southeast progradational trend and a tendency for the sub-Millerella units to thicken updip to the line of post-Carboniferous erosional truncation. An isopach map of the Tuscumbia-Millerella interval shows thickening toward the north, away from the Ouachita orogenic source area.

Limited petrographic evidence from Lewis and Carter sandstone bodies associated with the principal subsurface deltaic facies tract indicates a dominance of monocrystalline quartz and chert rock fragments, as well as an absence of lithologic indicators for an orogenic provenance. By way of contrast, outcrop studies of the Hartselle and Parkwood units in Alabama by W. A. Thomas et al describe an abundance of polycrystalline quartz in the Hartselle and both metamorphic quartz and phyllite rock fragments in the Parkwood. The Parkwood samples containing the orogenic indicators are restricted to the folded Appalachians.

The Pottsville Group can be broken down into a maximum of 10 regionally mappable subsurface intervals. Widespread delta destructional coal seams and marine reworked sandstone bodies serve as marker units. Pottsville gas production derives from barrier bar facies in the lowest two genetic intervals and from the mixed barrier-bar and deltaic sandstone units of interval 3 (Nason). This Lower Pennsylvanian clastic wedge has its predominant source area to the south in the Ouachita orogenic belt. An isopach map of the total Pottsville documents significant thickening to an excess of 10,000 ft (3,000 m) in central Mississippi. All of the previously mentioned orogenic indicators are noted in the outcropping deltaic Pottsville facies.

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Vicksburg Group Carbonates—A Look at Gulf Coast Paleogene Carbonate Banks

Throughout the Paleogene of the northern Gulf coastal plain large deltaic systems dumped thick sequences of lithoclastic sediments onto the shelf of the Gulf of Mexico. In between major deltaic pulses, thick carbonate banks or reefs developed in the vicinity of the broad Wiggins uplift of southern Mississippi and Alabama. Because the present-day outcrop of the Oligocene Vicksburg Group in Mississippi and Alabama cuts across sedimentary strike, all of the component lithofacies of a typical Paleogene carbonate bank complex of the northern Gulf coastal plain are exposed. By relating outcrop lithology to electric log character, the various lithofacies of the Vicksburg Group can be mapped throughout its subsurface extent. Similar inferences and maps can be made for the other Paleogene carbonate complexes.

Outcrop sediments of the Vicksburg Group comprise five lithofacies, all of which show variations: (1) molluscan, glauconitic, foraminiferal, quartz silty sand/wackestone; (2) foraminiferal, algal mudstone; (3) (quartzose) bryozoan, foraminiferal silty sand; (4) glauconitic, *Lepidocyclina*, algal(?), silty sand; (5) skeletal grainstone/coarse sand.

These lithofacies suggest a set of depositional environments (corresponding lithofacies number in parentheses): (A) destructional delta (1); (B) algal muddy shelf bottom (2); (C) regressive carbonate shelf (1); (D) carbonate bank (back-bank primarily) (3,4); (E) regressive carbonate shoal/shoreline (5).

All of these environments, with their slightly different faunal constituents, can be found in the other carbonate units of the Gulf Coast Paleogene. The Tatum and the Salt Mountain Limestones have coral-algal community shelf margins, whereas the Cook Mountain, Ocala, and Vicksburg have a slightly deeper water foraminiferal-algal community at the margin. Time-equivalent lithoclastic deposition to the west prevented westward expansion much beyond central Louisiana. During the Miocene, bank complex communities were displaced farther to the east by continued Rocky Mountain–derived sediments coupled with a major epeirogenic uplift of the southern Appalachians.

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Depositional Framework and Reservoir Potential of an Upper Cotton Valley (Knowles Limestone) Patch Reef, Milam County, Texas

The Knowles Limestone is an upper unit of the Cotton Valley Group, and in Milam County, Texas, it is approximately 350 ft (100 m) thick, consisting of shales, terrigenous dolomitic limestones, grainy limestones, and algal boundstones with stromatoporoids and corals. The boundstones represent an elongate, wave resistant, encrusted skeletal patch reef which probably developed on a subtle salt-generated topographic high. The reef appears to be slightly more than 1 mi (2 km) across in its narrowest lateral dimension as determined by facies correlations of three cored wells in the study area.

Principal reef framebuilders included massive and columnar stromatoporoids, solitary or dendroid corals, and encrusting *Tubiphytes* and *Lithocodium* algae. Dendroid stromatoporoids, digitate corals, *Tubiphytes* oncoids, echinoids, and various mollusks were the principal contributors to the detrital infill of the reef.

Increased dip and dip reversal of draping beds suggest the Knowles reef achieved relief above the sea floor. Evaluation of dipmeter logs indicates the beds dip 5°NW on the updip reef flank and 10°SE on the downdip reef flank.

Reef core boundstones and reef talus were consistently present downdip, and lagoonal to tidal-flat facies were common updip throughout Knowles deposition. The reef organisms eventually became overwhelmed with terrigenous sediment transported downdip as the tidal-flat environment prograded over the lagoonal, reef talus and reef core facies at the end of Knowles deposition.

Early dolomitization of tidal flat and lagoonal facies has created local porous zones in some of these rocks. However, the reef, per se, is cemented by sparry calcite and is not a potential reservoir facies.

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Delineation of Delta Types: Norias Delta System, Frio Formation, South Texas

The Norias delta system was the major depositional component of the Frio Formation, South Texas. The Norias was an expansive, predominantly sandy, progradational complex fed by the updip Gueydan fluvial system. This progradational complex effectively filled the Rio Grande embayment of South Texas by the end of Frio deposition. Initiation of Norias deltaic progradation was probably associated with the early rise in sea level following a lowstand. As sea level rose following the lowstand, topographic expression of the preexisting Vicksburg progradational wedge caused a northward deflection of the Gueydan fluvial system within the Rio Grande embayment. Subsequently, the Norias delta complex was established as a stable progradational system in a position lateral to the north flanking margin of the main Vicksburg deltaic platform. The Norias delta system was flanked laterally with time-equivalent depositional systems, including a northerly strand-plain/barrier-bar system and to the south there are indications of a possible deltaic complex in northern Mexico. Entrenchment of the Vicksburg shelf during sea level lowstand probably led to development of a submarine canyon adjacent to the south flank of the Norias delta system. Incorporated within the complex body of the progradational sequence a well-defined evolution of Norias delta styles can be documented through the time of Frio deposition. Early Frio high-constructive, fluvially dominated, lobate geometries were characterized by meandering distributary systems as well as thick delta-front and delta-margin sands.

Middle Norias deltaic deposits continued to be generally high-constructive lobate in style, but evidence for significant reworking of deltaic sediments can be inferred based on the strand-plain/barrier system developed to the north. Late Norias deltas were high-destructive wave dominated in nature. Essentially the Norias depositional complex had become a broad alluvial plain feeding a strand-plain/barrier-bar system with little physiographic expression of a delta lobe.

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Geology of Sweet Lake Geopressured-Geothermal Prospect, Cameron Parish, Louisiana—Drilling and Testing Results

The Sweet Lake geopressured-geothermal well is located in a basin on the north flank of an east-west trending salt ridge that includes the Hackberry, Big Lake, and Sweet Lake structures. The south side of the basin is