

Sequence Stratigraphy of Fayetteville Shale from Outcrops and Cores, North-Central Arkansas

Douglas W. Jordan¹, Craig Cormany², M. Ed Ratchford³, Douglas J. Schultz¹, Erin Smart⁴, Jon W. Giffin¹, and Brian Winter¹

¹*Chesapeake Energy Corporation, Oklahoma City, OK 73118: doug.jordan@chk.com,
doug.schultz@chk.com, jon.giffin@chk.com, brian.winter@chk.com*

²*EOG Resources, Denver, CO 80202: Craig_Cormany@eogresources.com*

³*Arkansas Geological Survey, Little Rock, AR 72204: ed.ratchford@arkansas.gov*

⁴*Weatherford Laboratories, Houston, TX 77086: Erin.Smart@weatherfordlabs.com*

Lithofacies analysis of outcrop and conventional core of the Fayetteville Shale (north-central Arkansas, Arkoma Basin) provides a sequence stratigraphic and mapping framework that can be applied to exploration and development of this unconventional gas play.

In outcrop and core, the basal portion of the Fayetteville Shale overlies a ravinement surface present on top of the Batesville Sandstone, a fossiliferous, quartzose, and very fine-grained (transgressive?) sandstone. Overlying this ravinement surface are reservoir-bearing, transgressive-condensed mudstones alternating with non-reservoir distal highstand deposits containing thin erosional (sequence?) boundaries. Transgressive deposits are interbedded organic-rich, silty to siliceous (locally phosphatic), petroliferous mudstones. The condensed interval is organic and silica-rich mudstone, and contains localized calcareous, iron-rich concretions. Distal to medial highstand deposits contain less organic organic-rich, argillaceous mudstones and stacked, storm event beds (oid/bivalve/brachiopod lime packstones/wackestones) grading to micritic mudstone, calcareous chert, and siliceous mudstone. A local ravinement surface having a phosphatic-rimmed, bivalve-rich, pebble lag, occurs in the middle of the outcrop section, and this surface can be traced in core and log correlations throughout the area.

The upper portion of the outcrop section consists of light-gray, micritic and siliceous lime mudstones in bed-thickening parasequences (highstand) that are sharply overlain (sequence boundary/forced regression) by the oolitic Pitkin Limestone. This boundary is locally recognized in conventional core and regionally in cross-sections, and erodes downsection to the east in proximity to the Reelfoot rift.