

Bakken And Other Devonian-Mississippian Petroleum Source Rocks, Northern Rocky Mountains–Williston Basin: Depositional and Burial History and Maturity Estimations

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ABSTRACT

The three member Devonian/Mississippian Bakken-Exshaw organic-rich shaly facies is widely distributed in the northern United States and southern Canadian Cordillera. Equivalent facies are also present as far south as Utah and Nevada. Paleogeographically, these rocks thin markedly or pinch out to the west approximately along the Devonian-Mississippian carbonate reef/mound belt of the Cordilleran shelf margin. Although these rocks reach maximum organic richness approximately at the Devonian-Mississippian transition, similar but somewhat less organic-rich Bakken-like beds are also present in underlying Upper Devonian and overlying Lower Carboniferous carbonate depositional cycles. At least ten cycles are identified in the underlying Devonian carbonate units, characterized by basal organic-rich Bakken-like shale or shaly carbonate that grades upward into carbonate mound or reefal beds, overlain by evaporite or solution breccia. Cycles in the overlying Madison Group (Lodgepole/Mission Canyon formations), as many as 10 to 12 in number, are similar except that the carbonates are composed of algal-oolith, crinoid, or mixed skeletal beds. End-cycle evaporitic units are less prevalent in the lower cycles in the Williston Basin and are absent in north-central and western Montana. The organic-rich Devonian-Mississippian Bakken-Exshaw shales are the most important source of hydrocarbons in Montana and the Williston Basin.