

# The Bakken Formation of the Williston Basin: Deposition, Maturation, and Fracturing\*

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## ABSTRACT

The Bakken Formation is a Devonian-Mississippian age clastic sequence in the Williston Basin of North Dakota, Montana, and adjacent Canada. The Bakken has a tripartite division of two organic rich shales separated by a silty-sandy middle member. It is one of the richest source rocks in the world and is thermally mature over an area of approximately 15,000 square miles.

The Bakken is a marine sequence. The shales are of deep marine deposition, deposited below wave base and under anoxic conditions. The middle member consists of shallow marine, higher energy deposits. The source of the clastic material in all members is from the Precambrian Shield. The significantly different depositional environments indicate a rapidly fluctuating sea level. In fact, several rapid transgressive and regressive pulses are indicated in the Bakken sequence. Several previously unrecognized unconformities in the sequence are evidence of the rapidly changing sea level.

Hydrocarbon generation in the Bakken began in early Cretaceous time. Peak maturation coincided with maximum burial that probably occurred a few million years ago. The maturation process caused overpressuring and a bulk volume change in the shales. Hydrocarbon expulsion fracturing on a micro and macro scale resulted from the overpressuring. The Laramide Orogeny caused a compressional stress regime that resulted in an anisotropic system of regional fractures, and also resulted in tectonic fracturing associated with local folding.

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