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# THREE FORKS FORMATION

By Julie A. LeFever and Stephan H. Nordeng

Recent press releases by North Dakota operators have propelled the Bakken Source System once again into the spotlight. The Bakken Source System includes the hydrocarbon generating Bakken Formation as well as 150 feet into the overlying Lodgepole Formation and 150 feet into the underlying Three Forks Formation (fig. 1). Focus this time is on the Three Forks Formation.

that its wholly owned subsidiary, Fidelity Exploration & Production Company, had recently completed the Domaskin 11-29H (NWNW Sec. 29, T.154N., R.92W) in Mountrail County. This well was completed in the Three Forks Formation and flowed 634 bopd.

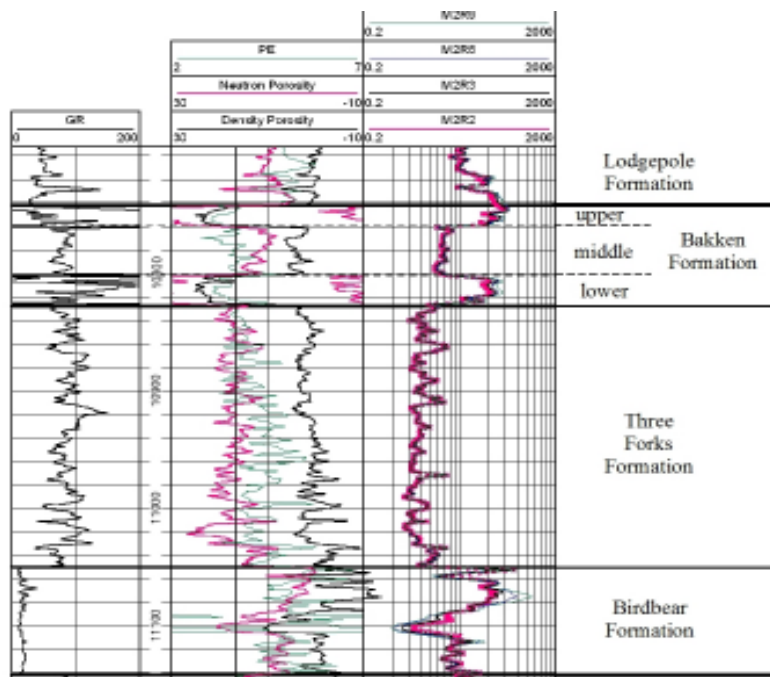


Figure 1. Typical geophysical log through the Birdbear, Three Forks, Bakken and Lodgepole formations. Log interval taken from Houston Exploration Co. Fancy Butte 19-32.

Press releases by Continental Resources, Inc. on May 20th and again on July 9th reported two different wells producing from the Three Forks. An active player in the Bakken, Continental Resources, Inc. placed the Dunn County wellbore for the Bice 1-29H (NWNE Sec. 29, T.146N., R.95W.) in the upper portion of the formation and completed the well for 693 barrels of crude oil equivalent per day. In a second press release, the company announced the initial results from a second well, the Mathistad 1-35H (SESW Sec. 35, T.150N., R96W.), in McKenzie County. This well flowed an average rate of 1,095 barrels of crude oil equivalent per day (bopd), with 90 percent of production being crude oil and 10 percent natural gas. On July 28, MDU Resources Group, Inc. announced

The Three Forks Formation has produced oil since the 1950s. Prior Three Forks production is from the Antelope Field in McKenzie County and is significant with a cumulative 12.9 million of barrels of oil to date. Production is from the upper portion of the formation that is characteristically apple green and tan carbonate mudstone and a localized burrowed sandstone sequence, informally referred to as the "Sanish sand" (fig. 2). The Bakken may contribute additional oil to some of the wells in this field.

Interest in the Three Forks Formation was renewed recently with the 2004 discovery of the Sinclair Field in Manitoba. Conventionally producing wells at shallow depths

have made drilling in this area attractive. As of April 2008, 737 wells have been drilled in the field and are producing about 11,000 bopd. The original oil in place for this field has been estimated by the Manitoba Province to be between 340 and 445 million barrels of oil.

The Late Devonian-aged Three Forks Formation is present only in the subsurface of the Williston Basin and extends over approximately two-thirds of the state of North Dakota (fig. 3). The formation consists of clean and argillaceous micrite and dolomicrite containing varying amounts of silt, sand and anhydrite. These sediments were deposited in and along a broad epeiric sea during several fluctuations in sea level. The Three Forks conformably overlies the Birdbear Formation and is conformably overlain by the lower Bakken member in the central portion of the basin and unconformably overlain by the progressively younger middle Bakken member, upper Bakken member and Lodgepole Formation towards the margins of the basin.

The Three Forks Formation attains a maximum thickness of 270 ft (82 m) and has a well-defined depocenter that covers Mountrail, Dunn and eastern McKenzie counties. The Three Forks thins to an erosional feather edge to the east and along the northeast flank of the Cedar Creek Anticline in the extreme southwest corner of the state.



Figure 2 Core from the Three Forks Formation at a depth of 3,390 feet in the Daniel Anderson #1 drilled in Rolette County (NE SE sec. 17, T.160N., R.73W.). Note the mineralized (in-filled) vertical fracture and the flaser (wavy) bedding in this carbonate mudstone. The Three Forks is typically encountered at a depth of about 10,000 feet throughout much of the basin.

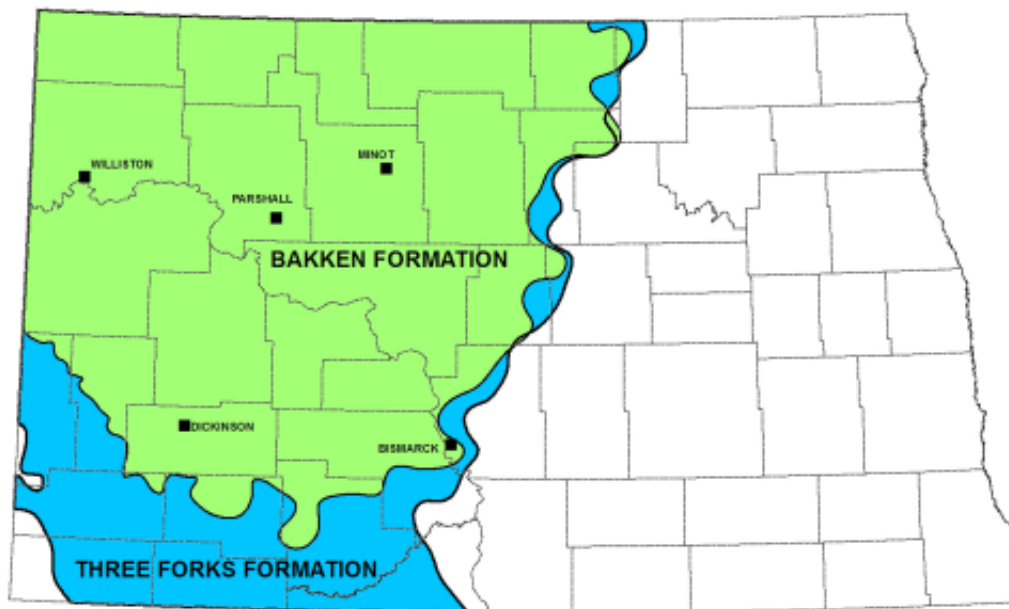


Figure 3. Extent of the Three Forks Formation and the overlying Bakken Formation in North Dakota (from NDGS GI-64).