

## **Understanding the Regional Haynesville and Bossier Shale Depositional Systems in East Texas and Northern Louisiana: An Integrated Structural/Stratigraphic Approach**

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Recent discoveries in the Haynesville and Bossier shales have dramatically increased unconventional gas exploration activity in the mature petroleum provinces of East Texas and Northern Louisiana. Using a variety of subsurface data including 2D seismic, well logs, mud logs, core descriptions, and absolute age control based on multi-disciplinary biostratigraphy, detailed depositional models for the Haynesville and Bossier shale depositional systems have been developed. In both systems, the framework of regional structural elements and antecedent topography strongly influences basin geometries and fill through geologic time.

After initial rifting, the Gulf of Mexico (GOM) basin filled with thick evaporite units of the Louann Group followed by the basinward advance of continental siliciclastics of the Norphlet Formation. Early segregation of the northern shelf was marked by intrashelfal highs and sub-basins such as the East Texas, Northern Louisiana, and Eastern Mississippi Salt Basins. Subsequent transgressions established the deposition of stacked Oxfordian to Tithonian carbonate systems with major siliciclastic input from the ancestral Mississippi River and predecessors of the Lone Oak and other deltas.

The antecedent topography shaped by underlying Oxfordian mixed carbonate/siliciclastic systems and subsequent sediment budgets strongly influenced (1) facies development and stacking patterns that vary along the northern rim of the GOM during Haynesville and Bossier time, and (2) the depositional processes, type, total organic carbon richness, and preservation of the self-sourcing Haynesville and Bossier shale units.

Building an integrated geologic model to unravel basin evolution, basin physiography, and sedimentary fill through time aids in our understanding of each time-equivalent depositional sequence and ultimately highlights greatest exploration potential.

This approach is particularly important in basins like the northern GOM where continued structural evolution including basement-involved faulting, inversions, and salt movement and evacuation has led to variations of the structural framework of the geologic past while ancient sub-basins and highs may not mimic the modern structural framework.