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## The Bakken Play of Montana and North Dakota

The Bakken Formation has once again become the center of attention in the Williston Basin. Unlike the shale play of the early 90s, the focus is directed toward the middle member of the formation. Horizontal drilling of the middle member began in 2001 and until recently has been restricted to Richland County, Montana. As the success rate increased in Montana, leasing increased in North Dakota in an attempt to bring the play across the state line. To date, there is one reportable well drilled in North Dakota with numerous permits for additional wells.

Three years of drilling activity have defined the Bakken play in Montana. The stratigraphy is relatively simple and similar to the area played in the 90s. It consists of each successively higher member of the Bakken Formation overlapping the Devonian Three Forks Formation. As the play area is reached in Richland County, only the middle member and the upper shale remain. These units pinch out farther to the south. A bottom seal is formed by the impermeable Three Forks Formation and the Mississippian Lodgepole Formation forms the top seal. A well-developed, mappable trend is readily apparent in the middle member on wireline logs over this area.

Technology has finally caught up to the Bakken Formation. The ability to fracture-stimulate these horizontal wells is what makes this play work. In the late 80s–early 90s, wells had to rely on encountering natural fractures to supply the oil; wells in the current play create their own fractures.

Wells generally consist of two 4000 to 5000 ft laterals drilled on a 1280-acre spacing unit. The middle member is now drilled with saturated brine instead of inverted mud. The zone generally has between 7% to 12% porosity, permeability of 0.01 to 0.02 md, and 70% to 80% oil saturation. Once drilled, the well is then treated with a 650,000 to 1 million pound gelled water sand frac. The cost per well is approximately \$2.2 million with potential

production rate of 500 to 700 BOPD initially, leveling off at 250 BOPD with virtually no water.

Statistics from the Montana Board of Oil & Gas demonstrate the success of this play. Production for the Richland County has doubled each year as new wells come on line. There is no evidence that this production trend will slow in the near future.

### *Technology has finally caught up to the Bakken Formation.*

The same facies that produce in Montana are present and potentially productive in North Dakota. Additional potential within the middle member occurs as the Bakken thickens toward its depositional center in Mountrail County, North Dakota. This is further substantiated by production from another higher lithofacies that is present in the northwestern corner of North Dakota and in the Canadian provinces.

Additional pay section may also be present locally in North Dakota. The “Sanish Sand” occurs at the base of the Bakken Formation. Already a significant producer at Antelope Field, this interval is untested and occurs throughout the “Bakken Fairway” (depositional edge of the Bakken). Another potential target is the lower Lodgepole Limestone between the upper Bakken shale and the “False Bakken.” Detailed mapping of all of the zones will be required to determine the best location to tap into the oil resources of the Bakken Formation. ■

### **Biographical Sketch**

**JULIE A. LEFEVER** has been employed by the North Dakota Geological Survey since 1980 working on petroleum-related studies in the Williston Basin. She is currently Director of the NDGS Wilson M. Laird Core and Sample Library. She has presented several papers and core workshops on the Bakken. Julie received her MS from California State University Northridge in 1982.