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Permian Tectonism in the Rocky Mountain Foreland and Its Importance in Exploration for Minnelusa and Lyons Sandstones

Permian sandstones are important producers of oil in the Powder River and Denver Basins of the Rocky Mountain foreland region. In the Powder River Basin, Wolfcampian Minnelusa sandstones produce oil from structural and stratigraphic traps on both sides of the basin axis, whereas in the Denver Basin, the Leonardian Lyons Sandstone produces oil mainly from structural traps on the west flank of the basin. Two fields, North Fork-Cellars Ranch in the Powder River Basin, and Black Hollow in the Denver Basin, are used as examples of Permian growth of the structural features.

At North Fork-Cellars Ranch a period of Permian structural growth and resultant differential sedimentation is documented by structure and isopach maps of the Minnelusa and overlying Goose Egg Formations. Structural growth began at the end of Minnelusa time and resulted in deposition of a much thicker Goose Egg section on the west flank of the field. At Black Hollow mapping indicates structural growth was initiated before deposition of the Lyons Sandstone and continued throughout Leonard time. In both field examples growth abruptly ceased in the upper Permian.

Both North Fork-Cellars Ranch and Black Hollow are located on structural highs, or arches, which trend east-west across the Powder River and Denver Basins. These arches were present during the pre-Laramide migration of Paleozoic-sourced hydrocarbons into the basins and acted as pathways for migration. Exploration for Permian reservoirs in the two basins should be concentrated on the arches as the early formed traps were ready to accumulate hydrocarbons when migration began.