The Horsethief and St. Mary River formations were deposited along the Late Cretaceous epicontinental seaway, which then covered much of the western interior. Where these formations presently crop out along the disturbed belt in western Montana, the sedimentary units form a volcaniclastic sequence deposited during the final regression of the Montana Group and contemporaneously with early stage development of the Laramide orogeny. The facies preserved within these volcaniclastic sequences represent barrier island, high-destructive wave-dominated delta, and fluvial plain environments of deposition.

The Horsethief, lower of the two formations, is divided into two facies sequences. Facies sequence A consists of coarsening-upward sequences of sandstones and interbedded shales. The predominant sedimentary structures include multidirectional planar and trough cross-bed sets, micro-cross-beds, and ripples. *Ostrea* sp. and *Ophiomorpha* are present and most abundant near the top of this sequence. These facies comprise a barrier island system consisting of shoreface, dune, tidal channel, and lagoonal environments. Facies sequence B, deposited along the depositional strike, consists of a coarsening-upward sequence of vertically stacked distributary channels that thicken and become more abundant upsection. Delta fringe and prodelta facies are absent; marine processes reworked the detritus into barrier island systems.

The St. Mary River Formation is divided into a lower and upper member. The lower member consists of shales, sandstones, limestones, and coals deposited in a lagoon landward of the barrier island system. The upper member contains trough cross-bedded channel sandstones, overbank sandstones, shales, and carbonate-nodule horizons indicative of fluvial plain sedimentation. These genetically related sequences were deposited along a basin margin characterized by microtidal to mesotidal ranges and dominated by longshore currents.

The recognition of these facies is significant because of the potential contributions that they may make to reservoir maturity and preservation. The interpretation of the depositional environments and petrographic characteristics as observed within these formations can be useful in analyzing facies sequences that have similar source lithologies and were deposited in basins with a similar evolution. The recognition of these facies is significant because of the potentially important application associated with hydrocarbon source and reservoir conditions, as well as heavy mineral assemblages.