depositional sequence of the Atoka Group, which is partly equivalent to the Big Saline Formation. Depositionally it reflects a transition from carbonate to terrigenous-dominated environments. Chert litharenites derived from the Ouachita structural belt and locally from the Muenster arch first prograded across the northern part of the Fort Worth basin during lower Atoka deposition.

Lower Atoka strata are interpreted to be a fluvially dominated fan-delta system which exhibits characteristics of both a fan delta and a high-constructive elongate delta. Fan-delta characteristics include tectonically active source, poorly developed alluvial plain, and interfingering and/or coexisting terrigenous and carbonate facies. High-constructive elongate delta characteristics include elongate, digitate sand-body geometry and a facies tract reflecting rapid progradation and aggradation.

Contemporaneous faulting within the basin was a major factor in distribution of lower Atoka facies. Sediment was confined to the downthrown sides of contemporaneous faults resulting in superposed fan-delta deposits. Stacking and coalescing of early fans constructed an alluvial plain. When sediment supplies exceeded fault movement, the fan deltas continued to prograde across the basin.

Cumulative oil and gas (equivalent) production from the lower Atoka is over 130 million bbl. Production is facies controlled and the distribution of fields coincides with the distribution of fan-delta lobes. Fields are aligned predominantly on the basinward side of major faults and they produce from fan-delta channel-fill and coarse-grained fan-delta plain facies.

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Petroleum Exploration in Pedregosa Basin, Southwestern New Mexico

In southern Hidalgo and Grant Counties, New Mexico, the northwestern end of the Pedregosa basin has a high petroleum potential. Paleozoic rocks, dominantly shallow-marine carbonates, are over 11,000 ft (3,350 m) thick. Of the 11 formations, ranging in age from Cambrian to Permian, 7 contain favorable oil- or gas-source units. Mesozoic rocks, generally shallow-marine limestones and deltaic sandstones-mudstones, are nearly 10,000 ft (3,050 m) thick. Two of the three Lower Cretaceous formations contain favorable source units. Gas-prone kerogens are more abundant than the oil-prone types. At normal depths of burial, organic matter in the source units has reached thermal maturity, and some in the older formations is overmature. In the lower plate of a major Laramide thrust fault, the Lower Cretaceous units are overmature and the older Paleozoic units may be thermally metamorphosed.

Best reservoir objectives are the porous dolostones, totaling 484 ft (148 m) in thickness, in the upper part of the Horquilla Formation (Pennsylvanian-Permian). They are located at the shelf margin of a deep-marine basin. Other favorable reservoir units are indicated in surface exposures.

In this frontier area, only 11 exploration wells have been drilled to Precambrian, Paleozoic, or Mesozoic rocks. Shows of oil or gas were reported in 6 of the wells. None of the wells have tested the better reservoir objectives in the deeper parts of the graben valleys, where commercial accumulations of petroleum are likely to be preserved. Tertiary-intrusive and volcanic-cauldron complexes have thermally metamorphosed older sedimentary units only locally. Basin and Range faulting has disrupted subsurface fluid systems in many parts of the area. Despite the challenging risks, the high potential encourages further exploratory drilling on selected petroleum prospects.

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Depositional Facies, Diagenesis, and Reservoir Heterogeneity of Upper San Andres Formation in West Seminole Field, Gaines County, Texas

The upper San Andres Formation at West Seminole field can be divided into three depositional sequences of transgressive, regressive, and transgressive cycles culminating in thick tidal-flat deposits. Diagenesis altered sabkha environments via dolomitization, anhydration, and de-anhydration. Heterogeneous porosity and permeability result in porous and permeable layers separated by nonporous and impermeable layers or porous and impermeable layers. The reservoir characteristics are the combined results of depositional facies and diagenesis.

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