

Abstract

Sequence Stratigraphy and Geologic Reservoir Characterization of the Niobrara in the Northern San Juan Basin

In the northern San Juan Basin, the Niobrara Formation is represented by the upper half of the Mancos Shale (the Smoky Hill Member and Cortez Member). This section is generally equivalent to the Niobrara Formation along the Colorado Front Range. Although the Fort Hays Limestone is absent west of Pagosa Springs, the C Chalk and B Chalk are well-expressed as two resistant bench-forming calcareous units in the northern San Juan Basin. These two calcareous units have also been established as prospective hydrocarbon targets by operators in the area. Calcareous facies equivalent to the A Chalk were not deposited in the northern San Juan Basin due to siliciclastic dilution during the regressive latter half of the Niobrara marine cycle. The overall third-order Niobrara marine cycle includes these members of the Mancos Shale: the Juana Lopez, Montezuma Valley, Smoky Hill, and Cortez Members. The Smoky Hill Member sits just above the basal Niobrara unconformity in most of the study area, and the entire section also has greater thickness and siliciclastic content than its equivalent farther east along the Front Range. Despite these differences, the four Niobrara fourth-order cycles (T7a-R7a thru T7d-R7d) have been assigned to distinct lithostratigraphic units with significant sequence stratigraphic surfaces interpreted.

Numerous extensive outcrop locations (in and around Pagosa Springs, Piedra, and Durango, CO) along with three new cores along the CO-NM border form the foundation for sequence stratigraphic interpretation of the Niobrara marine cycle in this study. Establishing and applying a sequence stratigraphic framework to any section creates consistent reference standards for communication, research, and further correlation. Comparisons of lithologic and geochemical data from equivalent strata between the northern San Juan Basin and DJ Basin reveal significant differences in the timing and style of source-rock deposition (and associated low-oxygen conditions). The sequence stratigraphic framework also emphasizes tremendous lateral facies changes within the basal Niobrara section (i.e. Fort Hays Limestone to Tocito Sandstone). Once refined and applied, this stratigraphic framework can be used for predicting the distribution of reservoir and geomechanical properties in addition to enhancing the current understanding of the Niobrara and the Western Interior Seaway.

Biography

Walter received a BS in geology from the University of the South (Sewanee) in 2014, where he completed a variety of local projects in geology, natural resources, and domain management. He also participated in the University of Georgia Interdisciplinary Field Program during his undergraduate education. After Sewanee he moved to Austin, TX and worked in the field mudlogging and geosteering in the Permian Basin before moving back to Tennessee in early 2015, where he spent two years at TriAD Environmental Consultants in Nashville.

He recently completed his MS at the Colorado School of Mines under Dr. Steve Sonnenberg and is still researching the Niobrara-equivalent section of Mancos Shale in western Rocky Mountain basins. For part of his time at Mines he consulted at Innovative Geotech Resources, and worked summer internships at Antero and QEP here in Denver. After CSM, he worked as a geological consultant at Earth Science Agency (DJ Basin geosteering and field operations), and currently works for Kimmeridge Energy in Denver.