
Jurassic Depositional Systems, Facies, and Reservoirs of the Northern Gulf of Mexico

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ABSTRACT

The Jurassic section in the northern Gulf of Mexico consists of post-rift siliciclastic, carbonate, and evaporite deposits that accumulated in continental to deeper marine environments on an irregular ramp where bathymetry was modified by salt tectonics and/or basement features. Deposition was characterized by high rates of tectonic subsidence, high sediment supply, and arid conditions. Paleotopography affected sediment distribution. During earliest Oxfordian times, continental deposits of the Norphlet Formation accumulated. With continued base level rise, these continental sediments were reworked by marine processes resulting in deposition of nearshore sandstones of the Norphlet Formation and limestones of the Smackover Formation. Maximum transgression occurred in Late Oxfordian time and contributed to the development of coral-microbial and microbial buildups of the Smackover Formation. With a reduction in the rate of sea level rise, higher energy nearshore and shoal deposits of the Smackover Formation accumulated. This reduction in accommodation resulted in establishment of supratidal conditions that produced sabkha deposits, including anhydrites of the Buckner Anhydrite Member of the Haynesville Formation. This fall in base level predated the deposition of subaqueous anhydrites of the Buckner Anhydrite Member and sandstones of the Haynesville Formation in the northeastern Gulf of Mexico. In this area, deposition of Kimmeridgian lagoonal shales and evaporite deposits followed. With continued rise in base level, marine flooding resulted in deposition of marine shales and limestones, including the Gilmer Limestone Member of the Haynesville Formation to the west. In Late Kimmeridgian to Tithonian times, reduction in accommodation and increase in the influx of siliciclastic sediments was accompanied by accumulation of marginal marine and coastal deposits of the Schuler Formation (Shongaloo Member) of the Cotton Valley Group. A subsequent rise in sea level after this base level fall resulted in deposition of Cotton Valley (Dorcheat Member) siliciclastic shelf sediments. Marine flooding followed in Berriasian time. To the west, deposits of the Bossier Formation accumulated in deeper marine environments during Tithonian and Berriasian times. Major hydrocarbon reservoirs include Norphlet eolian, fluvial, and nearshore marine sandstones, Smackover higher energy nearshore marine, shoal, and reefal carbonate facies, Haynesville fluvial, tidal, and nearshore marine sandstones and reefal carbonates, and Cotton Valley fluvial-deltaic, coastal, and deeper marine sandstones and reefal carbonates.