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Development of the Mowry Petroleum System in an Evolving Foreland Basin, Green River Basin, USA

The thermal history, fluid migration, and sedimentary successions within the Mowry Petroleum System are directly related to the structural evolution of the Greater Green River Basin. Mowry Shale source rocks and Frontier Formation reservoir rocks were deposited during the Cenomanian to mid-Turonian in a foreland basin consisting of foredeep, forebulge, and backbulge depozones. The Mowry was deposited within all depozones in a restricted seaway and anoxic conditions preserved organic matter in sufficient quantities to be a prolific hydrocarbon generator. The Frontier consists of about 300 m of shoreface and coastal-plain deposits in the foredeep depozone, thins to 75-100 m in the forebulge depozone where it is characterized by sharp-based shoreface deposits, incised valley-fills, and multiple widespread erosion surfaces, and about 30-50 m of isolated fluvial and lowstand deltaic deposits in the backbulge depozone. Source and reservoir rocks deposited in the proximal foredeep were subsequently buried by younger deposits and the source rocks generated hydrocarbons that migrated into conventional reservoirs on the forebulge. The foredeep deposits were then either overridden by successively basinward-breaking thrusts during the latest Cretaceous and Paleocene or were incorporated into the upper plates of the thrusts, and in many cases eroded. By Eocene time, the foreland basin was broken into intermontane sub-basins. Source rocks originally deposited basinward of the proximal foredeep were finally buried to depths sufficient to generate another pulse of hydrocarbons into tight Frontier reservoirs creating basin-centered accumulations and modifying the original conventional reservoirs on the forebulge.