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Madison Group Stratigraphy and Nomenclature in Northern Williston Basin

In the area of the international boundary, in northern North Dakota, carbonates and evaporites of the Madison group attain maximum thickness in the central Williston basin near the town of Williston, North Dakota. Recent drilling has resulted in scores of Madison discoveries in the United States and Canada in which the oil-trapping mechanism can be classified into one or more of the following: (1) predominantly, structurally controlled pools, (2) tilted and truncated porous units sealed under a Triassic shale cap rock, and (3) updip porosity wedgeouts resulting from facies change.

The area has gained prominence in recent years as a new province for stratigraphic oil exploration, and as such, offers the stratigrapher abundant opportunity to apply his ideas.

Considerable effort has been put forth in recent years to introduce a system of nomenclature which is tenable throughout the basin. It is held that the use of local terminology, based on rock types, is a workable answer to the problem. Long-range correlation across the basin is feasible with present well control and stratigraphic correlation is extended from the "east side" truncation belt of Saskatchewan and North Dakota to the Poplar anticline of Montana.

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Geology of Devonian Beaverhill Lake Formation, Swan Hills Area, Alberta

Early in 1957, several widely separated oil and gas discoveries were made in the Beaverhill Lake formation in the Swan Hills area of west-central Alberta. Production in this formation comes from the Swan Hills member, a southwest-dipping sequence of clastic organic limestones forming a platform on which small reef mounds are developed. To date, all the known hydrocarbons are trapped in the small bioherms downdip from the regional pinchout edge of the member, but the pinch-out edge itself is only in the early stages of being explored for possible stratigraphic traps. The Swan Hills member contains *Lingula spatulata* (early Waterways) zone fossils and represents early Beaverhill Lake reefing.

At the southwest corner of the type area, the Swan Hills member occupies the entire Beaverhill Lake interval and interfingers with the basal beds of the overlying Windfall reef of Woodbend age.

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Oil Potential of Minnelusa Formation, Powder River Basin, Wyoming

The Pennsylvanian and Lower Permian Minnelusa formation is a proved oil reservoir with 81,000,000 barrels produced to January 1, 1958. This formation is present and prospective throughout the Powder River Basin.

Density of Minnelusa tests is low and many large areas remain undrilled. To date, the structural approach has been used almost entirely in prospecting for Minnelusa oil, and present production is from closed anticlines. Many low-relief structures, similar to that at Donkey Creek field, should be present and oil-productive on the eastern flank of the Powder River Basin.

The Minnelusa is entirely marine in origin, having been deposited in a basin whose area coincides closely with the present Powder River Basin except on the south and southeast. Following deposition of the upper Minnelusa, an anticlinal arch formed in the north-central part of the Powder River Basin which was then truncated and buried by younger Permian shales. The oil found in this area appears to be related to the ancient anticline, with future prospects also being very good.

The Minnelusa formation can be divided by two intraformational unconformities into three separate rock units herein designated as the Upper, Middle, and Lower members. Paleontological evidence indicates that each unit is probably the same in age throughout the basin.

The Upper member of the Minnelusa is a sandstone-carbonate-anhydrite sequence of Lower Permian (Wolfcamp) age. Of the three Minnelusa members, the Upper exhibits the greatest thickness and facies variations and is also the most important for past oil production and future potential. The facies changes of porous sandstones to dense dolomites and anhydrites should provide favorable conditions for the generation and trapping of oil in stratigraphic traps.

The middle Minnelusa is a sandstone-carbonate sequence of Middle and Upper Pennsylvanian (Des Moines, Missouri, and Virgil) age. The "Leo" sandstones of the Lance Creek region (southeast Powder River Basin) are the principal oil reservoirs of the Middle member. Future production may be found in stratigraphic traps formed by the pinch-out of reservoir sands on the flanks of individual structures in the southeastern Powder River Basin and in the regional pinchout of the "First Leo" sandstone on the east flank of the basin.

The lower Minnelusa consists of cherty carbonates and red shales, usually with a basal sandstone unit, and is Lower Pennsylvanian (Atokan and Morrowan?) in age. Some oil production has been