

The Woodford Shale in southeastern New Mexico: Distribution and source rock characteristics.

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The Woodford Shale (Upper Devonian) is 0 to 300 ft thick in southeastern New Mexico. Maximum thickness is in south-central Lea County where it lies at depths of 18,000 ft. The Woodford pinches out to the north and northwest in Roosevelt and Chaves Counties where it is present at depths of less than 7000 ft as it rises out of the Permian Basin. The Woodford Shale is absent from the highest parts of the Central Basin Platform in southeastern Lea County. The Woodford is comprised predominantly of black, organic-rich shales and minor black cherts, siltstones, sandstones and greenish-colored shales. The Woodford unconformably overlies Wristen (Silurian) and Thirtyone (Lower Devonian) carbonates as well as scattered remnants of the pre-Woodford shale (Middle to Upper Devonian). The Woodford is unconformably overlain by the Lower Mississippian limestone.

The black organic-rich shales are a hydrocarbon source facies. Present-day Total organic carbon (TOC) ranges from 1.7 to 4.9 weight percent. Original, pre-maturation TOC ranged from 1.8 to 6.8 percent. Both original and present-day TOC are greatest in southern Lea County and decrease to the north and west. The kerogen fraction of the black Woodford shales is dominated by amorphous and herbaceous types. Woody and inertinitic types are prevalent to the north, closer to the Woodford pinchout.

Thermal maturity is greatest in southwestern Lea and southeastern Eddy Counties where the Woodford is within the thermogenic gas and condensate window. Thermal maturity is lower to the north and west where the Woodford is within the oil window. The volume of hydrocarbons generated within the Woodford increased to the southeast along with increasing TOC, thickness and thermal maturity.

The Gladiola Woodford Oil Pool is the only reservoir productive from the Woodford Shale in southeastern New Mexico. This reservoir is located in northern Lea County where the Woodford is within the oil maturation window. Produced hydrocarbons are oil and associated gas, in agreement with the thermal maturity of the Woodford in the area.

The Woodford has been long considered as the source rock for hydrocarbons within carbonate reservoirs of the underlying Wristen Group and Thirtyone Formation. Gas-oil ratios from Wristen reservoirs reflect thermal maturity levels of the Woodford and possibly the geographic distribution of Woodford kerogen types. The composition of Wristen oils may also reflect the distribution of kerogen types.