

Integrated Analysis of the Lower Cretaceous Edwards Reef, Stuart City Trend, South Texas, USA

Lowell Waite, Travis Loseke, Andy Stephens, Mark Millard, John King, Nikki Burnett, and
Gervasio Barzola

Pioneer Natural Resources USA, Inc., Irving, TX.

Carbonate shelf margin reservoirs of the Lower Cretaceous Edwards Group constitute important gas reservoirs within the 300 mi (480 km) long Stuart City Trend of south Texas. Integration of numerous 3D and 2D seismic, well log, core, reservoir engineering and production data for over 650 wells within the trend provides new insight to the regional structural setting, distribution of depositional facies, and variation in reservoir quality, production rates and gas reserves within this complex carbonate unit.

Regional seismic data indicate a high degree of variability in structural style and character throughout the region. The reef margin, fore-reef, and back-reef areas show a diverse set of primarily down-to-the-basin normal faults of varying age and extent, together with a smaller number of conjugant reverse faults. Fault trends are especially discernable on seismic coherency volumes. The structural styles observed along the shelf margin trend were influenced by the historic presence or absence underlying Jurassic salt, fault kinematics and timing. Based on regional structural elements, the Stuart City reef margin is subdivided into three main provinces, comprising, from SW to NE, the Maverick Basin/Rio Grande Salt Basin, greater San Marcos Arch, and Houston/East Texas Salt Basin. Within these provinces, a total of eight depositional facies (reef core, reef platform, back reef, lagoon, lagoonal shoal, island shoal, salt dome shoal, and slope) representing three main environments (reef, fore-reef, back reef/lagoon) are locally defined using available core information tied to well log character. Regional mapping of facies is facilitated using high quality 2D and 3D seismic data utilizing a method that ties the top Pearsall-top Cretaceous carbonate seismic isochron to the core and log data.

On the basis of available geologic and engineering data, the Edwards reef margin is tentatively subdivided into six geographic areas or sub-regions, each containing unique geologic and reservoir attributes (e.g., depth of burial, structural style, fault configuration/timing, main facies type, and reservoir performance). Production decline curve analyses of existing producers indicate that the island shoal facies, particularly in Word Field (Lavaca Co.) and Buchel Field (Dewitt Co.) contain the highest average reserves on a per-well basis, followed by reef core and reef platform facies in central Pawnee Field (Bee Co.) and Moray and Yoakum Fields (Dewitt Co.).