

JUDITH RIVER FORMATION IN EASTERN MONTANA—INNER SHELF SAND RIDGES AND PALEOTECTONISM

by

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The Judith River Formation (Upper Cretaceous) in the Montana plains east of longitude 108°W grades laterally from nonmarine rocks and coastal sandstones into shelf sandstones and shale. The unit was deposited on a broad siliciclastic shelf that stretched along the western side of the Western Interior Seaway. The shelf was situated on the western margin of the Williston Basin and received sediments eroded from tectonic uplands in western Montana. In general, the Judith River consists of two, and locally three, sandstone sheets which display the upward increase in grain size and increased sorting, characteristic of shelf sand bodies.

Stratigraphic studies on Porcupine Dome, the Miles City Arch, Cedar Creek Anticline, and Poplar Dome document a hierarchy of shelf sandstone bodies similar to that observed in the Shannon Sandstone in southeastern Montana. Elongate lenses which show a positive correlation in width and thickness are interpreted to be sand ridges. Larger, more equidimensional lentils are interpreted to be fields of sand ridges. Sandstone sheets are interpreted to be coalesced ridge fields. Although all elements of the hierarchy are not found on each structure, the interpretation of a siliciclastic shelf setting seems inescapable. Paleotectonism on that shelf influenced deposition of the sandstone.

Evidence for paleotectonic control is most clear on Porcupine Dome and Cedar Creek Anticline, where facies change perpendicular to individual mapped faults. Paleotectonic controls on shelf deposition near the Miles City Arch and Poplar Dome are less distinct; stratigraphic map patterns reflect lineaments interpreted from satellite data.

There has been extensive natural gas production from the Judith River Formation on Cedar Creek Anticline; currently the depleted sandstone reservoirs are used for gas storage. On Poplar Dome, there are numerous gas shows and some production for local field use. Near the Miles City Arch, the potential for gas production looks good, but tests have been disappointing.