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When Clastics and Carbonates Collide: Preservation and Exposure of a Unique Upper Pennsylvanian (Missourian) Fossil Assemblage from the Fort Worth Basin of North Texas

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ABSTRACT:

The Lake Bridgeport Shale (Upper Pennsylvanian, Missourian) is a local lithofacies of the Graford Formation that outcrops extensively around Lake Bridgeport in the Fort Worth Basin of Wise County, north central Texas. From 2011 until mid-2015, the dam-impounded lake dropped to record-low water levels due to a combination of drought and consumption demand by the city of Fort Worth. During this four-year window, extensive outcrops of formerly submergent formations afforded detailed study of the stratigraphy, sedimentology and fossil content of formerly inaccessible localities. Owing to its unique paleogeographic setting and favorable conditions for preservation, the fossil assemblage is unusual in containing a diverse mixture of terrestrial and marine plants, large invertebrates, vertebrates, trace fossils and sedimentary structures.

The Pennsylvanian Bridgeport seas in the Fort Worth Basin were intermittently silled to the north by the emergent Wichita Mountains and were subject to additional siliciclastic sediment from the Perrin Delta emanating from the rising Ouachita Mountains to the east. Although much of the shallow muddy substrate was well-oxygenated, at least two thin intervals of less-oxic sediments preserve phosphatic nodules containing a unique vertebrate-dominated fauna. A major flooding event eventually drowned the muddy substrate with algal carbonate but some of the predecessor benthic and pelagic species survived and even prospered in the new environment. A massive collection of fossils and associated sedimentary structures from Lake Bridgeport collected over a 30-year period has yielded a number of new or unique specimens.

Missouri Stage petroleum systems are of economic importance in Texas due to development of coal in non-marine facies of the Graford and the Canyon Lime oil and gas play farther west in the Panhandle Palo Duro Basin. This assemblage provides a unique perspective of the biodiversity, rock-forming processes, diagenesis and biogenic constituents that were present during this time in north Texas.

Speaker Biography:

John McLeod is currently a Geologist – Technical Expert with the Resources team at the corporate headquarters of SM Energy in Denver.

After completing an M.S. in Geology at Northern Illinois University, John embarked on a 35+ year career as a geoscientist, including earlier positions with Mobil Oil, Ladd Petroleum, the Idaho Department of Water Resources (as a hydrogeologist), Oryx Energy, the Illinois State Geological Survey, EOG Resources and Chesapeake Energy. He has lived in 12 different cities, including now his second tenure in Denver.

His current interests involve the analysis of petroleum systems, source rocks, and the determination of thermal maturity in sedimentary basins. He has pursued fossils and geology since 1979 at Lake Bridgeport in north Texas where he owns a residence.

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