

OUTCROP AND RESERVOIR CHARACTERIZATION OF  
THE BRUSHY CANYON FORMATION:  
GUADALUPE MOUNTAINS NATIONAL PARK, WEST TEXAS, AND  
CABIN LAKE FIELD, EDDY COUNTY, NEW MEXICO

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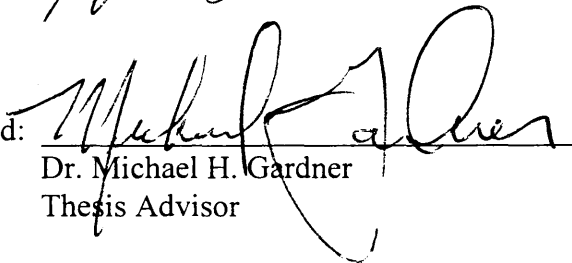
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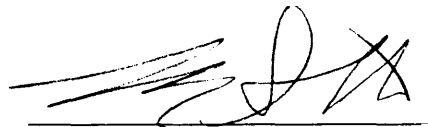
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## ABSTRACT

This study integrates outcrop and subsurface data from the Middle Permian, Brushy Canyon Formation of West Texas and New Mexico to evaluate the utility, limitations, and methods used in calibrating these data for reservoir characterization and flow-modeling studies.

Statistical outcrop characterization of an upper Brushy Canyon slump-scar-confined sandstone body was conducted at the facies, architectural element, architectural element set, and outcrop scales. When these various geometric scales were compared to the actual outcrop architecture, it is shown that architectural elements should be the smallest-scale sediment bodies that can be populated with rock properties that can be imported as reservoir simulation blocks for fluid flow modeling. Statistically, architectural elements are also the smallest sediment bodies that can be correlated in well-log data, therefore defining the fundamental building block for geologic model construction.

The subsurface study of the third-order Brushy Canyon Formation at Cabin Lake Field shows that it is approximately 1,500 ft (450 m) thick and consists of four fourth-order stratigraphic cycles. The fourth-order-cycle stacking patterns show basinward-stepping motif to the middle Brushy Canyon followed by a shelfward-stepping succession to the top of the formation. Each fourth-order cycle contains higher-frequency fifth-order stratigraphic cycles. Reservoir characterization shows that hydrocarbon predictability is directly related to the various architectural elements that make up the different classes of reservoirs. Architectural element analysis indicates that the lower Brushy Canyon and lower Cherry Canyon are composed entirely of lobeform architectural elements that allow for most economical accumulations of hydrocarbons at Cabin Lake Field. In both outcrop and subsurface, these architectural elements are sheet deposits that exhibit excellent horizontal and poor vertical connectivity properties.

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