
The Wilcox—The Seaward Expression of this Lower Eocene to Paleocene Depositional System

Tom Cheatham

Nexen Petroleum USA

ABSTRACT

The Lower Tertiary Wilcox trend represents an excellent example of a fully linked, proximal-to-distal depositional system of Laramide age. Onshore equivalents crop out across northeastern Mexico, through South and East Texas, and into North Louisiana and Mississippi. The section dives rapidly into the subsurface, setting up an older play with a production history of over 5 billion barrels of oil equivalent. Productive facies are primarily of fluvial-deltaic to shallow marine origin, fed by an extensive series of delta complexes, including the Rio Grande and Houston embayments in Texas and the Holly Springs delta system further eastward in Louisiana. Fluvial-deltaic facies grade seaward into more marine shelf facies prior to dipping into the deep, undrilled subsurface.

The seaward link of this Lower Eocene to Paleocene system was discovered in the deepwater Gulf of Mexico in Alaminos Canyon, where equivalent deepwater turbidite facies were encountered. To date, this downdip-equivalent play has proven up some 2.5 billion barrels of potential hydrocarbons from a series of charged compressional structures trending along strike some 350 miles from Alaminos Canyon to western Atwater Valley, where the eastward edge of the Wilcox Basin is defined.

Presently, the focus of the deepwater Wilcox Play is located in the central Gulf of Mexico in Keathley Canyon, Walker Ridge, and Green Canyon. The deeper reservoir unit of Late Paleocene to Early Eocene in age and is characterized by blocky, channelized basin-floor fan facies and rapid rates of deposition. The younger unit of the Lower Eocene represents a gradual shoaling of the system, with less-confined, stacked lower slope fan lobes deposited at characteristically slower rates. In reservoir architecture terms, the entire section is subdivided by a persistent, near-top-Paleocene condensed interval represented by 30 to 80 feet of sub-regionally-correlative highstand shale which acts, in some instances, as an excellent top seal and pressure barrier. The two units above and below this sealing shale represent persistent reservoir units, each with their own unique rock properties and reservoir characteristics. Reservoir quality is extremely variable within the two units and is dependent upon a number of controlling factors. These include (a) temperature and compaction history, (b) position with respect to sediment fairways and backstops, (c) ponded minibasin conditions versus unconfined deposition more typical of the abyssal plain, (d) sediment source vis-à-vis compositional percentages of rock fragments and their diagenetic products, and (e) pressure history. Overall moderate reservoir quality and undersaturated oils of medium API gravity combine to make this new play a developmental challenge. However, newer production and development technologies for the Gulf of Mexico including reservoir fracturing and gas lift of the Wilcox may significantly improve both economics and ultimate recoveries for this burgeoning new deepwater play.