sandstone in the *Textularia hockleyensis* zone overlying an unconformity suggests a minor sequence boundary, possibly correlative to the Cocoa Sand of the eastern Gulf (Baum and Vail, 1988). Marine deposits overlie the Fayette clastic wedge in the subsurface, but they are truncated by the sub-Vicksburg and sub-Frio/Catahoula unconformities before reaching outcrop.

Two important shelf processes may be noted on the cross sections. First, a large amount of mud was deposited far seaward of the sand depocenters of all units. Because of this, genetic units do not thin markedly seaward (although they do contain internal clinoforms). Second, discrete packages of highly resistive materials (limy shale or siltstone) with sharp bases are inserted into the distal parts of the genetic units. These units can be tens to several hundred feet thick, and they form useful correlation markers for substantial areas. They may represent scour or slump fill deposits.

The surface outcrops along the basin margin are useful, if limited, windows into basin sedimentation and have provided fertile ground for paleontological and sedimentological research. The full potential of these studies can only be realized when outcrop data can be placed in the basinwide context provided by detailed subsurface correlation.

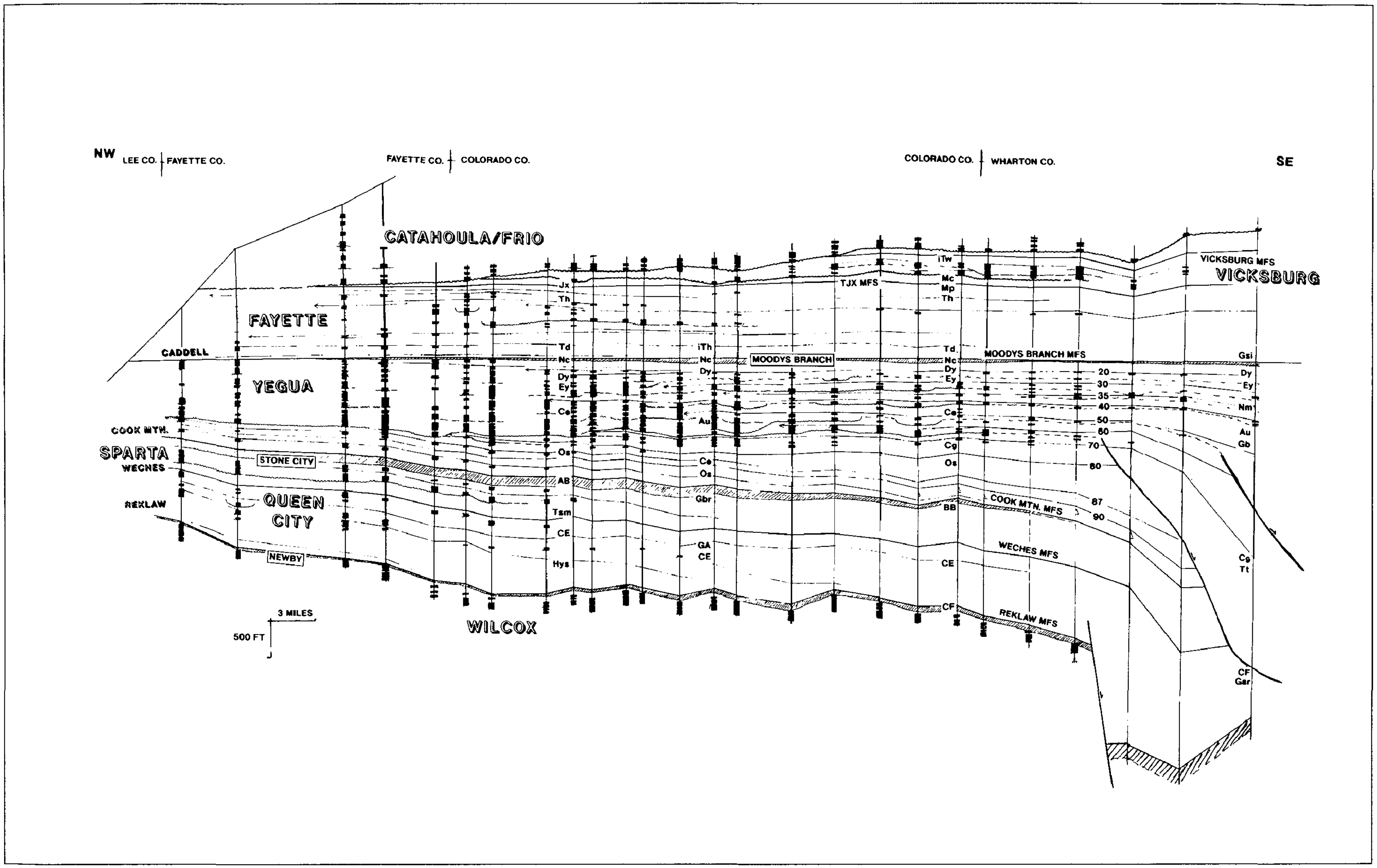

Figure 1. Regional stratigraphic section from outcrop in Lee County to a point near the Yegua shelf margin in Wharton County, Texas. Vertical exaggeration is 25×. MFS = maximum flooding surface; outline names = major genetic units; boxed names = transgressive units at MFS. Foraminifer tops: iTw = in *Textularia warreni*; Jx = First Jackson; Mc = *Marginulina cocoaensis*; Mp = *Massilina pratti*; Th = *Textularia hockleyensis*; Td = *Textularia dibollensis*; Gsi = *Globigerinatheka semiinvoluta*; Nc = *Nonionella cockfieldensis*; Dy = *Discorbis yeguaensis*; Ey = *Eponides yeguaensis*; Nm = *Nodosaria mexicana*; Au = *Anomalina umbonatus*; Gb = *Globorotalia bullbrooki*; Ce = *Ceratobulimina eximia*; Cg = *Clavulinoides guayabalensis*; Tt = *Truncrotalinoides topilensis*; Os = *Operculinoides sabinensis*; AB = *Anomalina* B; BB = *Bifarina* B; Gbr = *Globorotalia broedermanni*; Tsm = *Textularia smithvillensis*; GA = *Gyroidina* A; CE = *Cyclammina* E; Hys = *Hystracospheridium stenzeli*; CF = *Cibicides* F; Gar = *Globorotalia aragonensis*.

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