Wells in this area have typical ultimate recoveries of between 1.0 and 3.0 bcf of gas. The combination of stacked reservoirs and good production makes this area of the Morrow trend especially attractive.

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Marfa Basin of West Texas: Foreland Basin Subsidence and Depocenter Migration

The Marfa basin, encompassing approximately 6,000 mi^2 (15,539 km^2) of Presidio and Brewster Counties in west Texas, is a foreland basin that formed in the late Paleozoic in response to the encroaching Ouachita-Marathon thrust belt. The basin is one of several, including the Arkoma, Fort Worth, and Val Verde basins, that developed along the southern margin of the North American craton during convergence of North America and Africa–South America in Pennsylvanian to Permian time. We present a model of the formation of the Marfa basin in which basin subsidence is effected by compression from plate convergence and by loading owing to the emplacement of the Marathon fold-thrust complex.

A model of foreland basin evolution by thrust loading as applied to the Idaho-Wyoming thrust belt can be applied with some modification to the Marfa foreland basin. Preexisting northwest-trending faults in the Marfa region were reactivated by the Marathon thrust belt as the latter advanced onto the continental margin toward the craton. Subsidence owing to compression and thrust loading first formed the Tesnus basin, a Pennsylvanian basin now buried beneath the Marathon overthrust. In the later stage of thrust-sheet emplacement, the depocenter split into two prongs, and the Marfa and Val Verde basins collected thick sections of Wolfcamp sediments.

Preexisting northwest trends, which result from a Precambrian rifting event and the late Precambrian to Cambrian development of the Delaware aulacogen, controlled the location of subsidence in front of the thrust sheet. The fragmented craton was composed of northwest-trending high and low areas including the Diablo platform and the Delaware basin. These fragments behaved much like piano keys, subsiding first in a central region to form the Tesnus basin and later in adjacent regions forming the Marfa and Val Verde basins.

The model is supported with data from 63 well logs that indicate the position of the depocenters through time and that suggest the differential elevation of crustal slices controlling the formation and location of the three Pennsylvanian-Permian foreland basins.

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Detrital and Authigenic Clay Minerals in Lower Morrow Sandstones of Eastern New Mexico

Sandstone reservoirs of the Morrow Formation of southeastern New Mexico are important natural gas reservoirs. Production from this unit is affected by the types and distributions of detrital and authigenic clay minerals present in the rocks. Thus, X-ray diffraction and scanning electron microscopic analyses of samples from the lower Morrow reservoirs were conducted to understand the types, morphologies, petrographic positions, and regional trends of clays in the unit.

By far, authigenic kaolinite and chlorite are the major clays present in the lower Morrow sandstone reservoirs. The kaolinite content of the clay fraction of the formation can reach a maximum of 100%, whereas that of chlorite can be as high as 59%. When both are present, authigenic kaolinite and chlorite can effectively reduce much of the permeability of the sandstone reservoirs. Smectite, illite, and mixed-layer smectite-illite are relatively insignificant clays in the lower Morrow, except in certain small areas of the study area, and are largely detrital in origin.

The distribution of smectite, illite, and mixed-layer smectite-illite reflects the depositional processes acting in each of the facies of the lower Morrow. These clays are most abundant in immature fluvial-deltaic and basinal sandstones and relatively deficient in reworked marine sandstones. Distribution of authigenic kaolinite and chlorite also mimics the facies pattern, but is not controlled by it. In the lower Morrow, kaolinite increases landward while chlorite increases toward the basinal facies.

Successful treatment procedures for reservoir sandstones must differ with the different clay mineral types present.

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Queen Formation of Millard Field, Pecos County, Texas: Its Lithologic Characteristics, Environment of Deposition, and Reservoir Petrophysics

The Queen Formation is a sequence of interbedded siliciclastics, carbonate mudstones, and evaporites, that extend across a large area of the subsurface Permian basin in west Texas and southeastern New Mexico. We present a description of the lithologic and diagenetic characteristics of the formation in Millard field, Pecos County, Texas, and propose a model for its depositional environment and reservoir formation.

The Queen Formation in Millard field consists of four major lithologic characteristics: (1) cross-stratified or ripple-laminated sandstones of eolian origin, and a sabkha mudflat facies complex composed of (2) unfossiliferous and anhydritic mudstones, either massive or ripple-laminated; (3) thin dolomicrite crusts with birdseye structures and desiccation cracks; and (4) anhydrite in the form of discrete nodules, beds of nodular-mosaic texture and massive beds in the mudstones and sandstones, and as palisade anhydrite in the mudstones and dolomicrites.

Production from the Queen Formation in the field is consistently from two eolian sandstone units, designated the Queen A and C, which can be correlated across the field area. SEM examination of these sandstones indicates a positive correlation between the amount of grain-lining, authigenic smectite and porosity, and concomitantly an inverse relationship between anhydrite cement content and porosity. The porosity of the sandstone reservoirs in the Queen is of secondary origin.

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Pre-Leonardian Geology of Midland Farms Field Area, Andrews County, Texas

The Midland Farms (Ellenburger) oil field was discovered on September 16, 1952, with the completion of Anderson-Pritchard's 1 Fasken-24 well, drilled on an indicated single-fold seismic structure. The field produces from vuggy, fractured