

Reservoir Characterization of the Bakken Formation; or Why is Parshall Special?

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The Upper Devonian Middle Bakken Formation in the Williston Basin has become a prolific petroleum reservoir in recent years. The Middle Bakken Formation consists of several distinct lithofacies which represent different mineralogical assemblages and sedimentary mechanisms. Each lithofacies has unique petrophysical parameters, and these facies and lithotypes vary throughout the basin setting up multiple working play types. One striking example of this variability is presented by the lithofacies that are the predominate reservoir at Parshall Field. At Parshall Field there are three main lithofacies intervals present, two of which are reservoir facies. The Upper Middle Bakken consists of algal laminated dolomite mudstones and it has the highest porosity among the lithofacies at Parshall. The Lower Middle Bakken consists of limestone and dolomite and is heavily bioturbated. The third lithofacies is defined by crinoidal limestone shoals that are highly cemented with calcite. The reservoir quality and distribution of these facies, associated with the thermal maturity barrier, are the main drivers in setting up the field. By contrast, the reservoir lithofacies at Parshall are drastically different from those at Sanish Field and along the Nesson Anticline. Calibrating electric logs to core data is key in establishing the correct amount of oil in place in the Middle Bakken. Mapping the lithofacies and their corresponding petrophysical parameters have been useful in expanding the play to the north and south of Parshall Field, and as exploration ventures west of the Nesson Anticline.