

Regional Geology of Fayetteville Shale in North-Central Arkansas

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The Fayetteville play area is situated in north-central Arkansas and is bounded by the Ouachita front to the south, the Reelfoot rift to the east, and the Ozark uplift to the north. Intra-formational unconformable surfaces and isopach trends indicate syn-depositional movement may have influenced Fayetteville deposition, particularly in proximity to a northeast-southwest trending paleo-high associated with the Reelfoot rift. The Mississippian (Chesterian) Fayetteville overlies the Batesville sandstone and is unconformably overlain by the Pennsylvanian (Morrowan) Hale Formation.

Terrigenous sediment components of the Fayetteville were sourced from the north and northeast. Isopach mapping of Fayetteville gross/net thickness, petrophysical, and production trends all indicate two strong northeast-southwest trends and an abrupt eastern truncation edge parallel to a paleo-high associated with the Reelfoot rift. Regional correlations of subsurface well logs, lithofacies observed in conventional core, and detailed description of outcrops (in conjunction with gamma-ray scintillometry), depict transgressive and condensed deposits floored by flooding surfaces. These silica-rich and organic-rich mudstone intervals are the main productive zones. Distal to medial highstand, locally micritic mudstone deposits contain local internal erosional surfaces, are clay-rich and have poor reservoir-quality. These mudstones provide extensive regional fracture barriers.