

Mopping up the Shale Mess: Integrated Mudstone Depositional Systems: An Example From the Cenomanian-Turonian Western Interior Seaway

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ABSTRACT

The Shale Revolution in North America caught sedimentary geologists by surprise. Unlike deltas, submarine fans, carbonate ramps or other types of depositional systems, there were no ready-made shale facies models that could be used to help guide the exploration and development of source-rock reservoirs (Haynesville, Barnett, Eagle Ford, etc.). More than 15 years after the initial Barnett Shale boom, the sedimentary geology community still lacks widely applied shale facies models that integrate sedimentology, lithology, organic geochemistry and other aspects of shales in ways that can be used to understand and predict the distribution of properties of economic importance. In this presentation, I will propose a mudstone depositional model that links shoreline sandstones, siliciclastic shales and pelagic carbonates (marlstones, chinks) in an epicontinental basin. The public-domain lithology, sedimentology, and organic geochemistry data used to construct the model come from Cenomanian-Turonian strata of the Cretaceous Western Interior Seaway (Cardium, Second White Specks, Ferron, Dakota, Greenhorn, Eagle Ford, and other formations). The model is an idealized simplification that facilitates our understanding of the complex natural phenomena active in these settings and should serve as: 1) an integrated basis for process interpretation of the depositional system it represents; 2) a norm for purposes of comparison; 3) a guide and framework for further observations; and 4) a predictor during new inquiry. The model does not represent all muddy or organic-rich depositional settings, but with its focus on genetic processes, it should be a useful guide for developing similar models that represent those systems.