B, North Juniper, JY, Providence, Prudence, Stescott, and Tippen gas fields, and Prothro (Ramsey structure) and Wilie oil fields where it joins the east-west Matador arch at the structure known as "Narcisso" on the Cottle and Motley county line.

The producing Atoka sandstones or conglomerates consist of medium to coarse, predominately subangular, quartz grains with traces of glauconite. These stratigraphic traps were deposited as offshore sand bars on the northeast and southwest flanks of the Masterson arch. The Atoka conglomerates are erratic, as they were deposited on a steeply dipping erosional surface, with rapidly changing dips. The entire Atoka section between the base of the Caddo Limestone and the top of the Mississippian limestone consists of very hard, dark-gray to black calcareous shale and conglomerate beds. The Atoka shale is very thin on the structural axis, with no conglomerate deposition, but thickens basinward with the development of many different conglomerate lenses.

The Providence Atoka gas field in extreme southeast Cottle County was discovered in October 1973, with the successful completion for 10,200 Mcf/day of the "Gus" Edwards 1 J. J. Gibson. Development to date reveals more than 141 ft (43 m) of gas column with no indication of water, which is present at different subsea depths in other gas fields on this trend. Average absolute open flow for the 14 gas wells in the Providence Atoka field is 11,600 Mcf/day. The porosity ranges from 15 to 21% with average pay thickness of 18 ft (5.5 m).

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Depositional Systems and Petroleum Potential of Lower Permian Strata, Palo Duro Basin, Texas

Lower Permian (Wolfcampian) strata of the Palo Duro basin consist of thick, terrigenous clastic and carbonate facies which were deposited in (1) fan-delta, (2) high-constructional delta, (3) carbonate-shelf and shelf-margin, and (4) slope and basinal systems. Lateral and vertical facies sequences across the basin indicate that these strata are regressive deposits and they document the first episodes of Permian marine retreat from the Texas Panhandle.

Terrigenous clastic sediment was derived from highlands which surrounded part of the Palo Duro basin. Exposed Precambrian granite in the Amarillo uplift, Sierra Grande uplift, and Bravo dome yielded large quantities of arkosic sand (granite wash) to fan-delta systems which emptied into shallow-marine environments in the northern part of the basin. Along the basin's southeastern margin, high-constructive deltas prograded westward from the Wichita Mountains, depositing quartz-rich sand and mud across the shelf.

Seaward of the clastic facies belt, a carbonate-shelf-margin complex, averaging 1,000 to 1,200 ft (300 to 365 m) in thickness and facing south toward the Midland basin, dominated Wolfcampian deposition in the Palo Duro basin. The western shelf margin consists of a superposed sequence of carbonate strata exhibiting limited basinward progradation. Contrarily, the eastern shelf margin is composed of several superposed, progradational carbonate sequences, individually averaging several hundred feet in thickness. During early to middle Wolfcampian time, the eastern shelf margin prograded westward 10 to 30 mi (16 to 48 m) while the western margin remained stationary. Shelf margins shifted in response to deposition of slope sediments in front of the shelf and in feeder channels, creating a foundation for subsequent carbonate buildups.

Potential hydrocarbon reservoirs are thick zones of shelf-margin dolomites, delta-front sandstones, and fan-delta arkoses. Porosity figures in those facies are as high as 10 to 20%. Each potential reservoir facies is juxtaposed with potential source beds and nonporous sealing beds.

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Sedimentology and Source-Bed Geochemistry of Spraberry Sandstone, Midland Basin, West Texas

The Spraberry Sandstone is a Lower Permian (Leonard) unit restricted entirely to the subsurface of the Midland basin of West Texas. Production of oil from the Spraberry reservoir began in 1949 in east-central Dawson County. Permeability of the reservoir rocks ranges from 0 to 2.5 md, and porosity averages 10%. Major production is made possible by fracture porosity.

The Spraberry Sandstone is approximately 305 m thick and consists of upper and lower sandy and silty members separated by a middle member consisting of predominantly dark argillaceous carbonate rock and calcareous shale. Detailed study of sedimentary structures, vertical sequences, and petrography suggests that the Spraberry represents sedimentation from a series of coalescing submarine-fan complexes. The dark, finer grained intervals within the Spraberry may be the source beds for the petroleum being produced from the formation, although no published data exist to support this.

Samples from the finer grained intervals in two cores from the Tex-Harvey and Pegasus fields (Midland County) were analyzed by means of various geochemical techniques to determine their source-bed potential. Total organic carbon content of the samples ranged from 0.68 to 2.42 wt. %. Soluble organic matter extracted via Soxlet ranged from 1,892 to 6,598 ppm by weight. The carbon preference index as determined from gas chromatograms of the paraffinic-napthenic fraction ranged from 1.14 to 1.22. Kerogen coloration values were between 2.0 and 3.2, with the mode being 2.3. Hydrocarbons comprised from 0.65 to 8.6% of the total organic carbon and 17 to 71% of the total extractable organic matter. Compared with criteria commonly used to judge source-bed potential, the Spraberry has most requirements and probably contained its own source beds.

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Stratigraphy and Entrapment of Hydrocarbons in San Miguel Sands of Southwest Texas

The San Miguel section of the middle Taylor in the